

Lighthouse Project 1: Post-Mining Land-use – Regulatory and Industry Practices

Organisation:

enviroMETS

Research Consultant:

AffinitasODI

Report delivered:

Nov 2023

Research period:

**August-November
(15 Weeks) 2023**



Contents



Executive Summary	1
Introduction	3
Methodology	4
Key Insights	5
Strategic Issues	5
Industry Practices	8
Regulatory Practices	9
Summary of Key findings	10
Conclusion	11
Recommendations	12
Glossary	13
Reference List	14
Appendices	15
Appendix 1	15
Appendix 2	28
Appendix 3	29
Appendix 4	38
Appendix 5	39

Executive Summary



AffinitasODI was commissioned by enviroMETS Queensland (eMQ) to undertake a rapid analysis of regulatory and industry practices impacting on Post-Mining Land-Use (PMLU) outcomes in Queensland, through its Lighthouse Project funding initiative. As a for-purpose company funded by industry and government, eMQ has a key role in growing the METS sector in Queensland.

CRC TiME was a critical project partner in the analysis, not only providing funding support, but also guidance to the underpinning data-gathering process. CRC TiME has deep expertise in understanding Post-Mining Land-Use (PMLU) issues and without their hands-on support, this report would not have been possible.

AffinitasODI would like to acknowledge the funding support provided to it and eMQ by the METS industry in Queensland, the Department of State Development, Infrastructure, Local Government and Planning (DSDILGP), CRC TiME, RCoE, GW3, Sedgman and Regeneration Enterprises. In addition, both eMQ and AffinitasODI would like to thank the in-kind support provided by the Department of Environment and Science (DES), the Department of Resources (DoR) and the many METS firms and mining companies that participated in the review process, while still noting that the opinions in this report are those of the author and do not reflect current government or industry policies.

The review process was conducted in a 15-week timeframe and works through qualitative data generated through a stakeholder workshop, a specialist report on overseas experiences in PMLU, a series of case study activities and document searches.

This short, sharp review and reporting approach, initiated by enviroMETS is not meant to provide a comprehensive summary of all the possible positive and not-so-positive factors impacting on potential PMLU in Queensland. Its intent was to identify and raise significant observations about the systemic barriers and enablers to promoting positive PMLU outcomes, giving strategic opportunities for both government and industry to consider further, providing a platform for more detailed investigation.

Key amongst these strategic opportunities are:

- The need for a series of strategic planning frameworks to guide potential PMLU-based activities in designated geographical zones (eg. Bowen Basin, North-West Minerals Province, North-West Cape, etc.);
- These strategic planning frameworks should identify potential multi-site and site-specific PMLU options to provide direction to current mine operators when developing mine rehabilitation plans;
- The creation of a new mining remediation tenure to facilitate PMLU activities such as secondary mining;
- Associated with the establishment of the new tenure arrangement, new Environmental Authorities that partition the liabilities of new PMLU operators from the residual risks from the former mining activity;
- A modernization of the Environmental Protection Act to enable it to deal with PMLU outcomes more effectively;
- Examination of targeted government incentive schemes to encourage innovative PMLU outcomes that take advantage of strategic assets created by mining activities.



- The creation of a “concierge service” within the State Government to help proponents of innovative PMLU options to navigate the current regulatory and incentive systems, as well as help identify potential PMLU sites.
- Intergovernmental negotiations with the Australian Government to design suitable tax incentive schemes to encourage capital expenditure on innovative PMLU options; and
- Inclusion of suitable mine waste (ie. Rock and tailings) as recycled material in the Department of Transport and Main Roads (DTMR) procurement processes.

eMQ aims to stay connected to the ongoing developments in PMLU through its ongoing Lighthouse Project process. In this regard, eMQ has commenced a further Lighthouse Project designed to assist potential investors and governmental decision-makers identify a range of “net-best value” options for formerly mined land that take into account not just the economic viability of proposed ventures, but also the societal and environmental benefits as well.

This report represents the completion of Lighthouse Project 1.

Introduction



In late August 2023, enviroMETS (eMQ) commissioned AffinitasODI to undertake a short, sharp policy review process over a fifteen-week period, to examine the strategic regulatory issues associated with Post-Mining Land-Use (PMLU). This report provides the findings from this review, under the title of Lighthouse Project 1: Post-Mining Land-Use: Regulatory and Industry Practices.

This report outlines the key findings and recommendations from the review, along with detailing the research methodology used to derive these outcomes. We hope that the transparency provided through the review process gives others (particularly government, industry representatives and researchers in the field) confidence in the directions provided in the findings and recommendations.

AffinitasODI would like to thank the participants in the review process, especially members of the Reference Group Committee, the Industry and Government Force Field Analysis Group, the Case Study interview subjects and two expert PMLU advisors, Darren Murphy and Pete Whitbread-Abrutat, with the latter providing an overview of innovative PMLU outcomes from his international experience (see Appendix 1). While several people have participated in developing this report, the views expressed in this paper are those of the author, Professor Brett Heyward, from AffinitasODI.

This project is one of three integrated activities designed to provide enviroMETS and CRC TiME stakeholders with prioritised recommendations for advancing Queensland's interests in post mining land use. These activities include an advanced methodology for assessing 'what's next' options for mining affected land, and a 'sandbox' framework that enables the establishment of pilot sites for research, testing and commercial development of new innovations.

Methodology



This review uses a qualitative research method to derive its findings. The method has four key elements. First, was a facilitated group process to determine views on the forces enhancing and restraining action on four, overlapping concepts in the resources development and land-use planning space: relinquishment, re-purposing, re-mining and re-investment. The definitions used for these terms in the group exercise can be found in Appendix 2.

The facilitated group was comprised of twenty-five (25) participants from a range of backgrounds including representatives from mining companies and METS business, along with senior public servants from the DSDILGP, DES and DoR. The group process ran over a four-hour period, using a facilitation device called force-field analysis.¹ A force-field analysis is a facilitation tool designed to identify systemic issues at play in any given topic or idea. The artefact from the group exercise can be found at Appendix 3.

The artefact provides a rich source of participant views. As an example, under the banner of the relevant policy interest (eg. Relinquishment) participants identified the various “forces” at play in moving the concept to its end conclusion. The participants also identified some of the initiatives that would give further positive support to achieving the policy goal. As a collective, the group was also able to prioritise initiatives based on a group voting process.

The second element of the qualitative research was a series of case studies. Senior representatives from ten (10) mining companies were interviewed to assess their views on PMLU objectives. The prompting questions used in these interviews can

be found in Appendix 4. These companies agreed to participate in the process under the guarantee of anonymity. The key learnings from each case study can be found at Appendix 5.

The case study process was enhanced through the engagement of an expert advisor in PMLU matters, Darren Murphy. Darren worked closely with the author of this report and, together, were able to review each other’s work to ensure the key learnings from each case study were consistently derived. Further, Darren was also able to provide comment on the overall review findings providing further linkages to the case studies and the final report.

The third element of the methodology included a document search process on the topic of PMLU, with significant contributions coming from CRC TiME. Some 2,000 pages of relevant documents were reviewed as part of the review documented in this paper.

Finally, the review process sought feedback from a specialist reference committee comprised of members from several government departments, CRC TiME and eMQ. The reference group met on a fortnight basis during the 15-week process, for thirty (30) minutes to one hour. The reference group provided the reviewer with timely direction and information on the matters emerging from the case study interviews and other process steps. Again, reference group members were guaranteed anonymity, as with the case study interviewees.

Reference group members were also provided the opportunity to comment on an early draft of this paper. As stated at the outset, the views expressed in this paper are those of the author and do not represent an authorised view of the reference committee, nor the collective views of the individual PMLU experts mentioned above.

¹ For further information on how to conduct a force field analysis, see: http://www.aral.com.au/pdfs/13ffa2_ho1.pdf

Key Insights



Strategic Issues

As a truism in public policy, governments of all colours, in all jurisdictions “muddle through” important policy fields.² Resources policy, and PMLU options in particular, endure the same fate. The field, like so many others, is replete with overlapping and sometimes conflicting policy objectives, spread across different legislative mechanisms and government policy initiatives.

At a glance, some of the policy processes impacting on PMLU outcomes in Queensland include, various Acts of parliament and associated subordinate legislation (eg. The Mineral Resources Act, The Land Act, The Environmental Protection Act, The Planning Act, The Regional Interests Act and The State Development and Public Works Organisation Act, as well as a number of special purpose Acts)³, multiple policy positions (eg. Energy and Jobs Plan, Critical Minerals Strategy, and the Queensland Resources Industry Development Plan), as well as numerous government expenditure and tax incentive programs.

For potential PMLU proponents, navigating this complex governance environment can be daunting, if not outright intimidating. Yet, the achievement of PMLU outcomes offers communities and individuals so many potential benefits, including improved environmental outcomes, new economic development opportunities, as well as just outcomes for Traditional Owners and rural communities.

