

Institutional, stakeholder and regulatory constraints to the redevelopment of mine sites to alternative employment-generating land uses: Hunter Valley case study

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Abstract

There are currently 13 operating open cut coal mines, four underground operations and one large power station operational within the Hunter Valley of New South Wales, Australia, with an underground operation in the processes of recommencing operations. The currently approved and pending operational periods for these mines range from several years to 2050. It is expected that employment and supplier opportunities within the industry will decline progressively but significantly over the next 10–20 years and, without planned structural change, these communities are likely to experience significant impacts to their livelihoods, way of life and sense of community. Given the context of the region, with many of the towns currently reliant on the industry for significant revenue and employment, there is a substantial dependency.

The current approved post-closure land uses for mine sites are generally restricted to a combination of agricultural land, native vegetation regeneration and pit lakes within final voids. However, existing and recently closed mine sites and power plant sites offer significant opportunities for post-mining land uses which could mitigate the negative social and economic impacts associated with the anticipated (and unanticipated) closure of mines in the region. Key attributes which make these sites suitable for redevelopment include installed infrastructure, buffers from neighbours, availability of a local workforce and suppliers, proximity to key export and domestic markets, and approved disturbance areas minimising additional biodiversity impacts.

This paper considers some of the institutional and regulatory framework constraints which have potential to delay a smooth transition within the Hunter Valley. The paper identifies key areas where regulatory frameworks can be improved to facilitate and encourage the timely transition to alternate land uses in ways which do not compromise social or environmental outcomes, and which generate further economic and social value for communities across the region.

Keywords: mine closure, social impact, economic impact, post-mining land use, regulatory reform

1 Introduction

There are currently 13 operating open cut coal mines (complexes), four underground operations and one large power station operational within the Upper Hunter Valley (Singleton and Muswellbrook local government areas) region of New South Wales, Australia. An additional underground operation in the processes of recommencement. There are an additional three operational underground mines and one open cut mine in the Lower Hunter/Newcastle region, with a further underground mine approved but not yet operational. There are also several operations under ‘care and maintenance’ or in the process of closure/rehabilitation. The currently approved and pending operational periods for these operating mines range from several years to 2050. It is expected that employment and supplier opportunities within the industry will decline progressively and significantly over the next 10–20 years (CSIRO 2023) due to the transition away from fossil fuels as a key energy source.

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The region has experienced substantial population growth, primarily driven by the expansion of coal mining over the past two decades, and it is now heavily dependent on the mining industry for revenue and employment. Without planned structural change these communities are likely to experience significant impacts to their livelihoods, way of life and sense of community.

This paper focuses on the Upper Hunter region (consisting primarily of the Muswellbrook and Singleton local government areas) and examines the current regulatory setting and expectations for mine site rehabilitation. It also describes the social and economic baseline against which any structural changes can be considered. The paper considers how mine sites contain a wide range of attributes that lend themselves to being used for post-mining land uses (PMLUs) which can mitigate the socio-economic impacts associated with mine closure and also recommends a range of institutional and regulatory reforms that would enhance these opportunities.

2 Context

2.1 Regional economy and dependency on coal mining

The coal industry plays an important social and economic role in the Hunter region, particularly in the Upper Hunter. Coal mining is innately woven into the region’s milieu. Although coal mining began in the Upper Hunter in the 1870s (and earlier in the Lower Hunter and Newcastle area), it was in the 1950s and 1960s when the industry transitioned from underground to open cut mining methods, embedding this process within local communities such as Singleton and Muswellbrook as people flocked to the region to obtain employment in the mines (New South Wales [NSW] Minerals Council 2021).

Coal mining in the Hunter Valley plays a significant role in the economy of regional communities in NSW as both a major source of employment and state revenue. A survey of mining companies in the Hunter region undertaken by Lawrence Consulting for the NSW Minerals Council (Lawrence Consulting 2023) highlights the substantial role that mining, and specifically coal mining, plays in the region’s economy. The survey notes key economic contribution in the Hunter region for the 2022–2023 period as being 15,299 full-time equivalent (FTE) direct jobs and 84,569 FTE indirect jobs, AUD 17.1 billion injected into the regional economy (approximately 26% of the Hunter region’s gross regional product), AUD 1.3 billion spent on direct employment wages and salaries (excluding contractors), and AUD 5.7 billion for goods and services purchased from over 2,700 local businesses (including contractors). Such contribution is evenly spread across local towns and communities (Umwelt 2019a, 2019b). While positive for the local and regional economy, the high proportion of local employment and procurement results in a high level of dependency of the community on the mining industry, with employment in mining representing 40.6% of the workforce in Singleton and 31.1% of the workforce in Muswellbrook (REMPPLAN 2021). Consequently, the local economy is extremely reliant on mining, with the industry accounting for 71% of Singleton’s gross revenue and 58% of Muswellbrook’s gross revenue (REMPPLAN 2021).

This reliance correlates with a very low industry diversity in the Upper Hunter region; in particular, in the Singleton and Muswellbrook local government areas (as shown in Figure 1).

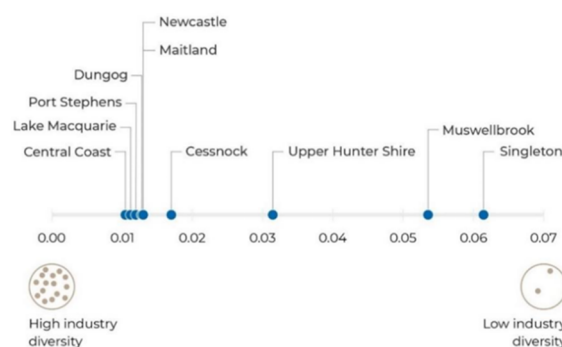


Figure 1 Industry diversity in the Hunter Valley (Source: Australian Bureau of Statistics 2016)

