CASE STUDY

Project 2.1: Understanding the values of stakeholders in Australian post-mining economies: South West Western Australia

CRC TiME
Transformations in Mining Economies

Australian Government
Department of Industry,
Science and Resources | AusIndustry
Cooperative Research
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Introduction

This case study for South West Western Australia focuses predominantly on the coal mining area around Collie (Figure 1).

Recognising the imminent closure of the site's coal mining and power generation, a 'Just Transition' working group was established in 2018 bringing together industry, community, unions and state and local government. The working group is focused on 2020–2026 and seeks to address opportunities for affected workers, diversifying the local economy, celebrating Collie's history and promoting its future, and committing to a Just Transition (Department of Premier and Cabinet (WA), 2020).
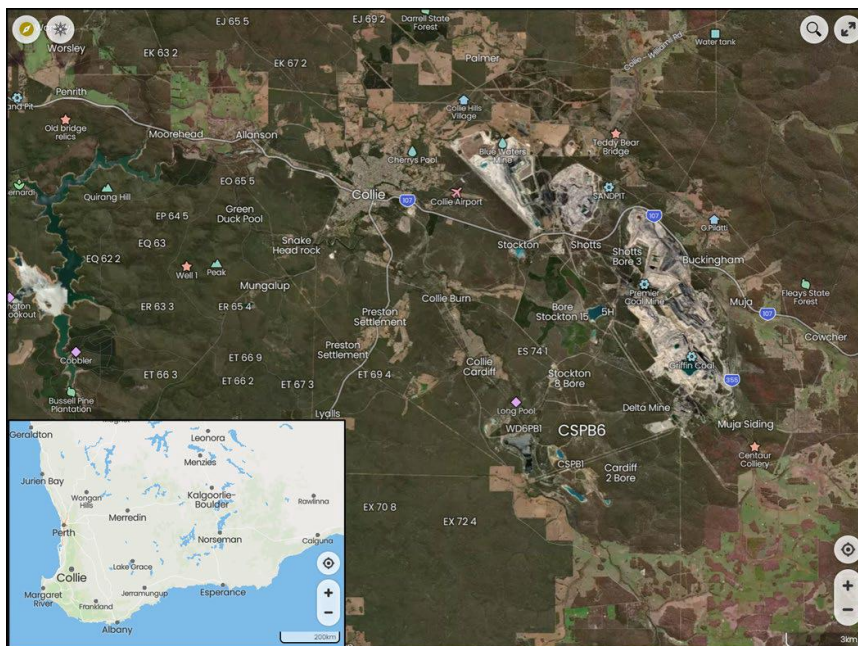

Figure 1: Collie locality in South West Western Australia. Source: Mapcarta.com and Mapbox

Background

Mining has taken place in Collie since the discovery of coal in 1883, and the town of Collie is a direct consequence of coal mining. In 1931 the first power station was constructed and as a result of both mining of coal and power generation, Collie has been a major contributor of energy for southern part of the state, providing up to 50% of required generation. This coal mining transition case study is supplemented by the perspectives of research participants whose professional experience relates to other forms of mining transition in the South West, notably mineral sands mining on the coastal plain.

The historical trajectories of mining and post-mining transition and specific place-related impacts in the South West differ depending on whether the mineral is coal, mineral sands, or gold. Nonetheless, it is possible to identify a 'mine closure planning policy regime', with certain underlying values and general institutional arrangements which are common across different minerals.

Coal mining has been a major source of employment and remains the biggest employer in Collie as well as supporting a range of other businesses. Alongside, and stimulated by the generation of energy, the town is also an economic hub contributing around 12% of the region's Gross Regional Product (Collie Economic Development Task Force, 2017). At its most populous, Collie comprised around 9,000 people in the 1950s but has dropped to around 8,500 with around 25% directly employed by mining and power generation.

Collie is in the Wilman region, which is home to the Ganeang, Pinjarra and Wilman people of the Noongar Nation. The area is of spiritual significance, particularly the Collie River, Minningup Pool, and Jack Mears Spring.

There are currently two operating coal mines – Premier (Yancoal) and Griffin – and a combination of state-owned (Synergy) and private (Bluewaters) power stations. In 2017 Muja A and B (two of Synergy's power generation units) were retired, and by the end of 2029 the following state-owned units will close:

    2022 – Synergy Muja Unit 5 (Stage C)
    2024 – Synergy Muja Unit 6 (Stage C)
    2027 – Synergy Collie Power Station
    2029 – Synergy Muja Units 7 and 8 (Stage D).

