

Community capacity to envisage a post-mine future: rehabilitation options for Latrobe Valley brown coal mines

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Abstract

Since closure of the Hazelwood Power Station in 2017, and the associated Morwell open cut mine, the community of the Latrobe Valley have largely come to terms with the coming end of an industry that for almost a century defined their region. However, the capacity for the community to envisage what comes next has been limited. This is in part due to uncertainty of the viability of options for rehabilitation, future ownership and responsibility for the sites, and a challenging policy framework. It is also related to systemic social issues, such as mistrust of both government and energy companies, as well as over-consultation fatigue.

We draw here on findings from a recent study, commissioned by AGL Loy Yang, on the community perspectives on the final void forms and future land and water uses of the three Latrobe Valley open cut brown coal mines – and surrounding lands. The data were obtained through a series of focus groups with key stakeholders, including community organisations, environmental groups, government authorities, business groups, primary producers and Traditional Owners; and a web-based survey, completed by over 560 participants. From this we found a common theme concerning a desire to have the land returned to the community and to leave a positive legacy for the sites. Options that were visually attractive and enabled either recreation and/or tourism were preferred to future industrial uses; environmental benefit was also a strong priority.

Authentic community consultation necessitates that the community be empowered to make an informed contribution to the discussion, and that they are made aware of how their input will be utilised. The community of the Latrobe Valley are invested in having a positive outcome for their region, which future generations can benefit from. To achieve this, the community must be actively engaged in the process.

Keywords: *transition, community consultation, post-mine land use, revisioning*

1 Introduction

Globally, governments and private enterprise are coming under increased pressure to transition from greenhouse-gas intensive industries toward a lower emission future. Aspirational targets limit global warming to within 2°C above pre-industrial levels in line with the Paris Agreement (UNFCCC 2015). Coal-fired energy generation is one of the first targets, which contributes currently to around 40% of global emission from energy use (Jakob et al. 2020). To date, over 40 countries pledge to transition away from coal at COP26 in Glasgow in 2021 (UNFCCC 2021). However, there is wide recognition that communities who specialise in coal-fired energy generation will be disproportionately impacted through economic as well as societal change (Harrhill & Douglas 2019). In this context, the mining and power industry in the Latrobe Valley, Australia is currently undergoing an important and disruptive transformation. Economic considerations within the coal industry, including more ambitious targets set by the Victorian State Government to reduce CO₂ emissions, are the primary drivers of these changes.

Lessons from Germany demonstrate that the transition from coal is most successful when there is active participation of the local community in both the design and implementation of both policy and rehabilitation outcomes (Furnaro et al. 2021). In a review of Canada's mine closure plans, companies that look beyond technical feasibility and recognise local values, needs, priorities and visions for the future are more likely to succeed (Xavier et al. 2015). These considerations speak to the significance of involving Indigenous communities' knowledge and expertise in closure planning (Monosky & Keeling 2021). Although lessons can be drawn from other comparable regions who have undergone such transition, it is critical that community views are not presumed, but rather, be grounded through assessing the local context. This is because each community has a lived experience that is unique and informs their values and response to transition, as well as holding strong motivations for involvement in the process (Measham et al. 2021). However, regulations under the *Mineral Resources (Sustainable Development) Act 1990* require that the licensees achieve 'safe, stable and sustainable' criteria in mine relinquishment and comply with environmental regulation through an Environmental Effects Statement process, without requirement of further consideration of social values or impact (Government of Victoria 1990).

On 9 February 2014, a significant fire broke out in the Hazelwood Pit, one of the three large open-cut brown coal mines of the Latrobe Valley. This fire burnt for 45 days, shrouding Morwell and surrounding regions in toxic smoke. Resultant impacts prompted the Hazelwood Mine Fire Inquiry, which delivered key recommendations, including addressing the health impacts of the fire and monitoring air quality. Recommendations also included developing a regional rehabilitation strategy for the Latrobe Valley's three mine voids (HMFI 2017). The Latrobe Valley Mine Rehabilitation Advisory Committee (LVMRAC) was established to bring together stakeholders from across the region to contribute towards the Latrobe Valley Regional Rehabilitation Strategy (LVRRS) (Lloyd 2019). Since then, the Victorian Government has established the Mine Land Rehabilitation Authority (<https://www.mineland.vic.gov.au>), as an independent body to oversee the implementation of the LVRRS.

The Hazelwood power station and coal mine closed in March 2017, with owners, Engie, giving workers just five months' notice. This announcement prompted the formation of the Latrobe Valley Authority, tasked with finding new employment and/or re-skilling workers from Hazelwood Mine and Power station. It is expected that by 2045 there will no longer be coal-fired power stations in the Latrobe Valley as the State transitions away from high-fossil fuel generating industries. Energy Australia has announced their plans for closure of the Yallourn pit in 2028, and AGL Loy Yang in the 2040s.