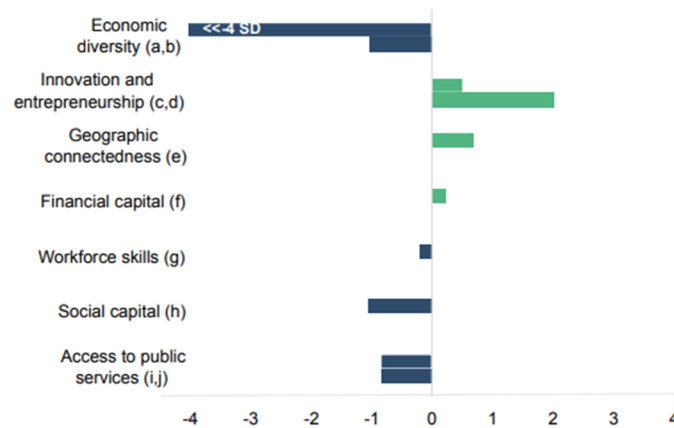


Figure 2 Adaptive capacity dimensions for Muswellbrook (Source: Hammerle & Phillips 2023)

2.2 An economy in transition

The Strategic Statement on Coal Exploration and Mining in NSW released by the New South Wales government (State Government of New South Wales 2020) highlights the dual role of coal as both a key domestic energy source and a valuable export commodity. However, it also brings to light the challenges and discussions around energy sources and sustainability, considering the global shift towards renewable energy and the environmental implications of coal usage. Figure 3 charts the maximum run-of-mine production for currently approved and proposed (including announced planned cessations of production) Upper Hunter coal mines (NSW Department of Planning, Housing and Infrastructure 2024a) and represents a proxy for employment.

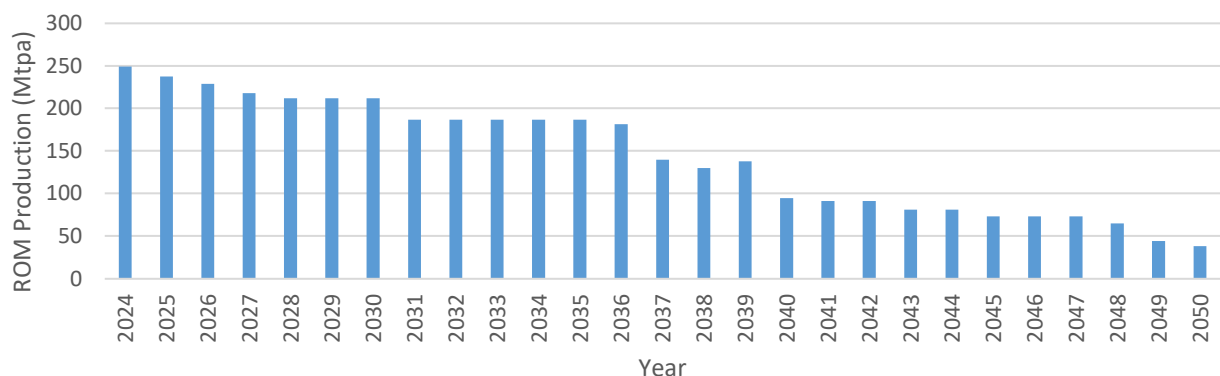


Figure 3 Approved and proposed run-of-mine production – Hunter Valley Mines (Source: NSW Department of Planning, Housing and Infrastructure [2024a])

To date, the need to manage closure activities in a manner that mitigates the socio-economic impacts associated with closure has not been a major consideration (or requirement) for mining operations in the Upper Hunter. This is likely due to mining production and associated employment continuing to grow over the past decade (Lawrence Consulting 2023; Coal Services 2024), and ongoing employment opportunities that have typically existed at other operations mitigating or avoiding any significant ongoing socio-economic impacts associated with the closure of any single operation. However, as can be seen in Figure 3, there is a steady but consistent decline in proposed production out to at least 2050. Coupled with the likely decline in demand for thermal coal, this mitigating factor is unlikely to continue. This decline in employment opportunities in the Hunter Valley is further compounded by the scheduled closure of Bayswater Power Station, south of Muswellbrook, between 2030 and 2033 (AGL 2024).

2.2.1 *The transition*

While transition of the mining industry and the move away from coal mining is a reality, at the same time the region is bracing for considerable change associated with renewable energy development. In November 2020 an AUD 32 billion investment in renewable energy was proposed over the next decade as part of the NSW Electricity Infrastructure Roadmap (NSW Department of Climate Change, Energy, the Environment and Water 2024). As part of the New South Wales government's commitments under the Net Zero Plan 2020–2030 to cut emissions by 70% by 2035, renewable energy zones have been proposed in four locations including the Hunter-Central Coast (EnergyCo 2024a). The Hunter-Central Coast renewable energy zone (REZ) is a significant initiative aimed at transforming the Hunter region into a hub for renewable energy and is expected to have a significant impact in terms of supporting the region's transition away from coal while providing new opportunities for job creation and economic growth. An initial registration of interest process for the Hunter-Central Coast REZ attracted significant commercial interest in renewable energy generation and storage projects, representing around 40 gigawatts and more than AUD 100 billion in potential investment (EnergyCo 2024b).

Construction activities associated with these renewable energy generation projects and REZ electricity distribution works are likely to increase in coming years with the recent approvals of wind and solar projects, and battery storage, and a number of proposed solar, wind and pumped hydro projects in the Upper Hunter. While construction workforces are large for these projects, they typically have lower operational employment than existing coal mining projects and coal-fired power generators.

So, while one industry is preparing for transition out of the region, it is evident that new industries sitting in the wings could potentially fill some of this void. However, the scale and ongoing economic contribution of both sectors is vastly different and consequently effective structural adjustment programs will be required to assist communities in transitioning away from what has been considered a significant economic and social mainstay for many years. A survey of 300 Upper Hunter residents found that 98% of participants wanted more of the state's coal royalties invested back into the Upper Hunter to support a number of initiatives aimed at promoting economic diversification and landscape restoration (Hunter Renewal 2023).

The New South Wales government has responded to these challenges through the Royalties for Rejuvenation Fund, which was established in 2023 to 'to alleviate economic impacts' from the decline of the coal industry by supporting diversification projects in mining regions through an injection of \$25 million per annum. The fund is overseen by a regional expert panel tasked with providing advice and recommendations on applications received. The panel's assessment focuses on the consequences and opportunities associated with moving away from coal mining, particularly in relation to the impact on employment and economic activity in the affected coal mining region, alternative land uses for coal-mining sites, and options to support the economic diversification of the affected coal mining region in alternative industries (NSW Department of Primary Industries and Regional Development [DPIRD] 2024a).