As of August 2022, the privately-owned Bluewaters Power Station does not have a scheduled closure date, but is facing closure as a result of contractual supply and offtake arrangements concluding over the next few years.

As part of the announced closures, $500 million has been promised by the State for the decommissioning of the power plants, a Collie industrial transition fund and training initiatives. As noted by Mark McGowan (Premier of Western Australia at that time) 'We owe it to Collie. They've done a lot for the state over the last 130 years and we want to make sure this town and community have a long-term, viable and prosperous future' (Mercer et al., 2022).

The Collie area is situated in a dense jarrah forest with extensive tourist opportunities including excellent mountain biking and walking trails, water bodies suitable for recreation (Lake Kepwari, Stockton Lake, Wellington Dam, Black Diamond Lake), and historic exhibits. The latter include a mural trail reflecting the town's history, a steam locomotive museum, Coalfields Museum, and a historical research centre. At the same time, the impacts of mining in the Collie area have resulted in considerable modification of groundwater and surface water resources (Department of Water, 2009).

Recognising the imminent closure of both coal mining and power generation (due in part to a commitment to renewable energy alongside financial considerations) a 'Just Transition' working group was established in 2018 bringing together industry, community, unions and state and local government. The working group is focused on 2020–2026 and seeks to address four key areas: (i) maximising opportunities for affected workers; (ii) diversifying the local economy, (iii) celebrating Collie's history and promoting its future, and (iv) committing to a Just Transition (Department of Premier and Cabinet (WA), 2020).

Mining's impact on the region

Respondents reflecting on the range of different impacts triggered by mining, identified three overarching categories of impact. These were impacts relating:

- to the environment (e.g., creation of mine pits, impact on the water).
- to the economy (notably, providing stable employment).
- to identity.

These three categories had implications for one another and were not mutually exclusive.

In terms of the **environment**, mining has had both a direct and indirect impact. The direct impact centred on mining disturbing landforms (for example, soil removal, vegetation removal) creating mine pits, and at times resulting in the diversion of rivers. Of these, the impact referred to by all eight respondents related to the creation of mine pits, which in many cases had resulted in pit lakes (including for abandoned mines such as Black Diamond). These coal pit lakes required rehabilitation predominantly due to concerns regarding injury or drowning risk to recreational users (Respondent 1), as well as contamination:

The lakes were drowning people on the average of one person every 5 years. There were multiple drownings in Collie multiple quadriplegic accidents from Black Diamond [pit lake], jet ski accidents...

Many hundreds of meters high of overburden that produces pH3 leachate when it rains, and 100 years later no vegetation has grown. All the water is contaminated with zinc and manganese. (Respondent 1)

You are talking about dumps just being left on virgin ground not rehabilitated. Not managed, you've got inter-burden and overburdens. So, you've got material here, you've also got leachate production. I think about 60 to 70% of the landform has been altered within the Premier [coal] sub-basin as a result of mining, we've got vegetation loss. (Respondent 2)

Mining's impact on environment however depended on the form of mining, with Respondent 5 noting that the impact of mineral sands mining could be unapparent to an untrained observer.

The impacts of mining on water (as a specific element of the system context) was discussed in depth by two respondents, and touched on by four others. In addition to acid mine drainage within certain underground voids, Respondent 2 noted that the coal mining practice of 'dewatering' resulted in surplus groundwater being disposed to surface streams, which in turn became regarded as a valued resource: 'less coal mining means less de-watering, which means less surplus water, so less disposal, flows are [unfortunately] starting to reduce in town.'

Coal mining also has altered surface water – groundwater interactions:

We've had so many underground mines dug, and in the Cardiff [coal] sub-basin, the aquifer system is now like a pin cushion... we don't know the exact contribution of the mining in terms of turning that surface water to groundwater relationship on its head and all the surface water contributing now and replenishing the groundwater system, as opposed to flowing through and topping up the Wellington reservoir.