Under the *Mineral Resources (Sustainable Development) Act 1990* (Government of Victoria 1990), mine operators in Victoria are required to develop closure and mine-scale rehabilitation plans for their sites for post-mining implementation. Current plans for each of Gippsland's three mines feature full pit-lakes in order to stabilise the sites and provide an effective covering for the coal. The vast size of the mine voids and very limited available overburden prevent cost-effective solid fill for the sites. However, in order for this to be achieved, water must be made available. Options under consideration include extending bulk water entitlements currently provided for the provision of energy through site rehabilitation or accessing other sources of water either from current surface water (e.g. flood) and/or groundwater resources and/or including alternative water sources (e.g. recycled water, desalinated water, diverted stormwater) (DJPR 2020). The quality and quantity of the available water will also determine future uses of these pit-lakes and their potential for providing economic, social and environmental benefit.

Should water not be available, either due to the bulk entitlements not being extended or decrease in rainfall due to climate change, other options need to be considered. Dry pit options, where batters are contoured to a safe slope, with soil capping placed over the coal face and revegetated are also a possibility. Various technical assessments have been undertaken to determine the volumes of water and/or capping required, their availability and the feasibility of the various options under consideration (DELWP 2020).

Community consultation has been undertaken. However, there is criticism that consultation has been somewhat one-way, whereby the options are presented to the community for feedback, rather than inviting the community in a more participatory process (pers. comm. 2020, 2021). Documents such as the LVRRS'

Land Use Strategy Draft (DELWP 2019) have also been criticised for being too open-ended, therefore unrealistically increasing community expectation (pers. comm.). As well as capturing visions for potential land use, acknowledgement of the impact of mining and mine closure on long-term social benefit should also be considered for rehabilitation to be considered ‘successful’. This is a common oversight, which Lawrence and O’Faircheallaigh (2022) attribute to active strategic ignorance, in the case of the Mirarr people and the Ranger uranium mine in the Kakadu region.

A range of other attempts to revision a post-coal Latrobe Valley have occurred prior to the endeavours cited through the LVRRS process (DELWP 2019 and by the individual energy companies).

These include: a *Community Partnering Project* (PAR) in the early 2000s, which used a participatory approach to look for new economic identities and opportunities in the Valley after privatisation (Cameron & Gibson 2005); a series of Climate Change forums held by the Gippsland Trades and Labour Council to discuss the impact of climate change policy on local industry and community (Snell 2018); and the formation of the Latrobe Valley Transition Committee (Weller 2018). All options were considered a ‘Just Transition’. A design competition, initiated by RMIT University’s Office of Urban Transformations Research Laboratory, was held in 2012 to seek designs that would revitalise the townships of the Latrobe Valley, including the future rehabilitated lands. This initiative later led to the ReActivate social enterprise program, which ran from 2011–2019. The researchers also worked with the community of Morwell to develop the *Future Morwell Urban Design Revitalisation Plan* (Monacella & Douglas 2017). Some of these initiatives have since been taken up by the Latrobe City Council. There has also been a strong sense in the Latrobe Valley community of being ‘over-consulted’, or at least over analysed, without bringing about meaningful change (Cameron & Gibson 2005). One overarching common theme from the numerous studies is the community need for hope (Cameron & Gibson 2005; Duffy & Whyte 2017; Weller 2018).

This current research was designed to gain a deeper and current understanding of the community’s views on mine rehabilitation in the Latrobe Valley. In particular, the research sought to understand their concerns or preferences for different suggested landforms, as well as aspirations for future land uses, contextualised by known constraints. Care was taken to understand participant’s values around water and their connection to the Latrobe Valley in responding to these questions. This design is less open-ended than various previous consultation efforts, providing greater agency for participants. A level of independence and understanding was enabled, given the research was designed and undertaken by researchers from the local university. Information from this study will be used to gain an informed understanding from the community about the risk appetite for the range of options under consideration as well as assist in the management of community expectations around the rehabilitated mine sites.

2 Method

To inform this research, a thorough literature review was undertaken of the available LVRRS reports, as well as consultation with AGL Loy Yang and the Mine Lands Rehabilitation Authority, to ensure survey design was informed by feasible options currently under consideration. To communicate this succinctly to the community, a two-page factsheet (Supplementary data) was developed to provide all participants with a common baselevel understanding of the various options.

We employed a mixed-methods approach, incorporating focus groups and supplementary interviews, followed by a community online survey. The preliminary analysis of the focus groups was used to inform the design of the survey instrument.

The focus group component of the broader study sought to gather views from diverse groupings within the local community. Focus groups are a commonly used research method for gathering in-depth information within a short time duration. An additional advantage of focus groups is provided through the opportunity for participants to engage interactively in discussions that provide more considered and fruitful responses (Kruger & Casey 2009). The focus group study included representatives from nominated groups labelled: Traditional Owners; Environmentalists; Government authorities; Businesses, Community Groups and Farmers.

Focus groups and interviews completed comprised 30 participants in total with discussions generally of 60 minutes duration. Data were collected during June–July 2021 at Federation University, Gippsland campus with sessions audio-recorded and later transcribed, supplemented by facilitator notes. A combination of face-to-face and videoconference communications were employed. Data were collected anonymously.

Participants were questioned on viewpoints concerning interconnected issues: 1) water considerations, and 2) void future uses. For water considerations, a broad line of questioning provided for discussions concerning water connections, values, use preferences, quality aspirations, desired water levels and accessibility. For void future uses, questions were directed towards stakeholder interest, benefits realised, preferred or possible applications for unfilled, partially water-filled and completely water-filled void, supported or potential water sources where water-filled, preferred options, and viewpoints on diversified uses. Time was provided for discussion including general comments not captured in response to posed questions.