Additionally, it has announced the future jobs and investment authorities that will comprise local representatives in coal-reliant regions (including the Hunter Valley) to provide advice on regional priorities and investment opportunities to support a just transition (NSW DPIRD 2024b). The authorities will facilitate economically beneficial PMLUs, such as the plan to transform the closed Rhondda Colliery at Lake Macquarie into a motor park resort and tourism centre that will support 450 jobs in construction and 229 permanent roles (NSW DPIRD 2024c) while providing tourism and associated economic benefits to the Lake Macquarie Local Government Area.

2.3 Existing regulatory framework for mine site rehabilitation

Under the NSW regulatory system, areas impacted by mining must be rehabilitated. The primary regulatory instruments related to mine site rehabilitation are development consents issued under the *Environmental Planning and Assessment Act 1979* (EP&A Act) (State Government of New South Wales 1979) and mining leases issued under the *Mining Act 1992* (State Government of New South Wales 1992). The primary objective of mine site rehabilitation is specified in the development consent as making the site 'safe, stable

and non-polluting'. The criteria against which rehabilitation objectives are set is based on the proposed end land use for the areas impacted by mining. These are also identified in development consents and their associated assessment documentation or can be varied to other uses which are 'permissible without consent' under EP&A Act strategic planning policies. Closure performance objectives and criteria for areas impacted by mining operations are specified in rehabilitation management plans (RMPs) which are required as a condition of consent. RMPs are reviewed regularly and compliance with the plan is required as a condition of the lease. Security deposits are also required under the terms of the mining lease(s) and are set based on projected costs of the rehabilitation works detailed in the RMPs. The current end land uses 'approved' for most mine sites in the Hunter Valley are predominately a mixture of grazing land, ecosystem restoration with remnant mining voids backfilled with tailings (or, in some cases, fly ash from coal-fired power stations) or remaining voids with pit lakes.

The works associated with the rehabilitation of disturbed areas typically occur progressively throughout the life of the operation. However, there are inevitably significant works required following the cessation of production which include landform reshaping (where not done as part of operations), infrastructure removal and revegetation. As these works typically occur after production has ceased there are limited revenue streams from the operation to cover them so they are generally prioritised based on benefits in terms of reduced operating costs. Some works are undertaken over an extended time using smaller fleets of equipment to manage annual operating costs.

Effective relinquishment of rehabilitation responsibilities (and release of securities) is typically demonstrated through the land being returned/converted to the approved post-mining land use identified in the RMP.

In recent years, coal mining projects progressing through the EP&A Act assessment processes have been required to show regard to social impact assessment (SIA) guidelines (NSW Department of Planning and Environment 2017, 2023). SIA is a key process in identifying the socio-economic impacts of development projects on surrounding communities and those associated with the closure of a project. However, the current regulation requires an SIA to be undertaken during the initial project approval assessment process; mine closure planning is not a trigger for an SIA to be applied. While the SIA guidelines outline the need for development of management plans relating to social impacts over a project's life cycle, including closure, detailed commitments to mitigate social impacts are largely deferred to a period close to the date of planned closure. As noted above, there is little to no regulatory obligation under development consents or mining leases to avoid socio-economic impacts associated with closure. The use of an SIA in closure planning is currently a voluntary commitment adopted by some mining companies as part of internal environmental, social and governance (ESG) policies.

2.4 Permissibility of alternative land uses

In NSW the approval requirements for different land uses are defined by environmental planning instruments prepared under Part 3 of the EP&A Act. Land zoning under local environmental plans (LEPs) prepared by local councils prescribe uses which are prohibited or permitted, with or without consent, on land within the relevant local government area. Planning controls in different local government areas are broadly consistent due to being based on a standard planning instrument. Planning controls under a LEP can be overridden by state environmental planning policies (SEPPs) prepared by the minister administering the EP&A Act. In the Upper Hunter, mine sites are typically located on rural zones; particularly the RU1 Primary Production Zone. Open cut and underground mining are both permissible with consent wherever agriculture is permissible (which includes most rural zones) due to the overriding controls under the *State Environmental Planning Policy (Resources and Energy) 2021* (State Government of New South Wales 2021).

The rural zoning is appropriate for many areas where mines are located, based on pre-mining attributes of the land. As a result, permissible uses of land impacted by mining (i.e. post-closure uses) are typically limited to those more compatible with a rural setting. However, it is noted that the Singleton Local Environmental Plan 2013 (State Government of New South Wales 2013) does contain significant flexibility within the RU1

zone. SEPPs do not currently include any provisions which provide specific flexibility for alternative PMLUs on mine sites or buffer lands.

3 Importance of alternative post-mining land uses in managing the transition

3.1 The problem

As has been established, towns within the Hunter Valley are reliant on the mining industry, which contributes significantly to the economic and social sustainability of these localities and the broader region through employee wages and business procurement. Without alternative employment opportunities to replace jobs lost as coal production rates decline in the Hunter Valley, there is likely to be significant socio-economic implications for the towns heavily reliant on the income associated with employment (both direct and indirect) and the supply of services to the mining industry. An established rule in the social sciences assumes that given a predicted change in operational activities approximately 80% of the workforce and their respective family members may migrate out of the region to seek employment elsewhere, with around 20% remaining in the region (Burge 2004). This suggests that without clear PMLUs that support ongoing employment opportunities there could be large-scale migration out of the region that would impact the sustainability of the towns and the regional economy.

With reduced employment and supplier opportunities, the demand for – and therefore the income associated with – housing, corporate and industrial real estate is likely to significantly decline, along with the sustainability of service provision in other sectors such as health, education and retail as the result of a decreased labour pool associated with migration out of the region.

In addition, mining workforces have strong links and are highly integrated within the communities in which they and their associated family members reside, utilising local and regional infrastructure and services and participating in community groups and organisations. Decreased demand for infrastructure and services would decrease supply, which would impact other users in the community.

Mental health is also likely to be significantly impacted due to the uncertainty that comes with the energy transition, potentially leading to broader wellbeing challenges and antisocial behaviour across the region.