From the AMD [acid and metalliferous drainage] perspective, we're going to get to a point in time where the risk around acid mine drainage, discharging [into] the surface water systems that flow into the mine [and] Wellington dam is going to be a significant management consideration both in Cardiff [sub-basin] on the South Branch, and East Branch in the Premier [coal] sub-basin. (Respondent 2)

Economic security, the second category of impact (and system context element) was referred to by all eight respondents. Coal mining has created a town that wouldn't have been there otherwise. It brings in not only mine workers but associated industries and services, all reliant on the mining employment, and has done so for an extensive period of time:

A lot of contracting companies and businesses and things like that have either gravitated here because of the mines, or they've set up businesses associated with the mine because that's where a lot of the work is. (Respondent 6)

The mine accounted for a significant percentage of the total workforce. Coal-fired power stations, coal mines and companies directly servicing these industries account for about one quarter of employment in Collie[1].

The third category of impact related to mining was one of identity – both from an individual perspective (two out of eight respondents) and from the perspective of a resident of the town or local area (six of eight respondents). This impact has been influenced by the stability of employment noted above.

You go into some of the mining houses, and you'll see awards on the wall for 40 years of service with the Griffin coal mine, multi-generations have worked in these mines. (Respondent 1)

The Collie community traditionally has been very, very wedded to coal mining and power generation. So, the whole of the community is of a mindset that is completely dependent upon that. (Respondent 4)

[A mine worker is] very knowledgeable about what he does and very soon that'll be worth nothing, so it's a grieving process for those guys. It's their life's work and for some of them, their families' generations life's work. (Respondent 3)

Mining was seen to be part of the town's cultural fabric as well as individual self-worth (associated with their profession). The legacy of mining further influenced how some respondents believed Collie was perceived by the external world. This interpretation of external perceptions reflected some of the changing societal values regarding coal mining and mining in general:

It's not just that your industry is closing up and moving on. It's also that you're vilified for it. In the press. (Respondent 3)

In addition, there were also cultural considerations around coal mining's impact on the identity of the area (the Collie river was diverted to allow for coal mining), indicating interactivity between the three categories of impact:

The Collie River, the entirety of the Collie River is an Aboriginal heritage site. This represents the Collie River Waugal, the hairy-faced serpent... [we need to] resurrect those and help support recovery of those Story lines. (Respondent 2).

[1] A portion of the coal mining, power station and associated industry workforce however resides outside of Collie (e.g., in regional centres such as Bunbury (60 km by road) and its surrounding areas.

Respondents recognised that mining had positive impact (employment) alongside negative impacts, but overall, considered that mining was not a zero-sum game. When considering negative impacts, particularly in relation to mine pits, four of eight respondents pointed out that there had been a number of other impacts on the land. For example, native forests had been cleared for farming and forestry, and as such mining wasn't always starting with a pristine environment. Related to this was the view that towns are always in transition, from a remote farming community to a mining community, and now potentially transitioning to a tourist and lifestyle community:

The holes where there never was, have been filled with water and they've become an asset to the community. Our community doesn't necessarily see mining as a blight on the community. Certainly, it's the backbone of our economy and has been for a long time. (Respondent 3).

Overall, it can be concluded that impact is multi-faceted with some respondents focusing on the positive (economic) benefits and others focusing on the negative (contamination). This split could potentially be explained by those who (a) had deep technical knowledge and (b) did not live in the area, having a more nuanced understanding of the negative impact of mining on the environment, and those who lived and worked in the area valuing the employment opportunity (although they were more exposed to impacts on local identity).

Best possible outcomes and significance of outcomes

There were five types of **place-related**, **substantive**, or **procedural** outcome values raised by respondents, and as with the impacts discussed above, these impacted one another, again deserving a systemic understanding. These were:

1. The need for an integrated approach to transition (six of eight respondents).
2. Ensuring a vibrant town and local economic sustainability (seven respondents).
3. Management of human capital (four respondents).
4. Management of historical, physical, or landscape assets (historical, five respondents; physical or landscape, three respondents).
5. Restoring sites with cultural or spiritual value (four respondents).

Ensuring that an integrated approach to the transition was undertaken constituted taking economic, environmental, social, and cultural values into account. The integration took two dimensions. The first dimension was a **procedural value** – relating to processes of stakeholder engagement (five respondents). The second dimension was more **substantive**, oriented towards the resultant outcome.

It all needs to work together because it all interacts. Environmental outcomes need to be married with economic outcomes... [this requires] a holistic approach, and probably having a long-term planned approach. (Respondent 1).