Incorporating feedback from the focus groups, the online survey instrument gathered input from the broader local community on future landforms and land use. Graphical prompts were included that explained the final pit forms under consideration plus adjacent land areas. The questionnaire comprised 27 questions, with 19 of these being close-ended questions utilising 5-point scales, and eight being open-ended questions. Demographic data were also collected to identify attitudinal differences between groupings (e.g. age or gender). The survey was administered via social media and email with weblink and QR code access promoted via media efforts (e.g. local newspapers and radio stations) and community groups. The data collection period spanned from July to November 2021, this produced 563 useable responses.

Ethical approval for the study was granted by the Federation University Human Research Ethics Committee (Project No. A21-013).

3 Results

3.1 Focus groups

Across participants, options and constraints associated with a range of void uses were canvassed. General concerns associated with these uses were detailed first followed by views and opinions on void future uses as empty, partially filled and completely fill. From the deidentified transcripts of the sessions, thematic coding was undertaken. This identified four key themes across each of the groups. The themes represent participant responses about uses of water within or connected to the Latrobe region and related issues for future mine void scenarios (mindful too of surrounding lands). Participants expressed high interest and involvement in these interlocked issues. Discussion revealed also that all participants were well informed on key issues. Beyond provided information, many participants offered detailed and insightful technical knowledge on the practicalities of mine void options and possible effects from future water- and non-water void applications. The four interrelated themes representing study results are: ambitions and visions for the region; evident concerns associated with water use and mine-void futures; enduring responsibilities, and; knowledge gaps to be addressed.

3.1.1 Ambitions

General agreement existed among participants from all groups that mine void futures should be determined in the interest of the community and visitors to the community, rather than the current licensees.

“I think the community. And by the community, I mean greater community. So, it’s the agricultural sector, it’s the industrial sector, it is social sector, it is the landholders, both urban and rural, in that process. And probably – maybe controversial – probably at the bottom of that list are the current owners of the mines.” (Business Group)

A Traditional Owners group participant noted also concerns with ongoing and detrimental visual and cultural consequences from the voids, underpinning others’ views on the importance of finding suitable solutions.

“For me, the cultural and spiritual aspect of rehabilitating this scar on country is enormous. I don't travel down that freeway ... I go the other way so I don't have to pass that massive scar on country, that really harmful spiritual pit in the ground... So, for me it's going to be whatever happens to that pit, it has to be returned to nature, it has to be.” (Traditional Owner Group)

A Government authorities group participant remained mindful of the broader regional picture underpinned by important community aspirations.

“I suppose what we're hearing from the community and very loudly is around their call for a just transition. So, the community has derived lots of benefits, economically and other from the operation of power stations and everything that goes with that.... But they're not all benefits and some of those have been environmental, health and other impacts as well that have been detrimental. So, I think the community does have a large say.” (Government Group)

For the Business group, whatever form the voids take into the future, applied use should provide a positive community 'legacy' recognising past, present and future. The Community group expanded their concerns where the community should be the beneficiary, and for whatever solution is found, responsibility should be clear as to initial and ongoing costs.

3.1.2 Options and concerns

In terms of potential options for the voids themselves, the participants were first asked to consider pit lake options. Many respondents saw the solutions to be multi-faceted, providing a range of recreational, environmental and economic opportunities. Where voids can be converted to healthy lakes, aspirations for the Community group saw benefit from these being part of the natural system and developed for tourism.

The Environmental group envisaged multi-faceted benefit too from full lakes. One participant noted that choices made may depend on physical suitability of locales. They describe a multi-purpose vision:

“... if we were to have a mine filled with good quality water I can see many uses for it...So there would be a public recreation area, picnics, nice water parks or whatever. There could be a fishing option, there could be landside housing developments assuming that the slope was correct. There could be a portion that is set aside for floating solar to produce energy. There could be another section that's suitable for industry that relies on some water usage. Or another section could be agriculture where you're using the water out of the dam, maybe having greenhouses alongside it so that the irrigation usage isn't excessive.” (Environment Group)

There was shared concern among participants around using water for rehabilitation in a drying climate and the quality of water, both within the pits and potentially downstream environmental assets, such as the Latrobe River system. An Environment Group participant, for example, saw only disbenefits flowing from a full lake option through exacerbating reduced water availability:

“And I don't know if there is going to be a benefit, I think it's just going to create more problems, create more problems with shortage of water, quality of water within the mine itself is going to be a problem, and I don't know that I see too many benefits there at the moment other than the mine owners themselves who are looking for the cheapest option to fill the hole so they can walk away...” (Environment Group)

A water-filled void was seen by many participants as a cheap solution to be taken in private company interest, but not in that of the community. On this, the Government authorities group expressed a range of informed opinions on issues and concerns surrounding water-filled voids. One participant in this group favoured the water-filled voids where a holistic plan for water can make this feasible:

"I think the State needs to rethink water in its entirety and ... [where] filling up these voids with water ... needs to be connected to a river system, it needs to be maintained because that's when you get the opportunity to do many things.... the State needs to step up and have a broader conversation... the State in particular has benefited ... from power generation and they need to have a bigger voice in the broader solution and we can't keep ring-fencing the three voids in the Latrobe Valley as the issue." (Government Group)