While there are limited regulatory requirements placed on mine operators to manage the closure of mines to mitigate socio-economic impacts, there are potentially significant financial and ESG reasons for doing so. However, many of these financial benefits are unrealised and the ESG drivers have, to date, been largely absent in the Hunter Valley due to the ability of other operations to mitigate the impacts associated with closure up until now. In addition to financial benefits being unrealised, the requirement to remove infrastructure or attributes which present significant opportunities to higher-value land uses often represents a poor use of capital and/or opportunity costs associated with the removal of existing sunken capital costs. A good example of this is the potential opportunity costs and poor investment of capital associated with backfilling of mining voids. The Australia Institute estimates that it would cost between AUD 12 billion and AUD 25 billion to fill the Upper Hunter's 23 final voids (The Australia Institute 2021). While backfilling voids would allow these areas to be used for other purposes, the cost of backfilling is unlikely to be recouped from any land uses able to take advantage of the terrain generated; this is particularly the case for default PMLUs such as grazing and ecosystem restoration/forestry (even taking into account the value of nature services provided by ecosystem restoration).

3.2 The problem is the solution

As noted above, the redevelopment of mine sites has been identified as presenting significant opportunities to mitigate or avoid the socio-economic impacts associated with the closure of mines and coal-fired power stations. In January 2023 the Department of Regional NSW – Mining Exploration and Geoscience Division released the *Practical Guide: Post Mining Land Use* (Department of Regional NSW 2023), which recognised that:

- the typical ‘default’ PMLUs of grazing and native woodland/forestry do not provide the significant economic benefits generated by mining activities for regions and states
- mine sites present a range of opportunities for higher economic value land uses that, if utilised properly, provide significant benefits to both mine operators and the broader community.

The opportunities presented by mine sites is also the subject of an NSW Parliamentary Inquiry into Beneficial and Productive Post-mining Land Use which was announced in May 2024 and commenced hearings in August 2024. The inquiry will focus on investigating how mine sites can be repurposed to continue to bring economic opportunities to communities post-mining and includes consideration of the use of buffer lands. The terms of reference also include the consideration of the skills and training required to facilitate the transition (Parliament of NSW 2024).

The general attributes of mine sites which make them particularly attractive for alternative, high-economic-value PMLUs include large parcels of land with established transport links and infrastructure (road and rail), access to regional population centres and support industries/infrastructure, water storage infrastructure and access to good quality water, and access to electricity infrastructure (Department of Regional NSW 2023).

In addition, mine sites are already disturbed areas and present opportunities for avoiding additional biodiversity impacts associated with alternative greenfield sites. Mine site buffer land also provides separation between potential development sites and adjoining landholders and sensitive receivers, which may be particularly attractive to industries with significant noise, air quality or odour impacts, or large hazard-management zones.

There is a wide range of examples of mine sites being redeveloped for alternative uses that take advantage of the physical attributes of the sites. For example, voids are being used as waste repositories (such as Woodlawn Eco-Precinct [Veolia 2024]) or for pumped hydro-energy storage (as at Muswellbrook coal mine in NSW [AGL 2024]), or being filled with water and used for recreational and other aquatic uses (e.g. Penrith Lakes in NSW [NSW Department of Planning, Housing and Infrastructure 2024b] and Lake Kapwari in Western Australia [Government of Western Australia 2024]), or other innovative uses unrelated to the previous mining use (e.g. Eden Project Botanic Gardens in Cornwall, UK [Eden Project 2024] and the proposed redevelopment of Rhondda coal mine as a motor sports facility (DPIRD 2024c). There are also numerous examples of former mining and industrial sites being redeveloped for uses ranging from other industrial uses to transport terminals (e.g. BHP’s Newcastle Steelworks), residential and commercial development (e.g. Rhodes Peninsula in Sydney – City of Canada Bay 2024), bulky goods retailing (the Pasmenco site in Lake Macquarie, NSW [Hunter and Central Coast Development Corporation 2024], or renewable energy generation (e.g. the Kidston project in Queensland – a solar farm on a tailings dam [Genex 2024] or the Liddell Power Station redevelopment [AGL 2024]). Opportunities associated with repurposing mine sites in the Pilbara are also being investigated (Murphy et al. 2019). These examples all demonstrate the proven ability to develop former mine sites into alternative, high-economic-value PMLUs.

3.2.1 Benefits to mine operators

The redevelopment of a mine site for different PMLUs will typically be funded by developers looking to utilise the assets presented by the former mine site rather than the mining companies themselves. The benefits for mining companies are therefore largely related to reduced rehabilitation costs and earlier divestment opportunities (see also the discussion in Murphy et al. 2019). In many cases the features which prove the greatest potential value for PMLUs are also features which represent significant rehabilitation costs for mine operators if they are required to be removed or revegetated. For example:

- Transport and utilities infrastructure such as roads and rail lines, power lines, telecommunications and water management facilities would all need to be removed under most ‘default’ rehabilitation land uses, and often at significant cost. If they are able to be retained for PMLUs these costs need not be incurred and securities can be reduced accordingly.

- Administrative and workshop/processing areas often include established buildings, car parks and hardstand areas. Many of these structures can be repurposed for other land uses which remove the need for demolition/removal. In some cases they include areas with varying levels of contamination that would need to be removed/remediated under default land use scenarios but which can sometimes be managed in situ with alternative land use options.

These items represent a liability on the ledger under a 'default' PMLU scenario which can be turned into, at a minimum, a zero-cost item and potentially into a significant value asset where it can be repurposed at little additional cost and a reduction in security obligations. In addition to the above examples, there are potentially significant opportunities to adjust mine plans (including, in some cases, to increase production and/or minimise operating costs) to develop landforms which are more suited to a preferred PMLU (Murphy et al. 2019) and in some cases, this may improve the financial viability of different mine plan options that may not be viable under a default PMLU scenario. An example of this is the potential to maintain or increase final void depths and emplacement heights to optimise voids being used for pumped hydro-energy storages. Tailings facilities also present significant opportunities for redevelopment due to their flat terrain and some uses may also reduce potential long-term management or liability issues (e.g. through reduced infiltration associated with hardstand areas). Such uses also provide regulators with confidence that longer-term monitoring and management will be undertaken on these sites.