As a general theme, mine rehabilitation across government policy programs has focused on the return of safe, stable, and non-polluting landforms suitable for the reinstatement of the pre-mining land use. Government policy and regulation of mine rehabilitation has focused on the minimisation and transfer of liability from tenure holder to tenure holder. Relinquishment rarely occurs and mine tenure structures span decades.

For potential PMLU proponents, navigating this complex governance environment can be daunting, if not outright intimidating. Yet, the achievement of PMLU outcomes offers communities and individuals so many potential benefits, including improved environmental outcomes, new economic development opportunities, as well as just outcomes for Traditional Owners and rural communities.

² Lindblom, C.E. (1959). “The science of “muddling” through,” *Public Administration Review*, 19(2): 79-88.

³ There are Commonwealth Acts to consider as well, such as the Environmental Protection and Biodiversity Conservation Act, particular if the PMLU proponent is seeking environmental offsets.

In recently enhanced regulations, such as those determining Progressive Rehabilitation and Closure Plans, or PRCs, put the onus on the current mining company to investigate and facilitate PMLU outcomes, something that few are well-equipped or motivated to do. This situation exists in Queensland even though authorities know that PMLU successes in other jurisdictions have largely arisen when third parties, with a specific investment interest, have taken responsibility to deliver a PMLU outcome. As identified in the report on overseas experiences, successful PMLU outcomes are rarely dependent on the original mine operator (see Appendix 1 for a detailed analysis of the international experience in PMLU).

The international experience of positive PMLU outcomes shows that new operators are essential. Examples such as the Eden Project in Cornwall, UK, clearly highlight the process of transformation of a former mine site into a world-class tourism venture needs the dedication of new land-holders, companies and individuals with the vision and capability to make it happen. These entrepreneurs were able to bring energy and creativity to the table, along with the project management skills and financial backing to make it all possible.

One way to help this new class of proponents into PMLU opportunities is to provide them with expert government assistance to navigate their way through current policy and regulatory environments. To this end, this report suggests the establishment of a dedicated “concierge service” for PMLU outcomes within an appropriate economic development agency such as DSDILGP or DoR.⁴ Such a service would be headed by an executive-level public servant, with a small team of policy and project officers with a clear mandate to work across government to drive PMLU outcomes. Government has used similar, lead agency, structures to drive other innovative policy initiatives and has the experience to apply the same process to drive a PMLU agenda.

The international experience of positive PMLU outcomes shows that new operators are essential. Examples such as the Eden Project in Cornwall, UK, clearly highlight the process of transformation of a former mine site into a world-class tourism venture needs the dedication of new land-holders.

Several case studies identified the need for such a concierge service. For example, for one of the interviewees, the goal to achieve a positive PMLU required them to deal with more than nine different regulatory agencies, with some wanting competing and sometimes contradictory actions from the PMLU activity. In the end, the potential positive outcome (the use of suitable waste rock for construction) was abandoned, the bureaucratic maze was too difficult to navigate.

More importantly, PMLU outcomes rarely occur in a vacuum. Currently, there is no clear way of identifying how a specific PMLU option on a current mine site fits into the overall strategic direction of any given region or geographical zone (eg. how a clean energy project on a formerly mined area could integrate with similar projects in the area). As a result, PMLU options tend to be ad hoc and disconnected, with little likelihood of coming to fruition. As a result of this apparent planning gap, this report suggests that consideration be given to a suitable strategic land-use planning process to guide the development of PMLU outcomes in geographical regions or zones.⁵

The case studies showed that zonal strategic land-use plans would provide much needed guidance to investors and developers interested in working with government on economic transitions in mining communities (eg. the use of previously mined land for clean energy projects).

4 Such a service could be attached to an existing departmental unit responsible for facilitating resource projects more generally. A PMLU focus would be a natural addition to this primary function.

5 Such a strategic land-use process could also provide government with an opportunity to create a “register of beneficial assets” to enable potential PMLU proponents to identify opportunities that align with their individual business interests. It would be a useful register to guide recommendations from a future “concierge service.”

Zonal, or geographical-based, strategies would allow for landscapes and existing infrastructure, including mineralized wastes, to be seen as potential assets, rather than liabilities to be managed (or regulated) by future governments. This process would flip the thinking within policy and regulating agencies from “how to manage these liabilities,” to “how can we take advantage of material (and assets) in the area.”⁶

The change in thinking is subtle but nonetheless impactful. The most easily identified assets could be potential critical minerals within tailings dams and waste rock, along with established physical infrastructure such as roads and energy transmission lines, that could support the production of governments’ decarbonisation and other strategic agendas.

Strategic land-use plans could also help to develop other supporting activities for PMLU outcomes. For instance, a range of incentives (both federal and state-based) could be provided to stimulate investment activity. As was pointed out by an interviewee from a major international investment house, “we love government strategic plans – it helps us take a long-term view to our capex strategies.”⁷ The ability to provide targeted tax and program incentives helps to further justify significant capital expenditures. In addition, such a strategic approach has the potential to remove or significantly reduce the requirement for financial assurance on mining legacies where there is a clear net environmental and social benefit in the new economic venture on formerly mined land.

To this end, this report suggests an integrated approach to strategic planning activities across the State that is connected to a system of incentives to industry to encourage aligned investment. These incentives should include targeted tax breaks for large-scale capital investment, a responsibility of the Australian Government. To this end, the Queensland Government will need to engage with its counterpart at the national level.

Finally, a number of case study participants cautioned about adding further regulatory requirements onto existing mining operations. It was their view that industry has had to absorb significant policy changes in recent times, from national decarbonisation strategies to progressive rehabilitation planning mechanisms and associated financial assurance measures. Adding yet another policy initiative (ie. PMLU outcomes) was often put into the “what do you want us to do now?” category. By adding an incentive process, rather than a blunt regulatory mechanism, governments can acknowledge the impacts that regulation has had on industry in recent times.

Zonal, or geographical-based, strategies would allow for landscapes and existing infrastructure, including mineralized wastes, to be seen as potential assets, rather than liabilities to be managed (or regulated) by future governments.

⁶ While still ensuring that all residual liabilities are effectively managed.

⁷ Specific mention was made of the Queensland Government’s Energy and Jobs Plan



Industry Practices

Given the relatively rapid rate of regulatory change in the mining sector in recent times, industry has contended with the situation by bunkering down and focusing on compliance. As a consequence, it is a difficult time to start a conversation about innovative PMLU outcomes.

The case studies showed that the industry simply does what it needs to do in order to comply with the current legislative framework and to minimize their assurance liabilities. To interviewees, changing rehabilitation plans to accommodate a range of potential PMLU outcomes placed too much uncertainty on their mining operations and introduced unnecessary financial risks.

As already mentioned, PMLU outcomes are likely to be driven by entrepreneurs with different ways of thinking compared to traditional mine operators. The transition between operators (ie. from miner to entrepreneur) becomes more of a strategic land-use planning process rather than a site-by-site “how about we try this” approach, as PMLU has been progressed to date. A strategic land-use approach would enable the conversations between miners and regulators to change the conversation about mine rehabilitation plans, aligning them to the long-term land-use plans for the region (rather than the “default option” of pre-existing landforms).

Again, a centrally located concierge service could act as an intermediary/advisory service to identify potential land-use opportunities and help the transition of formerly mined-land to new PMLU operators, much like how land ownership transfers are facilitated by real estate agents in the private land ownership model. Such a service could also deal with the associated tenure resolution processes to accommodate new land-uses and help proponents navigate existing regulatory processes (as well as identify potential regulatory improvements).

The case studies showed that the industry simply does what it needs to do in order to comply with the current legislative framework and to minimize their assurance liabilities.

Regulatory Practices

Almost all the case study interviewees were quick to compliment the work of Queensland Government officials in assisting them to navigate existing regulatory frameworks. Proponents recognized that officers were doing the best they could with a regulatory system that was not necessarily fit for purpose, designed during a time when PMLUs were not considered part of the mining life cycle.

It was clear from the case study interviews that the current regulatory system is under significant strain and needs modernising. In particular, the EP Act appears unable to consider the net environmental benefit of a PMLU, or secondary mining activity, and as a result potential net environmentally positive PMLU projects fail to proceed.

The EP Act provides no efficient way to transition mining EAs to alternative land use and a significant amount of officer time is currently being spent on crafting new regulatory pathways to support these emerging PMLU opportunities. In addition, the inability of the EP Act to accommodate net positive PMLUs has added the unnecessary burden of high assurance costs on low-margin (but environmentally and socially beneficial) operations. This regulatory outcome only serves to discourage companies looking at repurposing opportunities.

Based on these observations, this report strongly recommends a review of the EP Act with a view to modernizing its approach to more appropriately deal with the emerging global trend of viewing formerly mined sites as assets, rather than seeing them solely as ongoing liabilities.⁸ This change of approach has the potential to provide significant benefits to Queensland, especially projects that are attempting to use existing regional assets for socially and environmentally positive outcomes (eg. using power and road infrastructure for renewable energy projects).