Although there were various concerns expressed about using surface water in the rehabilitation of the mines, other alternatives were considered. An idea that received support in a number of groups concerned accessing clean recycled water. A Farmers group participant enunciated the idea:

"...What a great opportunity to justify the infrastructure now that we can put in place for the next century. It's just a fantastic opportunity so the water from the East Melbourne Treatment Plant once treated or untreated could come out to Gippsland to lower value commercial sites where it could then be processed, desalinated or whatever to a quality that would be satisfactory to go into the mines and that could be a sustainable system in itself." (Farmer Group)

Participants were then asked to consider dry pit options. A Business group participant, for example, noted that new valuable uses for coal in the future may be found, and so 'sterilising' the resources may be unbeneficial in the long run. The majority however saw benefits in promoting leisure and recreational activities for those within and outside the community. A Community group participant offer their viewpoint on mountain biking opportunities. The Business group also saw the potential for recreation opportunities.

"I think there's significant potential for recreational open space. These will be large areas, probably in the area of 6,000 to 8,000 hectares. The opportunity to potentially re-vegetate, re-wild, some of those areas are significant if we don't fill them up with water." (Business Group)

An environmental group participant argued that the region already had an example of the future encapsulated by the Great Latrobe Park.

"...the concept of the Great Latrobe Park is to make this area a magnet to draw people who want to either grow their families here, to tackle health and wellbeing, to tackle environment, to tackle things like the climate challenges by planting trees." (Environment Group)

The Traditional Owners expressed concerns both with the empty-void stability issues and unrelinquished options available through potential re-uses of coal. The view expressed specifically was that empty voids would not close-off opportunity to re-engage in coal production. One participant describes such concerns:

"What will it be, will it be a big pit that has got grass growing over it and just conveniently sitting there ready for remaining later when technology gets better? ...I don't trust leaving it as a big hole in the ground because it's too easy to get at again." (Traditional Owner)

The greatest concern shared by all groups was that the mines would essentially be fenced off and abandoned, not providing any positive outcome for the community and increasing the long-term risk.

"But then of course, does it matter to us? Because we won't be here, and we're leaving this problem to the next generation that are going to have the Valley of Fences." (Community Group)

3.1.3 Responsibility

An issue raised commonly across groups concerned who do or should carry responsibility for meeting community aspirations. While voids are controlled by private hands, historic, current, and future uses have and will continue to have direct community impacts. These impacts stem from factors embedded in ecology, health, amenity, culture, society, identity, and prosperity. Hence, participants overall considered that

responsibility for what is to be done with the voids falls beyond the express wishes of private landowners, and potentially the allocated budget.

A Community Group participant conveyed the historic scenario where power stations were developed seemingly without an end in mind, and now continue operations in the same position. Hence, fixing this problem will necessarily rest with later generations. They contend:

“They didn’t build a power station without knowing they had coal to feed it. So why extend a mine when they’ve got no idea how they’re going to deal with the hole, or they’ve assumed that they’ll be enough water from somewhere; that community will invent a way for them to have some water.” (Community Group)

Clearly, negative attitudes towards power stations manifest in previous examples and will be reinforced or dissipated depending upon options taken for void rehabilitation. Extrapolating this view, options taken now will tie-in to legacy, which will determine in turn how the current generation will be judged by those of the future.

The Environmental Group in discussions considered the mine operator, as owners and beneficiaries from the land, to carry responsibility for it ‘in perpetuity’. The Community group offered a contrasting outcome where rehabilitation and ongoing water management/maintenance may not be recognised by the land-owning companies as their core business.

“(Energy company’s) core business is not in water management, it’s not in pumping water, it’s not in desal. None of those things. So I’ll be interested in what is the back-end model? Who’s going to look after it if it’s a community asset or burden? That’s pretty concerning.” (Community Group)

The prevailing view among groups is that community benefits will be more likely realised where responsibility for future void (and surrounds) uses are carried by those beyond current owners. For example, the Traditional Owners group saw the future as being a ‘shared responsibility’. This is ever more important as their voices have been excluded in the past.

The participants also felt that the Government should be expected to take some responsibility for the outcomes.

“So we need to talk about the realities. You need to trust the people that they can understand that there are limitations. We need to make sure that there is going to be enough water in Gippsland for this use, after all we’ve provided the State and other States with power generation for decades and decades, it’s time for payback. So we have to have some commitment from the government that we won’t just be dumped.” (Environmental Group)

It was also expressed in several groups that the issue is not the Latrobe Valley’s nor even Gippsland alone to fix. All of Victoria has benefited from the electricity generated in the Latrobe Valley and so they feel strongly that the State Government has a large role to play in ensuring a positive outcome for the region.

“And really the State should now step up and provide some of the economic benefit back to the communities of the Latrobe Valley and Gippsland more broadly through appropriate resourcing to achieve the community’s vision for these voids, or these pits.” (Government Group)

3.1.4 Knowledge gaps

In addition to a lack of clarity around responsibilities, participants across groups commonly expressed requirements for further information or straight answers to questions. Many recognised too that evidenced-based knowledge is required for informed decisions.