Alternative PMLUs also present opportunities for earlier lease relinquishment (and release of securities), where closure criteria can be set based on commencement of the alternative PMLU. Additionally, residual land values are also likely to be significantly higher under high-economic-value PMLUs relative to default land uses, and the ability to transition quickly to an alternate PMLU enables these higher asset values to be realised faster. This is a significant economic benefit over default PMLUs which typically represent lower land value returns due to the lower economic potential of the land.

The investigation of alternative PMLUs for areas disturbed by mining is also likely to demonstrate increased potential for buffer lands to also be used for higher-value uses prior to mine closure, or at least coincident with the transition phase from closure to relinquishment. Again, this is likely to yield significant financial benefits for mine operators relative to a conventional practice of managing these buffer lands for passive or grazing uses. Buffer lands (where retained as a buffer for alternative PMLUs) also present a potential opportunity to be managed as biodiversity offsets or nature-positive restoration projects supporting the redevelopment of the mine site for alternative PMLUs, particularly where these PMLUs have additional biodiversity or environmental impacts. In this regard buffer sites present a significant additional asset to be considered in combination with areas directly impacted by mining, and the combined value of buffer lands and areas impacted by mining may be higher than their value when assessed separately.

An additional benefit for mine operators relates directly to their employees. Managing a transition to a PMLU that will enable employees to have limited disruption in employment opportunities and asset values is likely to encourage greater employee retention and involvement in closure planning processes. The value of these benefits is likely to be significantly underestimated against the alternative of a poor transition process, particularly when social and wellbeing costs are also considered.

3.2.2 *Benefits to regional communities and the state*

The ability to reduce socio-economic disruption associated with mine closure is the most significant benefit for NSW and the Hunter region. Using mine sites to manage this transition has the following additional benefits, as it:

- facilitates a diversified economy within the Hunter region which improves socio-economic resilience to external influences
- takes pressure off less disturbed areas for development needs and therefore reduces the cumulative impacts on biodiversity

- enables existing installed infrastructure to be utilised and frees up capital/taxpayer funds for use elsewhere in the economy
- the ability to utilise existing infrastructure speeds up development timeframes by reducing needs for supporting infrastructure to be installed
- reduces infrastructure demands on Councils and maintains the value of existing built assets
- reduces pressures on other locations associated with displaced workers
- reduces risks associated with legacy mines
- reduces wastes generated through the repurposing of existing built infrastructure.

Most, if not all, of these benefits can be realised with little to no direct financial subsidies to mine operators if properly managed through existing and reformed regulatory settings, particularly if the financial benefits associated with reduced closure costs can be realised by mine operators and/or PMLU proponents. For many support businesses currently reliant or heavily dependent on the mining sector, the transition away from mining is likely to be difficult and it is likely that many enterprises in this position will cease to exist rather than transition. However, if managed well, these enterprises can adapt to a different customer base or, if closure is inevitable, the business closure process can also be managed to mitigate the financial impact on employees and owners.

3.2.3 Benefits for proponents of post-mining land uses

Mine sites offer significant potential benefits for proponents of alternative PMLUs, which make them attractive for investment. These benefits include:

- existing installed transport and utilities infrastructure
- existing disturbance areas which avoid or reduce biodiversity impacts and offsetting costs
- established buffers from neighbours
- landforms suitable for different uses (e.g. voids for pumped hydro storages or waste emplacement)
- close proximity to electricity distribution (and supply) infrastructure
- lower land costs and opportunities to expand the footprint (relative to other urban/metropolitan areas)
- the ability to utilise an established skilled workforce with neutral demand impacts.

As noted above, there are also opportunities for operating mines to create landforms specifically for different PMLUs as part of mining operations; this can often be achieved at little additional cost to the mine operator relative to a default PMLU option and may represent significantly lower development costs for alternative PMLU proponents relative to other potentially suitable locations. As noted by Murphy et al. (2019), these potential savings (to both the mine operator and PMLU proponent) could be used to cover the capital cost of additional plant or the active management of residual liabilities, and/or to establish financial instruments (e.g. trusts) to cover operational costs or insurance against latent risk.

3.2.4 Learning from others' experiences

Transition is not new to Newcastle and the Hunter region, and the closure of BHP's steelworks in the heart of Newcastle in 1997 provided key learnings on transition management. In the case of the steelworks' closure, considerable research was undertaken to identify how the City of Newcastle could position itself beyond mass production of a single commodity, along with an assessment of what skills and training might be needed to support this economic transition. The University of Newcastle played a key role in this regard, with the NSW and Federal governments also contributing to a relevant economic development strategy for the region (Atteridge & Strambo 2021). Key learnings from the case study outlined:

- the need to establish local and multistakeholder governance mechanisms
- the need to ensure local stakeholders have a role in transition planning and that engagement commences early to facilitate trust development between stakeholders
- that government support should be tailored to effectively address local needs throughout the transition process
- the need to recognise that transition is not quick and there needs to be a focus on implementation, ensuring sustainable mechanisms are in place
- the need to start with the end in mind by exploring all potential solutions and synergies while being creative and open-minded about potential solutions and strategies (Atteridge & Strambo 2021).

The Latrobe Valley and the wider Gippsland area in Victoria are also experiencing a similar transition process to the Hunter Valley, related to the staged closure of brown coal-fired power stations and associated brown coal mines. The *Gippsland 2035: Latrobe Valley and Gippsland Transition Plan* (State Government of Victoria 2023) was developed to guide the transition processes associated with the closure of power stations and associated coal mines, and establishes a vision for the region, goals and guiding principles underpinning the transition, and a roadmap to maximise opportunities for economic participation across the region. The plan recognises that strong engagement with stakeholders (including the community) is a key requirement for navigating the transition and achieving the vision and goals detailed in the Gippsland 2035 Plan and provides a range of recommendations for managing the transition processes (Latrobe Valley Authority 2024).

4 The way forward

There is broad recognition that transition is necessary and that mine site redevelopment will play a role in the transition process. This is reflected in the Parliamentary Inquiry terms of reference and the vast majority of submissions made to the inquiry (Parliament of NSW 2024), and the various funds and working groups established or planned.

The Regional NSW guidelines on investigating PMLUs provide a good template for considering site specific options, however, they do not provide any strategic guidance for managing transition processes where there are a large number of mining operations. These guidelines are also primarily focused on mine operators and not the broader stakeholder groups potentially impacted by mining.