A review of the EP Act should include a multi-jurisdictional analysis of policy options, comparing and contrasting the perceived benefits and limitations of applicable regulation systems of comparable countries or states. Such an analysis would assist any future EP Act review, as well as enabling non-government agencies such as eMQ and CRC-TiME to provide expert advice as the process evolves.

Working hand-in-glove with a modernised environmental approval system is the need to provide PMLU proponents with suitable tenure arrangements to authorize their activities on an existing mine site. To this end, this report recommends that DoR establish a suitable “remediation tenure” which provides the holder the necessary rights to undertake site activities as well as partitioning legacy environmental impacts of the previous operator from the specific activities being undertaken by the new proponent. Such a tenure should also recognise the net environmental benefit of the PMLU and hold the grantee accountable for achieving set goals and objectives in line with these benefits (eg. progress towards replacing or stabilising former tailings dams on abandoned mine sites).

As identified in the report on international experiences in PMLU (see Appendix 1), the US is now considering a bill to encourage new actors to achieve net beneficial outcomes on its tens of thousands of abandoned mine sites by partitioning liabilities from previous mining activity.⁹ Queensland could achieve a similar outcome with a new tenure and EP approval process.

It was clear from the case study interviews that the current regulatory system is under significant strain and needs modernising. In particular, the EP Act appears unable to consider the net environmental benefit of a PMLU, or secondary mining activity, and as a result potential net environmentally positive PMLU projects fail to proceed.

⁸ Such a legislative review is likely to also highlight the need for consequential amendments the Planning Act, the Regional Planning Interests Act and the Land Act (if the new tenure requires a Development Approval). Likewise, there may be consequential amendments necessary to the Water Act, if permits are required to take water. The team tasked with reviewing the EP Act will need to take these considerations into account.

⁹ Titled: Good Samaritan Remediation of Abandoned Hardrock Mines Act of 2023.

Summary of Key findings



The review found that there are several practical ways to encourage PMLU outcomes, from setting clear strategic priorities in long-term zonal land-use planning instruments to the creation of project advisory services from a government-led concierge service.

Industry opinion from case studies and focus group processes included a greater focus on strategy setting and incentive mechanisms. Stakeholders also pointed to the limitations of the current EP Act and its ability to accommodate the emerging PMLU environment. It was clear from the case study material that a modernization of the Act is necessary, especially for PMLU initiatives that deliver net environmental benefit on a formerly mined site (eg. re-mining of tailings dams for critical minerals in exchange for environmental works on-site, such as new or renewed tailings dams).

It should be noted that industry was extremely appreciative of the work done by public servants in creating regulatory pathways to enable PMLU outcomes within the existing regulatory framework. Though, the time has arrived for more streamlined, fit-for-purpose regulatory frameworks to assist the leadership already being shown by senior public servants working on PMLU initiatives.

In terms of priorities, this review found that a significant step change in positive PMLU outcomes could stem from two important initiatives: the creation of a new mining tenure to accommodate secondary mining activities (with associated tailored Environmental Approvals – a similar system to what is currently operating in Western Australia); and the provision of regional strategic planning frameworks to provide direction to PMLU opportunities. It is the view of the reviewer that these initiatives deserve to receive immediate attention.

There were other potential “quick to implement” opportunities identified through the case studies, such as the declaration of suitable mine waste as a recycled material in DTMR tender processes¹⁰ and the creation of a concierge service to assist PMLU proponents navigate the regulatory and incentive systems. The concierge service could also serve as an intermediary to connect PMLU proponents to potential emerging PMLU sites, as identified through the strategic land-use planning processes discussed above.

Over the medium term, and probably into a new parliament, the EP Act should be reviewed to ensure it provides fit-for-purpose outcomes for secondary miners and PMLU proponents. In addition, incentive processes that encourage PMLU investment should be explored, including negotiation with the Commonwealth Government on suitable tax incentives that promote long-term capital investment particularly for projects that contribute to Governments’ policy goals in clean energy and decarbonisation.

¹⁰ While including waste rock into DTMR procurement processes, the government may want to consider a broader review of mine waste generally and how it fits with DES policies on “end of waste.” There are possible other opportunities for circular economy outcomes that incorporate mine waste.

Conclusion



This report maps out the regulatory and industry factors that drive and potentially inhibit PMLU outcomes in Queensland. Through documenting the policy environment in this fashion, eMQ and CRC TiME hope to generate a systemic response to PMLU issues. The options range from the strategic (Zonal Strategic Land-use Plans) to the practical and immediate (the creation of a concierge service to assist emerging PMLU proponents).

For those interested in the PMLU policy environment, CRC-TiME has an ongoing catalogue of published material on the topic (see: <https://crctime.com.au/>). In addition, eMQ intends to publish further papers on PMLU through its Lighthouse project framework.

Recommendations



This paper provides the justification for the following recommendations:

1. The need for a series of strategic planning frameworks to guide potential PMLU-based activities in designated geographical zones (eg. Bowen Basin, North-West Minerals Province, North-West Cape, etc.);
2. These strategic planning frameworks should identify potential multi-site and site-specific PMLU options to provide direction to current mine operators when developing mine rehabilitation plans;
3. The creation of a new mining remediation tenure to facilitate PMLU activities such as secondary mining;
4. Associated with the establishment of the new tenure arrangement, new Environmental Authorities that partition the liabilities of new PMLU operators from the residual risks from the former mining activity;
5. A modernization of the Environmental Protection Act to enable it to deal with PMLU outcomes more effectively;
6. Examination of targeted government incentive schemes to encourage innovative PMLU outcomes that take advantage of strategic assets created by mining activities.
7. The creation of a “concierge service” within the State Government to help proponents of innovative PMLU options to navigate the current regulatory and incentive systems, as well as help identify potential PMLU sites.
8. Intergovernmental negotiations with the Australian Government to design suitable tax incentive schemes to encourage capital expenditure on innovative PMLU options; and
9. Inclusion of suitable mine waste (ie. Rock and tailings) as recycled material in the Department of Transport and Main Roads (DTMR) procurement processes.

Glossary

DES	Department of Environment and Science
DoR	Department of Resources
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
DTMR	Department of Transport and Main Roads
eMQ	EnviroMETS Queensland
EP Act	Environment Protection Act (Qld) 1994
PCRP	Progressive Closure and Rehabilitation Plan
PMLU	Post-Mining Land-Use

Reference List

Boggs, G. (2023). "What are we transitioning into? Re-thinking the model of mine closure." Presentation to IMARC Sydney, November 2023.

Dick, B. (2013). Force Field Analysis Technique. http://www.aral.com.au/pdfs/13ffa2_ho1.pdf Access on 30 August 2013.

Lindblom, C.E. (1959). "The science of "muddling" through," *Public Administration Review*, 19(2): 79-88.

Queensland Government, Queensland Government Energy and Jobs Plan, September 2022, <https://www.epw.qld.gov.au/energyandjobsplan>. Accessed on 14 October 2023.

Queensland Government, Queensland Resources Industry Development Plan, June 2022, https://www.resources.qld.gov.au/_data/assets/pdf_file/0005/1626647/qridp-web.pdf . Accessed on 14 October 2023.

Appendices



Appendix 1

International Experiences

SOME THOUGHTS ON HOW GOVERNMENT CAN ENABLE INNOVATIVE, ON-THE-GROUND POST-MINING SOLUTIONS

Dr Peter Whitbread-Abrutat
Director and Founder, Future Terrains International Ltd¹

INTRODUCTION

Government has a critical role to play in ensuring that closed mine sites are not an ongoing environmental or socio-economic burden to local people or the taxpayer. There are numerous situations where regulatory praxis is out-of-step with current on-the-ground needs or stakeholder aspirations for delivering world class post-mining regeneration, yet there are also examples where government actions have enabled innovative, positive action to address the post-mining imperative.

This paper forms part of enviroMETS Queensland's Lighthouse Project 1 legislative review project, which aims to identify potential legislative barriers and gaps to achieving outcomes that enable world-class mine site re-purposing. The paper presents some international examples of how mine closure has been addressed in different ways, facilitated by government actions, to enable positive new futures for local people and their environment. Please note that a detailed examination of how the policies work or how they were designed in their various jurisdictions is beyond the scope of this paper.

The subject is a complicated, multidisciplinary, global topic, so it is only possible to scratch the surface in a short paper. Recent reviews of the subject rightly focus mainly on the challenges of applying the statutory roles of government in mine closure, namely: working with mining companies and communities to develop a sound closure vision; applying diligence to the company's mine closure planning process and cost estimates; facilitating a just social transition; ensuring adequate financial assurance is in place; and agreeing relinquishment of the site.² These challenges are well-understood, but addressing them is difficult for many jurisdictions.

1 pabrutat@futureterrains.org; www.futureterrains.org

2 Brock, D. and Stevens, R. (2021). The mine closure challenges for government and industry. ICMM. At: <https://www.icmm.com/en-gb/stories/2021/mine-closure-challenges-for-government-and-industry>, accessed on 5th October 2023

Stevens, R. (2021). Current status of mine closure readiness: are governments prepared? Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development. International Institute for Sustainable Development

Stevens, R. (2023). Relinquishment of closed mine sites: policy steps for governments. Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development. International Institute for Sustainable Development

Perkins, D., Cooper, T., Scholtz, L. and Mulaudzi, K. (2020). Mine Closure and Rehabilitation in South Africa: Activating Coalitions of the Willing for a Just Future. Briefing paper to WWF-South Africa, Cape Town, South Africa.