“We [the community] can’t invent a new solution.... But...other solutions should be researched and presented to us. And there should be money spent on that research, on innovation. We can’t do what they’ve done in Europe. They have less coal and more overburden, and their pits are smaller.” (Community Group)

There were several concerns expressed around knowledge gaps with regards to the water quality in the pits, including the water temperature and whether pit lakes would be open or closed to surrounding waterways. Would the pit lakes actually be able to meet a standard where they could be accessible for water-based recreation or aquaculture? There was also concern expressed about understanding water availability under future climate scenarios – which may be significantly different over the time required to remediate all three sites.

“There’s just so much more information that we don’t have to hand or that hasn’t been made public that is really required in order to make informed decisions... I think to answer your question that there needs to be that information, those studies need to be completed around what the best fit option for those mines needs to be, it really needs to be a scientific and technical decision that needs to be made by the appropriate authorities.” (Government Group)

The responses indicate an invested community who want to have an active, participatory approach to the decisions facing the future of the mine sites and the Latrobe Valley more broadly. However, they require costed, evidence-based options that consider the environmental, economic, social and cultural impacts and benefits to be able to fully engage in deliberations. This may form part of the future function of the Latrobe Valley Regional Rehabilitation Strategy, to be informed by independent researchers as well as the industry and government stakeholders.

3.2 Survey

The online survey was open from July to November 2021, receiving 563 viable responses for the time-period. The survey was distributed electronically, so participants could read through and complete it in their own time. The survey included explanatory information and graphics to ensure that the questions asked were as clear as possible. The overall profile of survey respondents is displayed in Table 1.

Table 1 Demographic data obtained from survey respondents

Respondent profile
Gender: Male (60%), Female (40%)
Age range: 18–29 (10%); 30–39 (16%), 40–49 (19%), 50–59 (23%), 60–69 (22%), ≥70 (11%)
Education level: Secondary School (16.5%), Certificate/Diploma (36.5%), Degree (47%)
Place of residence: Traralgon (33%), Morwell (21%), Moe (18%), Churchill (8%) and outside the Latrobe Valley (21%)
Length of residence in Latrobe Valley: ≤ 5 years (13%), 6–19 years (15%), ≥20 years (72%)

Compared with the 2016 Census data, the sample was over-represented by: male gender (slightly); proportion holding higher education level (strongly); and those aged 50 years or older (Australian Bureau of Statistics 2016). Younger persons were significantly under-represented. Respondents residing outside the Latrobe Valley comprised 21%. Efforts were made to encourage more external responses via advertisements in local newspapers across Gippsland, however, these only elicited a handful of further responses. Over 70% of respondents from the Latrobe Valley are long-term residents. In this, the sample profile is perhaps indicative of those for whom survey issues are more salient.

The survey first asked participants what future land use they see for the current coal mining sites. Respondents were permitted to choose multiple options. The most popular response to this question (64%)

was for the sites to be used for recreation and tourism. Around half of all respondents (52%) prefer to see the land used to create habitats for wildlife, while a quarter of the sample would like to see it used for industrial purposes or farming/agriculture (28% and 24% respectively).

The next series of questions related to the final landforms, with regards the mine voids and the community's thoughts around dry pit or pit lakes. The most popular option, accounting for just over half of all responses, was for the three mine voids to be converted to some combination of pit lakes and dry voids. Just over a third of the sample (37%) would like to see all three mine voids converted to pit lakes, while only 11% of respondents would prefer that all three were transformed into dry voids.

To test the validity of results, the responses to these two questions were compared. Respondents choosing tourism were more likely to prefer a pit lake option. However, respondents who preferred the environment were less likely to choose a pit lake. This may be due to concern for availability of water through the Latrobe system.

Participants were then given the option to elaborate on their choice (Table 2). This question elicited a very strong response from around 57% of participants. This statistic is insightful because such a high proportion of responses is indicative of the sense of involvement many respondents appear to have in regard to the topic of Latrobe Valley mine rehabilitation.

Table 2 Key reasons respondents gave for preferring landforms

Pit lake	Dry pit
Long-term stability	Impact on waterways
Aesthetic reasons	Environmental impact
Water-based recreation	Water security
Tourism	High risk (e.g. water quality)
Green-energy (floating solar, pumped hydro)	Maintain access to coal
Fire protection	Time required to fill with water
Flood protection	Incompatible with Traditional Owner needs

Participants were next asked to consider uses for the pits, firstly pit lakes. There was a broad spread of responses, with habitat for wildlife, firefighting, flood mitigation and tourism and recreation all scoring highly. Analysis found that attitudes as to how a pit lake should be used were not consistent across all respondents. For example, males and females differ on some points, with the former showing a stronger preference for pit-lakes to be used for local industry, and the latter for it to be used for a habitat for wildlife, to supply local rivers and for 'green' energy generation. In addition, the age group of 50–59 strongly favoured the pit lakes being used for recreation and tourism purposes.

Participants were then asked where the water for filling the pits should be sourced from, given the choice of existing water sources (water currently allocated for power generation, river water and/or groundwater) and/or alternative water sources (e.g. desalination plant, recycled water, stormwater). By far the most popular response to this question was for pit lake water to come from both existing and alternative sources, accounting for nearly two-thirds of all responses.