The experiences of other regions where transitions have occurred or are occurring provide good background information for what has worked and what hasn't. Learnings from the transition processes occurring in the Latrobe Valley/Gippsland area are a particularly useful recent reference point, however, the strong interconnectedness between the power generation and coal mining sectors in that area, and the current initial development of renewable energy generation to replace the planned closure of the brown coal electricity generation system, provides a point of difference which precludes a direct comparison. That said, there is much to learn from the processes involved in developing the Gippsland 2035 Plan, including the methodology used to bring stakeholders together and establish the Latrobe Valley and Gippsland Transition Plan Project Control Group and associated implementation working group.

The work being undertaken by AGL in the redevelopment of the Liddell Power Station site, in addition to the Idemitsu/AGL Muswellbrook coal mine pumped hydro project, is also clearly a step towards transitioning Hunter Valley sites towards alternative uses. While the timing of the redevelopment of the Liddell Power Station site has not facilitated a smooth transition for all AGL's Liddell Power Station workforce, it may provide opportunities to do so for Bayswater Power Station as it approaches its planned closure date. The AGL redevelopment also offers valuable assistance in understanding what has and hasn't worked; information which can be carried through to more regional planning considerations.

Despite these positive examples and initial steps, there remains a range of institutional and regulatory challenges.

4.1 Institutional challenges

There are a range of institutional impediments to a transition from mining to alternative higher-value land uses. Several of these key challenges are discussed below.

4.1.1 *Mining versus asset management mindset*

Most mine operations manage mine sites and associated buffer lands from a mining mind set: that is, they are managed in the context of mining as the core business. Future planning decisions are usually made around resource recovery opportunities or potential linkages with other operations (e.g. the use of voids for tailings disposal or water storage) and the potential use of the overall asset base, including opportunities presented by longer-term alternative land uses, is often seen as contrary to this core business (Murphy et al. 2019). The regulatory and stakeholder views of rehabilitation as an obligation and cost rather than an opportunity also do little to alter this perception. Changing this mindset to consider the broader values of the asset base in making longer-term planning decisions is likely to realise significant additional shareholder benefits.

Realising these potential benefits will also require additional resources to investigate different PMLU and buffer land development opportunities, and to understand the potential legal, logistical and financial implications for mining operations. Mining companies will also need to ensure that there is appropriate resourcing and support for engagement with other stakeholder bodies to ensure corporate interests are appropriately represented in stakeholder forums, and that the company can provide timely and well-developed input into reform processes and forums to enable the company's interests to be best represented.

4.1.2 *Awareness of potential opportunities outside the mining industry*

Capital is mobile and many developers (including manufacturers and other industries) will prioritise sites with lower entry costs where other factors are relatively equal. Despite the obvious benefits that mine sites offer, the lack of awareness of the opportunities to develop them for PMLUs is likely to be a significant impediment to them being pursued and may also be linked to mining operators not being aware of the potential value that the mine sites present to other parties. Media stories about potential environmental impacts associated with former mine sites may also drive perceptions that mine sites are not appropriate for various PMLU opportunities or that the costs associated with preparing mine sites for different PMLUs are prohibitive. While some of these perceptions have an element of factual basis, these potential impediments can be managed through different operational and/or engineering controls and similar or different impediments generally exist in alternative (non-mine site) locations that may also be under-considered as development sites.

Increasing public awareness of the potential opportunities presented by mine sites, and improved transparency by mine operators and regulators regarding closure timing, approvals and relinquishment processes, will greatly assist potential investors in investigating the use of mine sites as options for development. Connecting mining companies and potential developers, however, remains a challenge. Traditional expressions of interest processes provide an opportunity for this but may not realise full site potential from either a cost-savings or socio-economic benefit perspective if not well prepared or broadly circulated. There are significant opportunities for third party businesses which facilitate the transition processes by connecting mine sites with potential developers and/or specialist mine closure businesses which manage closure and transition processes through an assumed or shared liability business model (CSIRO 2023).

4.1.3 *Timeframes*

The timeframes available to manage the transition have likely operated as an impediment to early action on the use of mine sites for alternative PMLUs. For many sites, the commitments surrounding closure planning typically identify the closure planning processes as commencing between five and seven years from planned closure. This timeframe may be appropriate for studies and detailed closure designs associated with already approved default land uses but is unlikely to be adequate for the proper investigation of alternate PMLU opportunities, commercial negotiations with third parties and approval processes, which can occupy a

significant percentage of available time, absent any construction period considerations. The commencement of investigations into alternative land uses at the late stage of a project's life also limits opportunities to adjust mine plans to optimise the site's suitability for different PMLUs, particularly where a modification of existing approvals is required before such changes can be implemented.

There are also limited opportunities for a single operation, or even a single mining company with multiple operations, to realise time closure and PMLU development opportunities such that they mitigate impacts associated with the closure of each operation. This is largely due to operational conflicts which, in many cases, preclude a smooth transition from employment in mining to employment in the construction or operation of a PMLU. The opportunity to use buffer lands, existing closed sites or a coordinated staging of closure and redevelopment across multiple sites can mitigate or even avoid these timing constraints.

4.1.4 Coordination and appropriate governance

The management of staged closure and PMLU employment generation (both through construction and operation) will require careful coordination between key stakeholder groups including mining companies and associated industry bodies; AGL; local, state and Commonwealth government; and key regulatory agencies. Industry, business and employee groups, landholder representatives, local and state environmental groups, and agricultural sector representatives (particularly from viticulture and equine sectors). First Nations people are key stakeholders in the development of PMLUs to ensure that PMLUs are culturally appropriate, assist in overcoming systematic disadvantages that are prevalent in Australia and provide benefits for Traditional Owners. SIA processes associated with closure planning can also play a role in identifying these key stakeholders (CSIRO 2023).

The importance of engagement and coordination in achieving a successful transition to a sustainable regional economy is largely well understood, however, there is a lack of leadership in progressing the processes and many stakeholders lack the resources to either take the lead or a meaningful role in the processes. All stakeholders have a part to play in ensuring a coordinated approach, however, a centralised, well-resourced leadership body with decision-making capability is required to manage the coordination. The Gippsland 2035 model of a government- and industry-dominated project control group supported by an implementation working group with broader stakeholder involvement provides a good template that could be applied to the Hunter Valley transition processes.