An alternative, insightful exercise is to consider how government has enabled excellence in delivering post-mining solutions from the starting point of analysing on-the-ground success stories.³ This approach will often determine some bespoke, creative contributions of wider applicability, fostered by government. This paper considers just such examples and attempts to tease out the relevant success factors that are of wider applicability. Unless otherwise defined, the term “government” is used broadly in this paper to include all levels of government – local, regional (state or provincial) or national or even supra-national (such as the EU).

APPROACH

This section describes six celebrated mine closure/ post-mining regeneration projects/ programmes and for each briefly outlines the relevant government action/ investment/ regulatory/ policy aspects of the project that enabled it to succeed. Each project has been researched in detail by the author, including site visits, discussions with key actors and desktop research to refine the story. Note that the case studies are not mutually exclusive – a single case study may illustrate more than one key point. The final section analyses these aspects and comments on how these may become more commonplace.

These examples were selected because:

- They show innovation in delivering better practice in specific on-the-ground situations;
- They address different mine closure/ post-mining regeneration realms that are of broad applicability to other jurisdictions; and
- They represent – to some degree – diversity in geography, environmental, cultural and socio-economic conditions and political/ regulatory regimes.

The case studies selected to inform this review are:

- Large-scale forest restoration in the Appalachian coalfields and adapting to the limiting effects of regulation, USA (Box 1);
- Creating a blank canvas for regional landscape restoration and socio-economic restructuring in the lignite mining regions of east Germany (Box 2);
- Creating a mountain biking resort at Derby, Tasmania, to enable community rejuvenation (Box 3);
- Initiating a bioeconomy campus at Ireland’s closed Lisheen mine site (Box 4);
- Developing the Global Centre for Rail Excellence, Wales (Box 5); and
- Adapting industrial infrastructure and industrial nature at Germany’s North Duisburg Landscape Park (Box 6).

³ Svobodova, K. (2023). Navigating community transitions away from mining. Comment. Nature Energy. Vol. 8, 1054-1057

These are presented in more detail in the boxes below.

Box 1. Adapting to limitations of mine closure regulation – large-scale forest restoration in the Appalachian coalfields, USA

The USA's 1977 federal Surface of Mining Control and Reclamation Act (SMCRA) sought to address the worst depredations of mountaintop removal (MTR) coal mining in which loose mountain rubble was tipped into neighbouring steep-sided, narrow valleys and left. Although ideal for tree growth, these piles were unstable and hazardous, with obvious risks to downstream communities. SMCRA ended this practice by obligating mine operators to create reclamation plans and pay bonds to restore the land in a way that would encourage future land use. Operators must grade mine wastes to the approximate original contours and create a final level plateau or a gently rolling contour landform. The stabilised land was planted with a quick-growing, herbaceous groundcover to protect the new surface and reduce dust and support a pasture end-use. It consisted of tough, non-native grasses (which were also a fire-risk) and, when combined with the effects of compaction, impeded natural forest re-growth. The resulting landscape is utterly changed from the characteristic forested ridge and valley geography to a seemingly boundless upland plateau covered with a “biological desert”. Federal inspectors from the Office of Surface Mining Reclamation and Enforcement (OSM) assess the reclamation and re-vegetation progress until – all being well – the bond is released five years after mining ends. The mine operators were primarily interested in meeting the terms of the bond release, satisfying the regulators and moving on.

Around the turn of the century, two federal OSM inspectors recognised the shortcomings in the SMCRA-mandated practices they were enforcing and vowed to find a more progressive approach to achieve SMCRA's requirements. Simultaneously, University of Kentucky scientists began raising concerns about poor natural forest recovery on reclaimed sites and persuaded the OSM that the twin challenges of surface stability and forest recovery could be solved. In response they formed the Appalachian Regional Reforestation Initiative (ARRI) in 2004. Housed in the OSM, ARRI comprised a core team of federal and state regulators. Its objective was to encourage active mining companies in Appalachia to use improved techniques for establishing forests on active mining sites and abandoned mine lands. It became a diverse and effective collaboration of federal and state agencies, academia, landowners, civil society groups and the coal industry across the Appalachian states.

ARRI's science team developed a simple, bespoke methodology for overcoming the technical barriers to establishing native, hardwood trees on MTR sites, known as the Forestry Reclamation Approach (FRA). The team created demonstration sites to showcase the approach and produced advisories aimed at the stakeholders who conduct and influence reclamation and reforestation practices. Federal and state regulations allowed the FRA under certain post-mining land uses and some states even widely adopted it. In Kentucky, state Reclamation Advisory Memorandums were passed to provide guidance to mining companies and permittees on how to implement the FRA. As a consequence, hundreds of millions of trees have been planted on mined land that would have otherwise have become “biological deserts”.

In 2016, President Obama signed the “Stream Protection Rule”, which was intended to right some of the wrongs of SMCRA and better protect water resources. Citing many of the ARRI science team's FRA research publications, its language was crafted to ensure that the FRA is considered as best practice in areas that were forests before mining. President Trump repealed the act in February 2017!

ARRI worked initially with active mines, but a further one million acres of pre-FRA, post-SMCRA bond-released sites, known as “legacy mines” also needed FRA treatment. Since bond-released sites were non-jurisdictional, having been reclaimed according to state and federal regulations, the ARRI science team concluded that a non-profit entity would be best placed for raising the necessary funds to restore native forest on “legacy mines” and stimulate related socio-economic opportunities. Set-up as a non-profit tree-planting organisation, Green Forests Work (GFW) grew out of ARRI to take forward FRA work on legacy mines. GFW's important work began with mass volunteer tree-planting events, eventually attracting accolades from the United Nations and start-up funding from the Appalachian Regional Commission.

GFW uses a modified FRA to jump-start natural succession on legacy sites and, also, in non-mining habitat enhancements. Its two main aims are to stimulate employment through reforestation and to enhance our environment by eradicating non-native species and restoring ecosystem services. Since its formation in 2009, GFW has planted over six million trees on nearly 12,000 acres (almost 5,000 hectares) of legacy mined land, while the active mining industry – under ARRI – has planted well over 100 million trees on more than 150,000 acres using the FRA (over 60,000 hectares). GFW also tracks the number of jobs created, the dollar-contribution to local communities and measurable benefits to ecosystem services.

Box 2. Creating a blank canvas for regional landscape restoration and socio-economic restructuring in the lignite fields of east Germany

On German reunification in 1990, the former East Germany's state-owned lignite mining industry was restructured to close uneconomic operations and upgrade and privatise the remaining open cast mines in accordance with the 1982 Federal Mining Act. The German government inherited the enormous environmental and socio-economic liabilities for those pits marked for closure in the Lusatian and Central German Lignite Districts across the four states of Brandenburg, Saxony-Anhalt, Saxony and Thuringia. The scale of the rehabilitation challenge was staggering: in the ten years from 1989, 31 surface mining areas containing 207 surface voids and 43 brown coal industrial complexes were decommissioned in the two lignite districts of Lusatia and central Germany. The immense challenge was to re-construct industry, environment and society in two regional coalfields, across four federal states and covering a cumulative area of well over 1,000 km². This excludes the enormous backlog of areas that had not been or were poorly rehabilitated under the Soviet regime, which had been extracting 300 million tonnes per year from these districts. There were no rehabilitation funds held in reserve by the regime. The total area requiring rehabilitation covered 120,000 hectares (excluding more recent areas from the active mining that continued).

The rehabilitation work remains ongoing and is complex, large-scale, long-term and costly. It is delivered through deep collaboration between three levels of government:

1. At a federal level the rehabilitation programme is overseen by the Steering and Budget Committee for Lignite remediation (StuBA), which also finances 75% of the programme's budget;
2. The states who draw up legally-binding rehabilitation plans in collaboration with municipalities, district authorities and associations; and
3. The Lusatian and Central Germany Mining Management Company (LMBV) – the federal agency responsible for project planning and implementation.

LMBV is legally responsible for creating a safe landscape for afteruse, including stable landforms and good lake water quality. About 1.7 billion cubic metres of earth have been moved to create new landforms surrounding the voids. As the water rises and the voids become lakes, the lakeside land and slopes can become prone to liquefaction causing subsidence and catastrophic slope failure. To date, 1,200 km of lakeside slopes have been stabilised comprising 1.1 billion m³ of material! Finally, once stabilised the new lakelands are a metaphorical blank canvas for painting new uses from a pallet of forestry, agriculture, commercial, industrial and/or residential development, wind and solar farms, nature conservation and a host of recreational and tourism facilities to maximise use of the lands and their attendant lakes. Such afteruse projects are implemented by private sector companies under typical commercial arrangements.