The survey then sought feedback on six potential uses for dry pit options. The strongest responses were for recreation and open parklands, particularly for the 30–39 age group. Another strong response was for the generation of green energy – particularly by tertiary educated females. Although not a popular option, a stalwart cohort of long-term Latrobe Valley residents, high school educated males still support dry voids for access to coal. The least preferred option was for the sites to be stabilised and fenced off. Reasons for these choices included community benefit (3%), environmental benefit (21%) and safety (14%).

The strongest responses respondents provided were around access to and future management of the mined lands. 94% of respondents felt that the lands should be made accessible to the public in some way, with 85% of respondents indicating that after relinquishment, the lands should be publicly managed, including ongoing responsibility for the maintenance of the sites.

4 Discussion

Under the *Mineral Resources (Sustainable Development) Act 1990*, the energy companies are obliged to deliver mine rehabilitation that meets the criteria of safe, stable and sustainable. There is no legal obligation to go further than that. It is also worth considering that currently only around 2% of the land covered by the mine licenses is public land – the remainder is freehold. But for those companies that want to maintain social license to operate in the region, or who have strong corporate social responsibility values, aspirations must be higher to meet community expectation.

The options that the sites present – spanning over 130 km², are myriad, with each of the sites having different attributes that will lend themselves to multifunctional uses. Pit lakes can provide mixed opportunities of recreation, food production, flood mitigation, water retention, power generation and potentially water release in times of drought. However, this is dependent on the availability and quality of water. Dry voids also present options for revegetation, wildlife corridors, land-based recreation and potentially future access to coal. Either lake or dry – or a combination of both, the future land use options are dependent on the long-term stability of the sites and realistic ongoing management, monitoring and maintenance programs. The community aspiration must be matched with geotechnical and financial feasibility. Decisions require holistic approaches while these will likely remain cognisant of physical and financial constraints. Fundamentally though, in the collective minds of participants, the community provides a benchmark for establishing suitable options, where disbenefits are minimised and benefits are maximised.

Beyond the physical constraints of the mine sites, success of rehabilitation and post mined land use (PMLU) relies on meeting both government regulations and community expectations (Roche & Judd 2016). This shifting awareness to also include a social focus to mine rehabilitation has been steadily increasing over the past four decades (Unger et al. 2020). Rather than simply mitigating risk, there is greater opportunity benefit of leaving a positive legacy. Indeed, even the Australian Government points out that “the future of the mining industry is dependent on the legacy it leaves” (Department of Industry, Tourism and Resources 2006). This includes actively engaging community in both mine closure and post-mine land-use options (Xavier et al. 2015). Traditional Owners hold a specific place within the community for both their connection to country and unique knowledge. Seeking Indigenous peoples’ involvement in decisions around rehabilitation and future mined land uses is critical to holistic, quadruple-bottom line outcomes inclusive of economic, environmental, social and cultural values. The earlier this journey commences, not only for opening new mines, but in plans for closure and mined land rehabilitation, the more authentic and successful it is likely to be (Bond & Kelly 2021; Monosky & Keeling 2021).

Successful engagement requires first gaining an understanding of the community’s values associated both with the mined lands and the post mine land-use options. Measham et al. (2021) present a conceptualisation of value that can be applied to mine rehabilitation and PMLU. In reflecting on our study, most participants applied some level of economic and non-economic gain: for example, environmental benefit with economic outcomes, such as tourism. There was also clear alignment with the shared ideals model – where the community expresses shared aspirations, such as a positive benefit for the region and for the Latrobe Valley to become a destination people seek. The Traditional Owner group, in particular, described values more aligned with the pattern of core principle concept, where connection to country is intrinsically linked to identity and the need to ‘heal the scars’ caused by mining. The individual assessment can be applied to the community’s trust – or lack thereof in both licensees and the government being able to complete a successful rehabilitation of the mine sites. Finally, the instrument concept, which focussed on financial worth, was most commonly applied in a pragmatic sense – such as the relative cost of surface compared with desalinated water for filling the voids. It was not a primary determinant for most respondents.

In looking to the future, participants highlighted benefits in creating and applying ‘simple values’, rather than pie in the sky ideas and adopting an opportunity-focussed mindset for the benefit of future generations, rather than as an issue. There is an opportunity here, for example, to become an exemplar and research hub for mine rehabilitation and economic transition. There was concern raised strongly from participants in both the focus groups and surveys that the image of the Latrobe Valley in the future be one of sustainability, rejuvenation and prosperity, rather than the taint of a polluting industry. One participant summed it up simply as “Something safe, something long term, something with a legacy” (Community Group).

The responses indicate an invested community who want to have an active, participatory approach to the decisions facing the future of the mine sites and the Latrobe Valley more broadly. However, they require costed, evidence-based options that consider the environmental, economic, social and cultural impacts and benefits to be able to fully engage in deliberations. The demographics of the participants were skewed toward the older age range (>50) and this likely has some influence on the breadth of aspirations for sites which may not be accessible for some decades. One of the key omissions from this research is the voice of youth of the Latrobe Valley. Given the length of time that mine remediation is anticipated to take, irrespective of landforms, this generational group will be most impacted by the decisions currently being made. We acknowledge that this is an exceedingly significant limitation to the study we hope to address directly in the future. The research team had obtained ethics permission from the Department of Education and Training (#2021_004435) to work with a local secondary college. However due to the disruptions caused by COVID-19 and change in senior leadership at the school, access was not forthcoming. However, it is critical that younger voices are included in consultation and decision-making, going forward.