Government has a key role to play in this coordination processes due to the need to adjust to regulatory and policy settings to define strategic objectives and guide the consideration of PMLUs and facilitate alternative PMLUs with higher employment and economic benefits. Mining companies, AGL and developers will also need to cooperate with each other on life of mine planning, rehabilitation objectives and PMLU planning within the regulatory constraints presented by anti-competitive regulations; in the absence of government coordination, specialist stakeholder engagement consultants are available to fill the void (CSIRO 2023), but at significant private cost and duplication of resources.

Coordination of training to ensure employee skills demands are met will be a key component and extends the range of stakeholders to include schools, TAFE, universities and private training institutions.

4.2 Regulatory challenges

Regulatory frameworks require adjustment to improve flexibility on PMLU options but also ensure that regulatory settings do not discourage potential high-value options and/or create perverse incentives for lower-value PMLUs.

There are a range of different regulatory systems which can hinder the investigation and/or implementation of alternative PMLUs in a timely manner and, in some cases, preclude potentially suitable options. The key regulatory challenges which are at relevant to this issue are:

- NSW EP&A Act approval process issues including permissibility, approval processes requirements for investigation activities and unclear approval processes for alternative PMLUs (e.g. modification to existing approvals or new approvals, or a combination of the two)
- *Environment Protection Biodiversity Conservation Act 1999* (Cth) (EPBC Act) (Commonwealth Government of Australia 2019) approval requirements for PMLUs and potential inconsistencies with existing EPBC Act approvals
- long and uncertain state and Commonwealth approval assessment timeframes
- constraints on land use presented by existing biodiversity offsets and onerous biodiversity offsetting requirements where impacts are unavoidable
- water licensing requirements under the *Water Management Act 2000* (State Government of NSW 2000) which limit opportunities to fill mining voids and a lack of credit for returns of water
- licensing requirements under the *Protection of Environment Operations Act 1997* (State Government of NSW 1997) which don't allow overlapping licence areas.

The *Mining Act 1992* likely does not operate as a constraint to the development of PMLUs as there is considerable flexibility in managing rehabilitation requirements where PMLUs are approved. However, there are opportunities to reform the securities management processes to encourage opportunities for beneficial reuse of sites and associated infrastructure, including arrangements for transferring liabilities to PMLU developers or third parties.

Given the potentially significant socio-economic and environmental factors associated with a well-managed transition process, there are significant political drivers to reform the regulatory processes and associated policy settings. Ideally, the regulatory framework would operate under a more permissive approval framework rather than a constraining process which limits innovative and/or beneficial outcomes.

The development of a strategic planning document which defines clear objectives in relation to the management of biodiversity values and preferred biodiversity corridors, and the preservation of higher-value agricultural resources and existing agricultural industries, will be an important component of the planning reform processes: providing guidance for mine operators and potential developers in understanding constraints and opportunities represented by particular sites, and providing confidence to other stakeholders that these important resources will be protected and/or enhanced. The Synoptic Plan: Integrated landscapes for coal mining rehabilitation in the Hunter Valley of NSW (Andrews 1999) and the Upper Hunter Strategic Regional Land Use Plan (NSW Department of Planning and Infrastructure 2012) provide a good starting point for these strategic planning considerations.

5 Conclusion

Due to the high reliance of the Upper Hunter and broader Hunter Valley on coal mining there are expected to be significant socio-economic impacts associated with the projected decline in production and associated employment. Without planned structural change these communities are likely to experience significant impacts to their livelihoods, way of life and sense of community.

Mine sites and associated buffer lands contain a wide range of attributes that lend themselves to being used for higher-value, higher-employment PMLUs which can mitigate the socio-economic impacts that would otherwise be associated with mine closure; many of these opportunities have the potential to reduce closure costs and relinquishment timeframes by repurposing infrastructure and landforms. There are also likely to be significant time and cost benefits for developers though the ability to repurpose existing infrastructure and avoid significant biodiversity constraints which may exist on alternative greenfield development sites.

This paper identifies a range of existing institutional and regulatory impediments to the development of these higher-value PMLUs on mine sites to date and includes recommendations for facilitating a transition from coal mining to a more diverse economy in the Hunter Valley. If managed appropriately, the transition can see

the Upper Hunter not only avoid significant negative socio-economic impacts associated with the projected decline in coal production but also create opportunities for communities and companies, setting up the region for sustainable growth in the future based on a more diverse industry base and greater community resilience to change.