Box 3. Mountain biking resort, Derby Tasmania

Derby, on the banks of Tasmania's Ringarooma river, is experiencing its third incarnation – first a tin mining township, then a ghost town and now a burgeoning, world-class, mountain biking (MTB) mecca known as Blue Derby. 3,000 people lived there at its 19th century population zenith but, after decades of decline, the 2021 census recorded only 109 residents frequenting a ghost town.

Blue Derby's inspiration emerged in two local lads who saw MTB potential in the landscape of this tranquil, rural backwater. They connected with Dorset Council when the Tasmanian state government published a strategy to develop bike trails on the island to stimulate rural regeneration. Aware that many other MTB trails were only accessible by car, thus limiting opportunities for community regeneration, they recognised that mountain bikers will cross the world to cycle stunning new locations. They visioned an MTB resort as a ski resort, where the trails start and end in the town making it the destination. Opportunities would then arise for new accommodation, bike shops, bars and cafes and shops, reversing the historic town's decline.

Dorset Council negotiated with state and federal government to grant AUD3.1 million to Blue Derby to build the first 40 km of trails. World Trails from Cairns, Queensland, designed and constructed them and they opened in 2015 as the first major MTB trail network in Tasmania. It was an instant success, attracting more funds until, now, there are 125km of trails.

In 2017, assisted by the state government, Derby hosted an international MTB event on the professional Enduro World Series circuit, which had never even visited Australia before. It was a renowned success, with riders impressed that – unusually – the event was hosted in a town, affording après-ski style post-exertion relaxation. As well as trailhead accommodation, Derby sports a microbrewery and distillery, restaurants and bars and even a floating sauna! In 2019 the Blue Derby trail 'Detonate' was voted the world's best single track by the elite riders. The World Series returned to race again in 2023 proving Derby as a pre-eminent destination that is firmly on the world's elite mountain biking calendar.

For less-than-elite riders, the free to ride trails are open year-round (trail construction and maintenance are covered by the public purse). The number and distance of trails means visitors stay a night or two to get a fuller experience, increasing visitor spend. Blue Derby averages 70-100 riders per day and over 30,000 people a year, generally staying four to five nights in close proximity plus a few more nights elsewhere in Tasmania. Annually, this is worth AUD30 million (over USD19 million) to the Tasmanian economy. About 150 local jobs have been created, in bars, cafes and bike hire businesses, with renovated old buildings and new constructions underway. Strict planning conditions require buildings to fit with the traditional architectural vernacular.

The Blue Derby Foundation (BDF) was set-up to promote the area's MTB activities and serve the interests of the community. It fundraises to manage and develop the trails and improve the visitor experience. A five-year strategy has been developed with both council and community, with the main priority being to create worker accommodation. It's early days, but the first initiative known as the Derby Workers' Village, is already underway.

Box 4. Lisheen mine and the National Bioeconomy Campus, Ireland

Zinc and lead ores were extracted from Lisheen's underground workings between 1999 and 2015. Initially operated by Anglo American, it was sold to Vedanta Resources in 2011. Anglo began planning the mine's closure in 2005 and, after acquiring the site in 2011, implementation became Vedanta's responsibility. A closure task force was set-up in 2013, with the full support of Tipperary County Council, to engage with key stakeholders to seek alternative post-closure uses for the site. During the closure phase, most of the site's infrastructure was removed, except for a few remaining buildings that comprise permanent capital assets to facilitate future economic activity.

Due in part to early preparation and planning, the closure engineering challenges – although complex – were relatively straight-forward to handle. The social transition aspects were more demanding as there were many factors that could only be influenced rather than controlled by Lisheen. Again, early recognition of the social transition challenges and prompt action were vital.

The closure vision for a green energy hub was developed in the mid-2000s. Lisheen successfully applied for planning permission to construct 18 on-site wind turbines during operations to help reduce the pumping costs of what was a very wet mine. As well as proving the wind resource for the area, Lisheen overcame strong negative community opinions with respect to wind turbines. Once the community accepted the application, subsequent developments have had smooth passage. On closure, the electrical infrastructure installed by Lisheen to support the wind farm was kept and subsequently leveraged by others to develop further wind farms in the vicinity. The Lisheen substation is now connected to 44 wind turbines, installed in four phases, with a capacity of 131MW. Lisheen also has planning permission for a 122 MW solar farm on its closed tailings facility. Discussions are also underway regarding power storage projects, including batteries and – potentially – hydrogen production and storage. It is fair to say that the original vision for a green energy hub has been realised!

As the green energy hub concept was being implemented, the vision morphed into one of a national bioeconomy hub to capitalise on the site's buildings, transport links and readily available renewable energy and water supply. The bioeconomy is based on low carbon growth and resource efficiency that uses renewable biological resources, including wastes, to produce food, energy and industrial goods. A national bioeconomy hub at Lisheen was subsequently named in the 2018 government's National Policy Statement on the Bioeconomy. The Irish Bioeconomy Foundation, which arose as an outcome from the task force, is headquartered at Lisheen. Its mission is to promote the development of a sustainable bioeconomy in Ireland. It is a not-for-profit organisation set-up by the county council, Glanbia nutrition company, commercial mushroom producers, University College Dublin, Trinity College Dublin, and the Limerick Institute of Technology. There are now many academic, corporate and SME members.

In 2015 the EU abolished dairy farm milk quotas, allowing a greater production of milk and dairy products, but inevitably causing an increase in dairy processing wastes, such as lactic acid, that were difficult to dispose of, causing a bottleneck to the expansion of milk production in Europe. In 2020 the foundation received a €4.6 million grant from the Irish government to set-up a bioeconomy innovation and piloting facility at Lisheen.

As part of the EU-funded AgriChemWhey project, Ireland's Glanbia constructed a pilot plant in Lisheen's old engineering workshops to progress their work towards a first-of-its-type, industrial scale biorefinery at the site to convert dairy waste into high value bioproducts such as compostable plastics. Ultimately this would underpin a circular economy around dairy products while enabling rural development and rejuvenation. The beating heart for this new industry would be Lisheen's – now re-named – National Bioeconomy Campus. Having constructed the pilot plant at Lisheen, the Glanbia/ AgriChemWhey initiative recently folded, but there are good prospects that the Irish Bioeconomy Foundation will be able to take advantage of the facilities and transform it into a commercial venture.

Other related environmentally-focussed businesses are moving onto the site, such as AQS Environmental Solutions, with links to the bioeconomy via its interests in composting, and Revive Environmental, a local wastewater and sewerage company which is constructing new premises on-site. Lisheen Renewable Energy Ltd is planning to construct a biological treatment plant for composting and the anaerobic digestion of organic waste materials.

Box 5. Single purpose vehicle – the Global Centre for Rail Excellence, Wales

Decades of deindustrialisation in South Wales, an historic coal mining heartland, has stimulated many imaginative ways to re-purpose former mine sites. One such example is the Global Centre for Rail Excellence (GCRE). The 700-hectare site sits on the former Nant Helen opencast mine and Onllywn Washery, where coal was mined for 200 years till 2022.

GCRE, which acquired the site from mining company Celtic Energy including all liabilities, will be a European first – a one-stop-shop for testing new rolling stock, carrying out world class research and development, certifying rail infrastructure and technologies and training to support the rail transport technologies of the future. Key features will include two electrified rail loops, one of 6.9km for high-speed rolling stock and a 4km track for testing heavy infrastructure, and a two-platform station. GCRE will also include visitor and conference facilities, a business park and hotel to host researchers and, potentially, tourists to the adjacent Bannau Brycheiniog National Park. An existing railway that used to transport coal from the mine to the port some 25 kilometres away was a major plus. Its refurbishment will allow rolling stock to be brought to site by rail, rather than road, and will enable the easy transport of people to and from mainline stations.

The concept for such a facility had been “kicking around” for years until, in 2021, the Welsh government formed GCRE Ltd as a special purpose vehicle to deliver the £400 million project. So far, £70 million of pump-priming finance has been provided by the Welsh and UK governments with the remainder to be met by private investment.

GCRE will create an estimated 100 to 150 direct, high quality jobs and should facilitate other major investments and R&D into in the area after decades of post-mining decline. Substantial funds have been awarded to a consortium of British universities with railway engineering interests to support the research arm of the initiative. The research is beginning; in early 2023, 24 projects were successful in the first round of research funding for the “Innovation in Railway Construction” competition. Potential European customers are showing interest and, at the time of writing, two high profile clients have signed up to use the site for research and development, namely: the major rolling stock manufacturer, Hitachi, and Transport for Wales – the public transport agency of the Welsh government.

It's early days, but preparatory on-site works have already begun; millions of cubic metres of spoil are being used to fashion final post-mining landforms and create test track routes while, in between, common grazing lands are being restored. GCRE aims to open in 2025 as the UK's first net zero railway. The exposed nature of the site makes it ideal for wind and solar energy and discussions are underway to enable these, with the aim of making the project self-sufficient in green energy.