5 Conclusion

The study objective investigated and evaluated Gippsland community views on future land and water uses within the region, contextualised by current and future use of coal mine sites. To achieve this, a mixed methods approach was used comprising targeted stakeholder focus groups and an online survey made available to the broader community. Data were collected using focus groups and supplementary interviews representing diverse aspects of the local community. Emergent from thematic analysis, data were presented in four themes concerning aspirations, concerns, responsibilities and gaps in knowledge. Findings presented across themes were noted often to correspond or overlap. Overall, participants shared views concerning the region’s future regarding water applications and void uses expressing a prevalent view of the importance of creating community benefit while reducing disbenefit. The role of government was seen as critical for discussions and decisions going forward.

From both datasets we found that community holds concerns about the quality of available water, dominance of interests that will disbenefit future communities, whether future void options can or will enhance community amenity, and failures appreciating efficacies derived from a heterogeneous and tailored approach to void repurposing. However, a bright future for the Latrobe Valley community is possible where decision-makers have foresight and courage to take decisions in the community’s long-term interest for a positive legacy. Responsibility for issues surrounding future land use post mine closures extend beyond present land or resources owners as government holds a moral obligation to ensure that wider community interests are met. Currently, a lack of clarity exacerbated by limited knowledge is evident for both water availability and use, and future void options, which limits the community’s ability to meaningfully engage in future visioning.

Looking more specifically at the survey responses, aspirations for post-mine land use were centred around recreation and environmental benefit, with potential for economic development in the areas of tourism and renewable energy. Mixed landforms across the three sites were favoured by most, however preferences for pit lakes centre around passive and active recreation and tourism benefit as well as stability. Preferences for dry pits centre around environmental values, and concern for the availability of water. There was a very strong sentiment that remediation of the mine voids leaves a positive legacy that enhances the reputation of the Latrobe Valley, whilst acknowledging the past. Equally strong is the notion that the sites should be made accessible, when safe to do so, for community benefit. There is an expectation that the sites eventually

become a public asset, managed and maintained by Local or State Government. However, knowledge within the broader community is mixed with regards the feasibility of aspirations, and this will need to be carefully managed.

The two data sources show consistent themes of amenity, accessibility and identity associated with the final landforms and land uses of the mine voids and surrounding area. There is significant concern in the community around the safety of the sites and the risks involved – both at the sites themselves and regional environment, with respect to the options under consideration. These concerns will need to be addressed for a range of different audiences in the messaging around the final landforms, before future land uses can truly be envisaged. Whilst there is acknowledgement that the coal-fired power stations have brought benefit to the region throughout the 20th Century, there is a sense that the Latrobe Valley has also carried a social and health burden, and the remediation should in some way recompense for this. In addition, the rights of the Gunaikurnai people as Traditional Owners and Native Title Holders of the Latrobe Valley must be acknowledged and empower their ability to heal country.

5.1 Recommendations

Recommendations reside in notions expressed by participants where decisions impacting communities in significant ways, now and in the future, should be made in the community long-term interest. It is also clear that decisions made are in the best interest of the Latrobe Valley region as a whole, but the responsibility be shared with the State. The choice of final landforms for each site should be determined in consultation, not isolation, to best suit the specific attributes of those sites and with the regional outcome in mind. The impact of these choices beyond the Valley – and in particular downstream, should be very carefully considered. Such decisions may require that vested interests or short-term political experiences be disregarded to ensure this unique opportunity is not squandered.

The community of the Latrobe Valley are invested in seeing a positive legacy of the industrial past of their region and seek empowerment to participate fully in this being realised. A process to meet this outcome is described:

Develop evidenced-based proposals for void future options detailing rationale, financial costs (and responsibilities for those costs), resource requirements, policy implications, impacts and benefits (environmental, economic, social, cultural), feasibilities and timelines. Options should be reviewed and recommended by an independent panel of qualified assessors.

Present options to the community with recommendation for preferred landform(s), clearly addressing the above-mentioned concerns, and the diversity of community expectation, allowing a period for considered public feedback.

Incorporate views of the community into the process of revisioning the Latrobe Valley mine void land uses through an iterative consultative or co-design process to capture values, share opportunities and address concerns. The voices of Youth and Traditional Owners should be at the forefront of these deliberations.

The final landforms for the three mine sites and rehabilitation of the pits and surrounding lands should be considered collaboratively, rather than in isolation, for the benefit of the Latrobe Valley region and community. The decisions made directly feed into the concept of a 'just transition' not just for the Latrobe Valley, but Gippsland more broadly. This study found that there is an expectation within the community that beyond the operations of the mines, the responsibility be shared between the current licensees and the Victorian government for the rehabilitation of the sites. Beyond relinquishment, there is a further expectation from the community that government assume responsibility for the ongoing maintenance of the sites, providing accessibility, amenity and opportunity for the community.