References

- AGL 2024, *AGL Macquarie Power Stations*, viewed 10 June 2024, <https://www.agl.com.au/about-agl/how-we-source-energy/agl-macquarie>
- Andrews, N 1999, *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW*, NSW Department of Mineral Resources.
- Australian Bureau of Statistics 2016, *Australia 2016 Census Community Profiles*, <https://www.abs.gov.au/census/find-census-data/community-profiles/2016/0>
- Atteridge, A & Strambo, C 2021, 'Closure of steelworks in Newcastle, Australia: lessons from industrial transitions', *Stockholm Environment Institute Brief, June 2021*, Stockholm Environment Institute, Stockholm.
- Burdge, R 2004, *The Concepts, Process and Methods of Social Impact Assessment*. Social Ecology Press, Huntsville.
- City of Canada Bay 2024, *The Rhodes Peninsula*, viewed 13 June 2024, <https://www.canadabay.nsw.gov.au/lifestyle/our-area/the-rhodes-peninsula>
- Coal Services 2024, *NSW Coal Industry Employment Report June 2024*.
- Commonwealth Government of Australia 1999, *Environment Protection, Biodiversity Conservation Act 1999*, Australia.
- CSIRO 2023, *Enabling Mine Closure and Transitions: Opportunities for Australian Industry*, prepared for CRC TiME.
- Department of Regional NSW 2023, *Practical Guide: Post Mining Land Use*, <https://meg.resourcesregulator.nsw.gov.au/sites/default/files/2023-02/practical-guide-post-mining-land-use.pdf>
- Eden Project 2024, *The Eden Project*, viewed 13 June 2024, <https://www.edenproject.com/>
- EnergyCo 2024a, *Renewable Energy Zones*, viewed 13 June 2024, <https://www.energyco.nsw.gov.au/renewable-energy-zones>
- EnergyCo 2024b, *Hunter-Central Coast Renewable Energy Zone*, viewed 13 June 2024, <https://www.energyco.nsw.gov.au/hcc-rez>
- Genex 2024, *50MW Kidston Solar Project (KS1)*, viewed 13 June 2024, <https://genexpower.com.au/50mw-kidston-solar-project/>
- Government of Western Australia 2024, *Lake Kapwari*, viewed 13 June 2024, <https://exploreparcs.dbca.wa.gov.au/park/lake-kepwari>
- Hammerle, M & Phillips, T 2023, *Making Our Way: Adaptive capacity in Australia's At-risk Fossil-fuel-exposed Regions*, Centre for Policy Development.
- Hunter and Central Coast Development Corporation 2024, *Cockle Creek, Lake Macquarie*, viewed 13 June 2024, <https://www.hccdc.nsw.gov.au/cockle-creek>
- Hunter Renewal 2023, *After the Coal Rush, the Clean-up: Community blueprint to Restore the Hunter*.
- Latrobe Valley Authority 2024, *About the Transition Plan*, viewed 13 June 2024, <https://lva.vic.gov.au/transition/about-the-plan>
- Lawrence Consulting 2023, *NSW Mining Industry Expenditure Impact Survey 2022/23*, prepared for the NSW Minerals Council, viewed 7 June 2024, <https://assets-us-01.kc-usercontent.com/b1c065f0-3877-009c-39ba-a9df6fc06e39/658a1dfc-bf4d-4c3e-9502-8cb5e3ff57ef/NSW%20Mining%20Industry%20Expenditure%20Impact%20Survey%202022-23%20Final.pdf>
- Murphy, DP, Fromm, J, Bairstow, R & Meunier, D 2019, 'A repurposing framework for alignment of regional development and mine closure', in AB Fourie & M Tibbett (eds), *Mine Closure 2019: Proceedings of the 13th International Conference on Mine Closure*, Australian Centre for Geomechanics, Perth, pp. 789–802, https://doi.org/10.36487/ACG_rep/1915_64_Murphy
- NSW Department of Climate Change, Energy, the Environment and Water 2024, *Electricity Infrastructure Roadmap*, viewed 13 June 2024, <https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap>
- NSW Department of Planning and Environment 2017, *Social Impact Assessment Guideline for State Significant Mining, Petroleum Production and Extractive Industry Development*.
- NSW Department of Planning and Environment 2023, *Social Impact Assessment Guideline for State Significant Projects February 2023*.
- NSW Department of Planning and Infrastructure 2012, *Strategic Regional Land Use Plan: Upper Hunter*.
- NSW Department of Planning, Housing and Infrastructure 2024a, *Major Projects Planning Portal*, viewed 4 June 2024, <https://www.planningportal.nsw.gov.au/major-projects>
- NSW Department of Planning, Housing and Infrastructure 2024b, *Penrith Lakes: Priority Growth Areas and Precincts*, viewed 13 June 2024, <https://www.planning.nsw.gov.au/plans-for-your-area/priority-growth-areas-and-precincts/penrith-lakes>
- NSW Department of Primary Industries and Regional Development (DPIRD) 2024a, *Royalties for Rejuvenation Fund*, viewed 28 August 2024, <https://www.nsw.gov.au/regional-nsw/resources/royalties-for-rejuvenation-fund>
- NSW Department of Primary Industries and Regional Development (DPIRD) 2024b, *Future Jobs and Investment Authorities*, viewed 28 August 2024, <https://www.nsw.gov.au/regional-nsw/future-jobs-and-investment-authorities>
- NSW Department of Primary Industries and Regional Development (DPIRD) 2024c, *Rhondda Colliery Rehabilitation*, viewed 28 August 2024, <https://meg.resourcesregulator.nsw.gov.au/news/rhondda-colliery-rehabilitation>
- NSW Minerals Council 2021, *Mining History*, viewed 12 June 2024, <https://www.nswmining.com.au/mining-history>
- Parliament of NSW 2024, *Beneficial and Productive Post-Mining Land Use*, viewed 2 September 2024, <https://www.parliament.nsw.gov.au/committees/inquiries/Pages/inquiry-details.aspx?pk=3046#tab-terms-of-reference>
- REMPAN 2021, *Economic Profiles - Muswellbrook, Singleton, Upper Hunter, Maitland, Cessnock, Newcastle and Lake Macquarie*.
- State Government of New South Wales 1979, *Environmental Planning and Assessment Act 1979*, Australia.
- State Government of New South Wales 1992, *Mining Act 1992*, Australia.

- State Government of New South Wales 1997, *Protection of the environment Operations Act 1997*, Australia.
- State Government of New South Wales 2000, *Water Management Act 2000*, Australia.
- State Government of New South Wales 2013, *Singleton Local Environmental Plan 2013*, Australia.
- State Government of New South Wales 2020, *Strategic Statement on Coal Exploration and Mining in NSW*, viewed 11 June 2024, <https://www.resourcesregulator.nsw.gov.au/sites/default/files/2022-11/strategic-statement-on-coal-exploration-and-mining-in-nsw.pdf>
- State Government of New South Wales 2021, *State Environmental Planning Policy (Resources and Energy) 2021*, Australia.
- State Government of Victoria 2023, *Gippsland 2035: Latrobe Valley and Gippsland Transition Plan*, https://lva.vic.gov.au/transition/plan/Gippsland-2035_Latrobe-Valley-and-Gippsland-Transition-Plan_August-2023.pdf
- The Australia Institute 2021, *Mind the Gaps: Unused Capacity and Unfunded Rehabilitation in Upper Hunter Coal Mines*.
- Umwelt 2019a, *Glendell Coal Continued Operations Project - Social Impact Assessment*.
- Umwelt 2019b, *Mangoola Coal Continued Operations Project - Social Impact Assessment*.
- Veolia 2024, *Woodlawn Eco Precinct*, viewed 11 June 2024, <https://www.anz.veolia.com/our-facilities/treatment-plants/solid-waste/woodlawn-eco-precinct>