Box 6. Iconic social and cultural asset – North Duisburg Landscape Park, Ruhr, Germany

The main post-closure challenge at Duisburg-Meiderich's Thyssen Ironworks in Germany was determining what to do with its towering structures and buildings and 200 hectares of polluted wasteland after it closed in 1985. Tensions arose between local politicians who favoured demolition and local people and experts who saw potential in the site's profound cultural significance. They formed a group to resist the demolition plans and commissioned studies that proved the site's high heritage value and led to the creation of the German Society for Industrial Culture and the Nordpark Duisburg Interest Group. Subsequent research concluded that demolition would be more costly than preservation, so, in 1992, Duisburg City Council prioritised preserving the site.

At that time the famed heavy industry of the Ruhr region was in rapid decline. The North Rhine-Westphalia state government was considering new approaches to structural change in the region and Meiderich became totemic in this re-thinking of regional renewal. Alongside economic regeneration, a major consideration was to increase green spaces and access to them across the Ruhr, of which the germinal North Duisburg Landscape Park became a major component. It, and other large, complex sites of the Ruhr, became the focus of the 10-year International Building Exhibition (IBA) Emscher Park, between 1990 and 1999.

The original site concept for a hybrid natural and man-made landscape of industrial nature and culture was conceived in 1989. The design competition was won by landscape architect, Professor Peter Latz. He planned a new community asset of recreational space, including sports and leisure activities, for local people; a hub for cultural activities like theatre, concerts and festivals; and space for nature by building on the natural ecological colonisation already underway – all within a literal framework of industrial archaeology and architecture. The first parts of the new landscape park opened to the public in 1994.

Today, the former contaminated wasteland of rusting, hulking structures symbolises the balance between preservation and redevelopment and is renowned for its unique ecological expression. Attracting a million visitors annually, it offers a range of recreational and sporting activities, including scuba diving, rock climbing and high wire/ parkour challenges among the towers. It hosts 250 events a year, including concerts, theatre and summer and Christmas markets and an open-air cinema. Many of its industrial buildings have been re-purposed for hosting events with an elegant industrial backdrop, or are occupied by a range of businesses and other organisations. Nighttime lightshows invite a different, spectacular perspective. On-site visitor accommodation is also available as a youth hostel in a re-purposed administration building.

Integrated with the natural open spaces, maintained gardens and spaces present a more formal horticultural expression of orchards and vegetables, herbaceous perennials and wildflowers. Elsewhere, naturalistic plantings amongst industrial hardware offer a different sensory experience. Water plays an important natural and structural role, connecting the site's drainage through naturalised water features that connect with the – once destroyed – Emscher river, which flows for three kilometres through the site. The wider landscape encourages exploration with play areas, cycle trails and footpaths on former railway lines. The last remnant of the farm that once supplied food to the Thyssen company is now a farm school – the Ingenhammshof – teaching urban children about farm life and food production and is home to bee colonies and rare local livestock breeds.

The park and its hardy biodiversity were instrumental in rooting an influential new ecological paradigm – “industrial nature”. In urban areas, post-industrial “brownfield” sites are often the most biodiverse areas, containing many species eradicated from, or squeezed out of, the surrounding highly managed urban landscape, finding refuge in the brownfield’s relative calm. Here nature is leading natural repair while space and culture continue to be developed by man. Some areas have been left to nature without intervention, forming an industrial “wilderness” – an undisturbed sanctuary for sensitive species, which is off-limits to people. The park cherishes and celebrates its nature-based solutions and has had a major influence on the way other post-industrial sites have been restored across Germany and beyond. Indeed, the Western Ruhr Region Biological Station even has an outpost here in a re-purposed building.

The North Duisburg Landscape Park is internationally revered for its influence on re-thinking the re-purposing of post-industrial legacies. It receives ongoing public funds from the city, region and state to preserve and develop the site – an ongoing obligation and challenge. But these costs should be weighed against the enormous price originally anticipated for demolishing, decontaminating and regenerating the site. It has become an international icon for a sensitive and positive way to re-style and re-use post-industrial land and facilities.

ANALYSIS

This section considers some key governance themes distilled from analysing what has worked on the ground in the case studies, and from others which may be referred to (and duly referenced) to support specific points. These themes are neither exhaustive nor mutually exclusive. The analysis is not comprehensive, but seeks to address the main learnings from these analysing real world successes.

1. De-risking liabilities

Government is usually the default owner for the liabilities of abandoned mines and when state-owned mines close. Occasionally the legal, financial and moral obligations can be enormous as amply demonstrated by the restructuring of Germany's lignite fields after German unification. In this case, three layers of government have interacted over decades to create – through the state-owned company (LMBV) – a safe, stable landscape and clean water across hundreds of square kilometres of former open cast lignite mines (Box 2). The resulting blank canvas landscape is open for others to paint their environmental and socio-economic regeneration pictures towards the goal of regional re-structuring.

At an individual site level where mines have been abandoned with ownership defaulting to government, action by third parties to alleviate environmental impacts is usually stymied by the risk of being held liable for the impacts. This is common in many jurisdictions. In the USA, long-standing discussions around federal Good Samaritan legislation are coming to fruition to address this. The *Good Samaritan Remediation of Abandoned Hardrock Mines Act of 2023*, currently passing through Congress, will enable third parties, including companies, environmental groups and others, to clean-up land and water affected by abandoned hard rock mines, without fear of being held liable.⁴ The general approach is applicable to other jurisdictions.

2. Site ownership and management

Before or after closure, a site may be bought outright, liabilities and all, by an organisation which must then comply with the regulatory requirements for closure and aftercare. GCRE Ltd is a single purpose vehicle established by the Welsh government to transform the Nant Helen mine and Onllywn Washery sites into the Global Centre for Rail Excellence (Box 5). GCRE acquired the sites before the closure activities had been completed by the mining company and agreed to complete the landforming according to the planning obligations while, simultaneously, modifying it to the project's requirements.

3. Funding action

Government plays a major role in the financing of post-mining regeneration projects and programmes – witness the many billions of Euros of public money spent to date on the environmental clean-up and socio-economic restructuring of the German lignite coal regions (Box 2), the Ruhr's coal mining past (Box 6) and the GCRE in Wales (Box 5). Usually a combination of national, regional (state/ province) and local government contribute financially to such strategic programmes. However, abandoned mine sites that have reverted to government ownership by default can be problematic in policy terms; such sites may have substantial and long term environmental and public health impacts and are very expensive to clean-up. There are a number of financing approaches to dealing with these challenges that are beyond the scope of this paper that are discussed in detail in – for example – two World Bank documents (see footnote references).⁵

4 The Good Samaritan Remediation of Abandoned Hardrock Mines Act of 2023 of the US Congress. Martin Heinrich Press Release 12 September 2023. Heinrich, Risch reintroduce bipartisan legislation to remove hurdles for good Samaritans to clean up abandoned hard rock mines.

5 Kovalick, W.W. & Montgomery, R.H. (2014). Developing a program for contaminated site management in low and middle income countries. The World Banks
World Bank Group (2014). Financing mechanisms for addressing remediation of site contamination.

4. Leveraging government policy

Closed or abandoned mine sites and their associated communities are usually viewed as problematic blackspots, but with a shift in perspective they can become potential assets with opportunities for delivering government policy. Two examples illustrate this: creating the Blue Derby mountain biking resort from a Tasmanian tin mining ghost town leveraged the state government's strategy for developing bike trails on the island to stimulate rural regeneration (Box 3); and the Irish government's support for a National Bioeconomy Campus at the closed Lisheen mine site to take advantage of the mine's buildings, transport and power supply and readily available renewable energy (Box 4). Both aim to act as focal points for rural, post-mining regeneration while delivering on national/ state policy objectives.

5. Overcoming institutional barriers

Information-sharing between different levels of government or different geographic jurisdictions in a federal system or, indeed, between national governments can be hindered by both institutional barriers and jurisdictional limits. This means, for example, innovative practices in one Australian state may not be known in another. Canada's National Orphaned/ Abandoned Mines Initiative (NOAMI) is a national, multi-stakeholder initiative established by provincial mines ministers in the early 2000s to – amongst other things – carry out research on the blockages to action and enable information sharing between jurisdictions and others and to establish an advisory committee.⁶ Other key organisations/ networks/ associations with this purpose include the Intergovernmental Forum on Mining, Minerals and Sustainable Development,⁷ the International Council on Mining and Metals (ICMM)⁸ and numerous mining industry associations. Such approaches are directly transferable and are essential in avoiding wasting effort and resources to reinvent the wheel.

6. Open-minded approach to addressing limitations in regulation

It is not uncommon for mine closure legislation and regulation to be regarded as inadequate to some degree, despite the good intentions behind them. The deficiencies are usually well-known, but are considered too difficult to adapt in a reasonable timescale; however, the example of restoring Appalachian mountaintop removal coal mine sites to native hardwood forests shows that such challenges are not insurmountable (Box 1). In this example, federal mine closure enforcement inspectors recognised the problems with the existing closure legislation and were sufficiently motivated to figure out how to surmount them by collaborating with others to provide, science-based evidence of a better way of doing things. More generically, this example shows that those who are closest to the site-based application and implications of regulation may be best placed to influence new approaches.