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References

- Australian Bureau of Statistics 2016, <https://www.abs.gov.au/>, viewed 2 June 2022.
- Bond, C & Kelly, L 2021, 'Returning land to country: Indigenous engagement in mined land closure and rehabilitation', *Australian Journal of Management*, vol. 46, no. 1, pp. 174–192, doi:10.1177/0312896220919136
- Cameron, J & Gibson, K 2005, 'Alternative pathways to community an economic development: the Latrobe Valley community partnering project', *Geographical Research*, vol. 43, no. 3, pp. 274–285.
- Department of Industry, Tourism and Resources 2006, Australian Government, Mine Closure and Completion: Leading Practice Sustainable Development Program for the Mining Industry.
- DELWP (Department of Environment, Land Water and Planning) 2020, 'Latrobe Valley Regional Rehabilitation Strategy Latrobe System Water Availability, *Technical Report*, Victorian State Government.
- DELWP 2019, *Latrobe Valley Regional Rehabilitation Strategy Stakeholder and Community Engagement Strategy*, https://earthresources.vic.gov.au/__data/assets/pdf_file/0009/456660/Stakeholder-and-Community-Engagement-Strategy.pdf
- DELWP 2019, 'DRAFT Preliminary Land Use Vision', *Latrobe Regional Rehabilitation Strategy*, Victorian State Government.
- DJPR (Department of Jobs, Precincts and Regions) Earth Resources 2020, 'Alternative water factsheet' https://earthresources.vic.gov.au/__data/assets/pdf_file/0011/558794/LVRRS-Alternative-Water-factsheet.pdf
- Duffy, M & Whyte, S 2017, 'The Latrobe Valley: The politics of loss and hope in a region of transition', *Australasian Journal of Regional Studies*, vol. 23, pp. 421–446.
- Furnaro, A, Herpich, P, Brauers, H, Oei, P-Y, Kemfert, C & Look, W 2021, 'German just transition: A review of public policies to assist German coal communities in transition', *Report 21–3*, <https://media.rff.org/documents/21-13-Nov-22.pdf>
- Government of Victoria 1990, Mineral Resources (Sustainable Development) Act 1990, Australia.
- Harrahill, K & Douglas, O 2019, 'Framework development for 'just transition' in coal producing jurisdictions', *Energy Policy*, doi.org/10.1016/j.enpol.2019.110990
- HMFI 2017, 'Hazelwood Mine Fire Board of Inquiry 2016', *Hazelwood Mine Fire Inquiry Report 2015/2016 Volume IV – Mine Rehabilitation*, Melbourne.
- Jakob, M, Steckel, JC, Jotzo, F, Urpelaien, J 2020, 'The future of coal in a carbon-constrained climate', *Nature Climate Change*, vol. 10, pp. 704–707.
- Kruger, RA & Casey, MA 2009, 'Focus groups: A practical guide for applied research', *Thousand Oaks*, Sage Publications.
- Lawrence, R & O'Faircheallaigh, C 2022, 'Shadow places' and the social impacts of the Ranger uranium mine', *Environmental Impact Assessment Review 93: 106723*, <https://doi.org/10.1016/j.eiar.2021.106723>
- Lloyd, S 2019, 'A stakeholder advisory committee as a mechanism to guide the preparation of a regional mine rehabilitation strategy: two years in, what have we learnt?' in AB Fourie & M Tibbett (eds), *Proceedings Mine Closure 2019*, Australian Centre for Geomechanics, Perth.
- Measham, T, Ackermann, F, Everingham, J, Barber, M, Haslam-McKenzie, F & Maybee, B 2021, 'Understanding stakeholder values in post-mining economies: a literature review', *CRC for Transformations in Mining Economies*, Brisbane.
- Monacella, R & Douglas, C 2017, *Future Morwell. Future Latrobe Valley*, RMIT University.
- Monosky, M & Keeling, A 2021, 'Planning for social and community-engaged closure: A comparison of mine closure plans from Canada's territorial and provincial North', *Journal of Environment Management*, vol. 277, pp. 11132.
- Roche, C & Judd, S 2016, 'Ground truths: taking responsibility for Australia's mining legacies', Mineral Policy Institute.
- Snell, D 2018, 'Just transition? Conceptual challenges meet stark reality in a 'transitioning' coal region in Australia', *Globalizations*, vol. 15, no. 4, pp. 550–564.
- UNFCCC 2015, Paris Agreement. Paris: United Nations Framework Convention on Climate Change. http://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf.
- UNFCCC 2021, United Nations Framework Convention on Climate Change, Draft decision/CMA.3, *Glasgow Climate Pact*, https://unfccc.int/sites/default/files/resource/cma2021_L16_adv.pdf
- Unger, CJ, Everingham, J-A & Bond, CJ 2020, 'Transition or transformation: shifting priorities and stakeholders in Australian mined land rehabilitation and closure', *Australasian Journal of Environmental Management*, vol. 27, Issue 1, pp 84–113, <https://doi.org/10.1080/14486563.2020.1719440>
- Weller, S 2018, 'Just transition? Strategic framing and the challenges facing coal dependent communities,' *Environment and Planning C: Politics and Space*, vol. 37, no. 2, pp. 298–316.
- Xavier, AM, Veiga, MV & van Zyl, D 2015, 'Introduction and assessment of a socioeconomic mine closure framework,' *Journal of Management and Sustainability*, vol. 5, pp. 38–49.