7. Promoting creativity and lateral thinking

Mine closure is not just an engineering or environmental issue; too often the closure remit is given to an environmental manager or an engineer, yet all the international good practice guidance promotes integrated and multi-stakeholder approaches from the outset. Lateral thinking and creative approaches are often lacking, but when these are engaged the results can be transformative, with the best examples hitting the environmental and cultural as well as the socio-economic and commercial buttons (Lisheen mine site's National Bioeconomy Campus embodies exactly this (Box 4)) as does the UK's Eden Project.⁹

6 <https://abandoned-mines.org/>

7 <https://www.igfmining.org/>

8 <https://www.icmm.com/>

9 <https://www.edenproject.com/>

Lateral thinking and creativity are embedded within the six case studies presented above. The North Duisburg Landscape Park is a case in point (Box 6); traditional closure regulation would have required the removal of its iconic structures and the return of naturalistic landforms and natural vegetation, or the redevelopment of the site.¹⁰ However, with unconventional thinking, the structures were re-purposed into new assets to generate new environmental, socio-economic and cultural values for local people, while reducing development pressure on greenfield sites. It seems that many jurisdictions are in a slow transition between the “old” approach to closure and a more sustainable approach enshrining the generation of new environmental, socio-economic and cultural values. During the transition though, the old regulatory system applies, leading to frustration between the key stakeholders and delays and increased costs in implementing socio-economic aspirations.

Creative and lateral thinking was and is fundamental in the ongoing regeneration of eastern Germany’s Lusatian Lignite fields (Box 2). The Internationale Bauausstellungen (IBA), or International Building Exhibition, has been a part of the German regeneration sector for over a century.¹¹ It works alongside government on 10-year, place-focussed programmes to creatively explore new paradigms for social and cultural regeneration with invited international architects, designers and artists working on some very challenging issues by facilitating and capacitating bespoke solutions to local challenges. Both the Lusatian lignite fields and the Ruhr (e.g. Box 6) were subject to these transformative programmes from 2000 to 2010 and 1989 to 1999 respectively.¹² The theme for the former was to develop a new cultural landscape, including addressing the disconnect between local people and their wounded landscape and to assist them in exploring potential new futures. The latter focussed on the future of an urban-industrial metropolis and how it could transform from one dominated by heavy industry to a modern, diverse economy and society.

8. Seeking inspiration beyond the mining sector

It is an observation that human nature instinctively turns towards familiarity to meet challenges – familiarity in professional relationships, or like-minded approaches and methods, or within the organisation, industry or sector that we work in. By looking inwards we risk missing external inspiration and answers to the problems we need to address. This situation is common in mining sector stakeholders.

Government is ideally placed to hold a notional umbrella over different sectors to pass on learnings. Germany’s North Duisburg Landscape Park (Box 6) was created as an integrated environmental, social, cultural and economic response to the challenge of what to do with an enormous, contaminated old iron works. The impetus and enabling framework around the asset that it has now become was set-up by the state government and city council and it has become an influential model for how post-industrial sites can be sustainably re-purposed.

10 Limpetlaw, D. and Briel, A. (2014). Post-mining land-use opportunities in developing countries – a review. *The Journal of the Southern African Institute of Mining and Metallurgy*. V. 114, p.899-903

11 <https://www.internationale-bauausstellungen.de/en/>

12 <https://www.internationale-bauausstellungen.de/en/history/1989-1999-iba-emscher-park-a-future-for-an-industrial-region/>
<https://www.internationale-bauausstellungen.de/en/history/2000-2010-iba-furst-puckler-land-werkstatt-fur-neue-landschaften/>

CONCLUSIONS

This paper poses the notion that there are few, if any, new problems in the mine closure realm; they have all been solved somewhere. The obstacles, then, are of awareness and communication. Rather than investing time and money on reinventing the wheel, a fraction of these resources could be directed towards researching where and how a post-mining challenge was addressed and by whom. The option then exists for direct engagement, including sending experts to visit that person and project. The learnings can then be adapted to implement solutions back home.

The traditional way of delivering mine closure is changing – albeit sporadically. As closure/ regeneration visions expand into viewing closing mines as potential engines for transformation, then a wider range of expertise will be more commonly required in the room beyond just the usual suspects (engineers and environmental specialists) to include unusual suspects, such as economists, financiers, architects, artists, horticulturalists, business developers, theatrical performers, etc. Arguably we do not need to wait for regulation or legislation to change in this regard, because all of the innovative case studies presented above, and others besides, have worked within the existing regulatory regime.

The best post-mining solutions have to be site specific – there is no “one size fits all” approach; not all mine sites are contextually suited to tourism developments for example. The context defines when a commercially successful transformation is viable. The context will dictate when a site is best left to nature (with attendant monitoring and maintenance obligations). It is important too to realise that, even in urban-industrial metropolises like the Ruhr, economic priorities also need to be balanced with human wellbeing necessities for green, open spaces and space for nature.

Ultimately the role of government is critical in delivering innovation beyond conventional mine closure. And, around the world, there are many examples that illustrate this point (but very many more that do not!). Therefore, most governments dealing with these issues should be capable of enabling innovation to some degree by convening unusual suspects; enshrining good Samaritan legislation; circumventing limiting regulation; improving networking, awareness and communication; funding long term and integrated approaches; and encouraging creativity.

Government cannot be just a spectator to the post-mining play; simultaneously it must be an actor, a stage-hand, a set designer, a playwright, a producer, a director and a critic. When done well, the performance will live long in the memory and touch people’s post-mining lives.

Appendix 2

Definitions used in the Facilitated Group Process Exercise

Re-purposing – a formerly mined site is converted into another use (eg. a new tourism venture or energy generation site)

Relinquishment – a mining venture hands back formerly mined land to government for future use (eg. returned to original state)

Re-investment – a mine close to closure exploring new mining operations (eg. current mine operator applies new technologies to extract a different class of minerals)

Re-mining – an abandoned mine trying to re-open to provide new mining opportunities (eg. mining of tailings dams for rare earths)

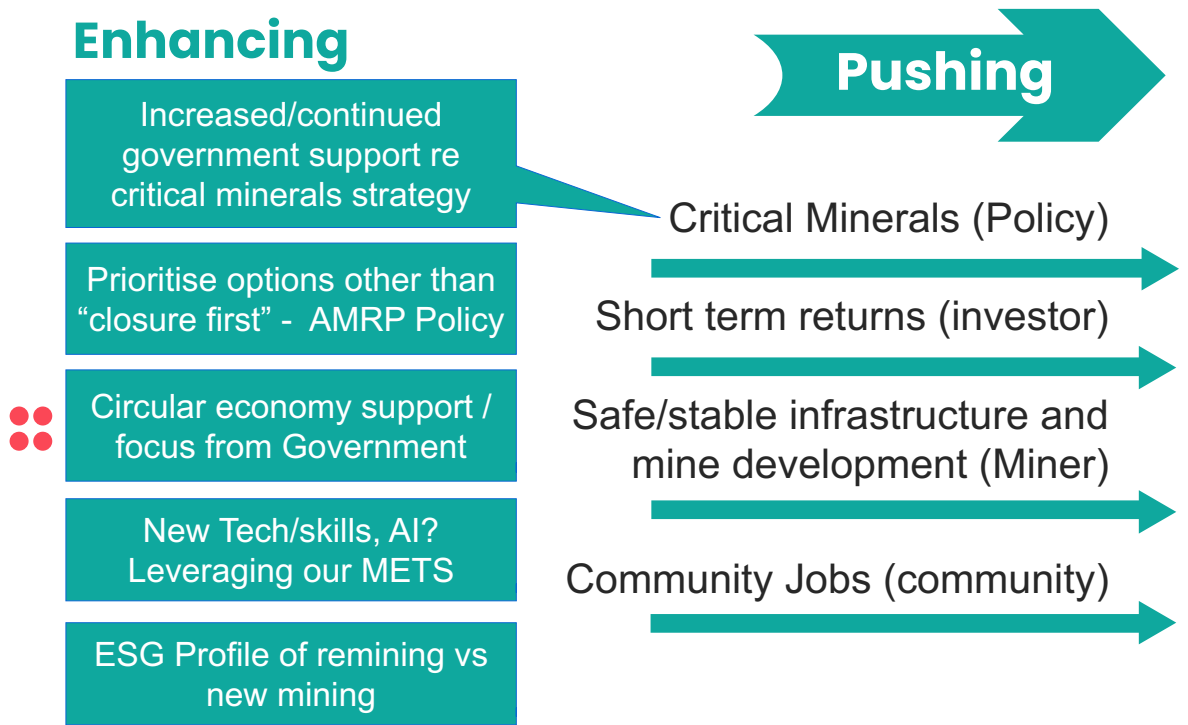
Appendix 3

Artefact from Force Field Analysis Workshop

FORCE FIELD ANALYSIS



RE-MINING PRESSURES



Resisting

Greenfield conditions/expectations for brownfields sites (full remediation rather than NET enviro benefit approach)

Regulatory uncertainty (and commodity price uncertainty) – investor

Hazards on site

Fossil Fuels (for coal remining), enviro and cultural, “owners” rights, legacy reputation

Process risk – lack of characterisation (investor)

Mitigating

Better characterisation of mine waste for new and existing mines

RELINQUISHMENT

Enhancing

Who holds the liability when the music stops

Reskilling, education, engagement with Traditional Owners

•• Local/Regional economic diversification

More focus on integrated mine planning

•••• Miners invest in progressive rehab.
More focus on integrated mine planning

• Regional planning mechanisms, funding requirement for long term plan

Pushing

No Current economic value (miner)

Miner reputation (relinquishment supports investment in future projects)

Want to invest in next mining use (investor)

Reduce risks / contingent liability

Continued Jobs, thriving community, long term economic future

• Progressive rehabilitation

Only viable option with current regs

Government optics

Resisting

- Potential future economic value
- Maintain mining employment ●
- Qld government – viable investment location?
- Meeting environmental performance standards to relinquish
- Environmental impact and economics of land-forming to pasture/nature (diesel)
- Limited dis-incentives to long term care and maintenance ●●●
- NPV accounting for closure

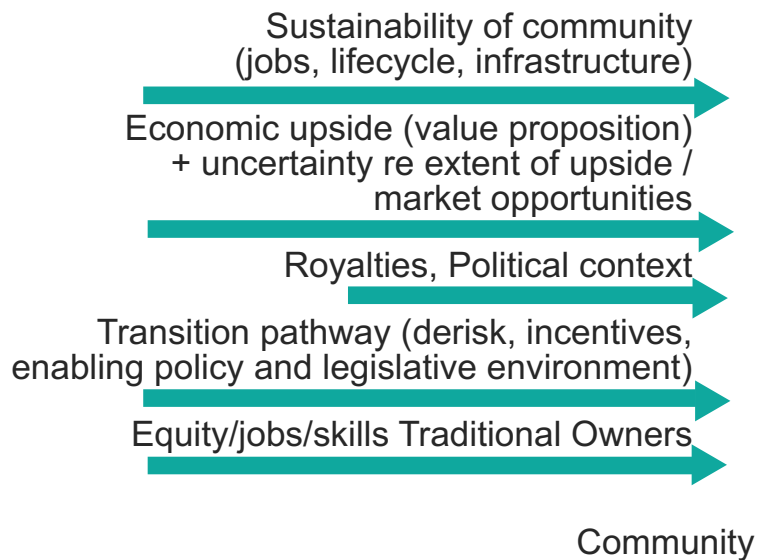
Mitigating

- Risk of progressive rehab sterilising resources
- Central Qld mine rehab group (positive force)
Sharing innovative approaches, meet quarterly, good model
- Research investment from trust fund financial scheme
- Research required to investigate environmental requirements

RE-INVESTMENT

Enhancing

- ● ● Strong, early, consistent community engagement to drive understanding, skill set development, etc
- ● Strong governance / JV arrangement around pilot plants
Equity arrangements
Regulatory support to innovation
- ESG Profile of re-mining vs new mining



Resisting

- Uncertainty about change (what does it look like?)
 - What does it mean to me? How will I be impacted, impacts to environmental value (e.g. water)
- Unintended consequences (e.g. commercial, 3rd party)
- Liabilities, legacy impacts (statutory, environmental, economic)
- Policy environmental (regulations, permitting, approvals, investment)
- Proven technology and availability of technology
- Cultural Heritage
- Context

Mitigating

- Proactive social investment programs, skills development, opportunities outside of mining to mitigate less jobs, infrastructure
- Pathway around alternate rehab plan with re-investment
- Government assistance to navigate new investment approval pathway
- Ringfence investment opportunity
- Solid understanding of policy environment, EA, legacy, rehab costs etc

REPURPOSING

Enhancing



Integrated framework to give investment path to repurpose

Reduce uncertainty



- Desire for sustainable outcome
- Regional economic development
- Investor desire
- Community desire to continue to exist
- Desire for financially advantageous outcomes

Resisting

- ← Fear of liability for state and operator (uncertainty)
- ← Investor rate of return (??)
- ← Limited community opportunities to instigate regional planning
- ← Biophysical constraints
- ← Lack of integrated mine planning – mine site, inter-site, local government, state planning
- ← Competitive, rather than collaborative ??

Mitigating

- Clear policy on long term risk / liability approach
- More flexibility on surety mechanisms and use of funds ●●●●
- Clarity on risk / liability on transfer of tenure ●●●●●
- Community input into regional development planning ●●●●
- Change practice re NPV accounting for rehab ●●●●
- Mine integrated planning – skills deficit interdisciplinary training - Investigate incentives ●●●
- Regional /local planning (incl mines ?, capacity building). Mine integrated planning Include mining in renewable energy zones and regional development planning ●●●●●

Appendix 4

Interview Questions used in the Semi-Structured Interviews

1. Has your company identified opportunities to use previously mined land for alternative purposes, how have these ideas been identified and assessed? What has been the outcome?
2. What does your organisation see as the major benefits and costs for using previously mined land for alternative uses?
3. Has your organisation engaged with relevant government agencies to discuss future land use on previously mined land, and if so, which agencies did you engage with? How effective was this engagement and what were some of the key challenges?
4. Has your organisation engaged with relevant non-government stakeholders to discuss future land use on previously mined land, and if so, which stakeholders did you engage with? How effective was this engagement and what were some of the key challenges?
5. Further to government and stakeholder engagement what have been the major barriers (if any) to investigating or achieving alternative land uses on previously mined land? Has there been sufficient knowledge of residual closure risk and available PMLU data to use previously mined land for alternative purposes?
6. What key changes are required to facilitate more effective consideration and achievement of repurposing for mined land and what incentives would entice you to explore these opportunities?

Appendix 5

Case Study Key Learnings

Case Study	Key Learnings
CS1	<ul style="list-style-type: none"> ➤ Strategic planning for Post-Mining land-use options needs to start as early as possible in the mining process; ➤ Both the Australian and Queensland Governments are likely to have strategic interests in remote areas and need to develop ways to manage these interests post-mining; ➤ Native-Title holders have significant cultural and financial interests that will help shape the future direction of land-use post-mining; and ➤ Any strategy developed for geographical areas needs to consider the type of underlying land tenure that will be put in place once mining leases are relinquished.
CS2	<ul style="list-style-type: none"> ➤ The operator was impressed with the support received from the Queensland Government; ➤ Waste Rock should be considered a recycled waste in DTMR procurement processes.
CS3	<ul style="list-style-type: none"> ➤ Investors take a long-term view on investment opportunities; ➤ In making their decisions, government strategic plans are critically important; ➤ Government financial incentives that help “smooth” capex investments provide further support for long-term investment decisions; and ➤ Significant opportunities exist in decarbonization investment, transitioning current coal operations into renewable energy sites.
CS4	<ul style="list-style-type: none"> ➤ The definition of waste and resource is ambiguous under the EP Act and potentially prohibitive to projects with a net environmental benefit.
CS5	<ul style="list-style-type: none"> ➤ The lack of clarity and appetite in regulatory process to establish PMLUs is driven by a singular focus on compliance for environmental protection. ➤ The status quo is being maintained by a perception of low performance and self-interest within the mining industry by regulators. ➤ Multi-PMLU outcomes have the potential to provide environmental and socio-economic net benefit to the State and local communities, as well as greater returns on investment.
CS6	<ul style="list-style-type: none"> ➤ No strategic focus on the potential repurposing of existing infrastructure. ➤ No ability to consider “net environmental benefit” of re-mining activity.

Case Study	Key Learnings
CS7	<ul style="list-style-type: none"> ➤ Difficulty in obtaining approvals for secondary mining to create net environmental benefit (though approval has been obtained post-interview). ➤ While difficult, the process has demonstrated a potential model for secondary mining activities on an abandoned mine.
CS8	<ul style="list-style-type: none"> ➤ Inability of EP Act to accommodate land use transition and ongoing site management under a modernised Environmental Authority. ➤ Lack of ability in EP Act to account for net environmental benefit. ➤ Environmental risk calculator is over prescriptive and inflexible with respect to closed mines in care and maintenance.
CS9	<ul style="list-style-type: none"> ➤ No ability in EP Act to consider net environmental benefit ➤ EP Act needs to partition residual risk to enable secondary mining to occur
CS10	<ul style="list-style-type: none"> ➤ No incentive for current miner to think about PMLU outcomes in PRCPs, only introduces risk and uncertainty. ➤ Perception that the regulator would see a PMLU option as a means to avoid financial assurance obligations.

Sponsors

Lead Research Partner



Lighthouse Project Partners



Supported by



Queensland
Government

enviroMETS (Qld) Limited

ABN: 88 662 593 580

Phone:

+61 7 3138 1332

Address:

Lev 8, Block P, 2 George St,
Brisbane, Qld Australia, 4000

Email:

contact@enviromets.net.au