The Just Transition working plan has four platforms to it – economic diversification, training, work opportunities and planning, and celebrating history. (Respondent 3)

There's a huge amount of engagement internally also – with the tech service teams, the long-term planners, the life-of-mine planners – to work out what kind of landforms we've gotten, how we can best design areas to achieve the outcome that we're after.
(Respondent 5)

Ensuring an integrated approach was strongly aligned with the need to ensure that those designing future of the town built in economic sustainability (a substantive value). Respondents were keen to ensure that they didn't repeat the past and rely on one industry. Economic diversity required rebranding of the town's image (relating to the impacts on identity noted above), and the generation of evidence-based options which took into account mining's impacts:

Science-based outcomes which can deliver future viability for the Collie area from an economy perspective. (Respondent 2)

Our employment profile was very much skewed towards trade, labour... we've had to change the perception of Collie from a dirty coal mining town in order to attract decent and sustainable investment in other sectors. (Respondent 3)

Both the integrated approach and economic sustainability were seen to ensure that the town would remain vibrant (both a **procedural and substantive** value) enabling a range of desired services, diversifying the employment opportunities beyond trades and related labour, and by providing a future for youth (Respondents 3, 7, 8).

As one means of enabling economic sustainability and giving the town a vibrant future, respondents noted the importance of managing a variety of assets. These assets typically arose from:

- The transition of mining to pit lakes, renewable energy generation, or other uses (six of eight respondents).
- Associated development due to State support during transition (e.g., development of recreational trails, and alternative business development opportunities).
- Potential opportunities based on the area's economic history).

Whilst these human, ecosystem, and physical assets were seen positively, some Respondents expressed concerns regarding their maintenance and management.

workplace experience of those people is quite specialized. So, to capture that before it changes or before they leave, or before those skills are repurposed in some other way is probably the one thing that really does need to [realize] advantage. (Respondent 4)

There is a substantial infrastructure around the place with high-voltage power lines, transmission lines that obviously today power comes out of the power stations, but that infrastructure can be used for power to come in as well. (Respondent 8)

We want to leave behind something that is positive. So, we don't want it to be a negative legacy that we've abandoned this giant hole on the ground that is polluting and unstable, we want to leave behind something that's returned to its natural state, state forest or something that is a usable asset. (Respondent 6)

I think a real potential story is to recognize some of the history of mining, power generation, the timber heritage, and milling and mining and the fire control story and turn it into a living museum. (Respondent 4)

Diversity of assets implies a diversity of potential options for post-mining development. Respondent 1 observed: 'I think the biggest risk to Collie is that there is a tremendous

opportunity here.' The 'risk' arises from the lack of insight regarding which option, on balanced consideration of short – and long-term pros and cons, should be pursued.

In addition, there were cultural or spiritual place-related values as illustrated through the regeneration of song lines and traditional trails, returning the river to its original path:

> *Minningup pool, which is just to the immediate south of the town side, adjacent to the existing golf course, is where the Wargyl, the mythical Wargyl rests. (Respondent 4)*
> *Why don't we build original [aboriginal] trails back up, and use them for tourism, for aboriginal people. (Respondent 7)*

Overall, there was considerable agreement in relation to taking an approach that engaged all stakeholders and was evidence-based (procedural values), with the aim of achieving holistic and integrated outcomes (substantive values). With respect to process, consultative processes substantiated by evidence could support determination of which of the many opportunities to focus upon. Addressing cultural and social considerations was construed as a positive outcome of post-mining transition.

Challenges to achieving outcomes

The major challenges as viewed by respondents were:

- **Financial costs** of rehabilitation/restoration (six of eight respondents).
- Lack of **coherent and integrated engagement** with agencies (five respondents).

The affordability (financial costs) of transition was a key concern with further implications for uncertainty. As regulatory requirements had changed over the 100 years of operation, uncertainty was perceived as a challenge in terms of what was required to meet such requirements. These aspects, combined with changing markets/demand for coal impacting financial viability, left coal mining companies in a difficult position:

> *It's not always economically viable to rehandle all this dumped material over here, back into the pit. It costs too much, it's a significant cost. Because you're not getting a resource at this point, you're moving this waste as rehandle, you're not getting any value from it. (Respondent 6)*

> *Coal mining is operating on a knife's edge financially which is unfortunate because it impacts rehabilitation activities and ultimately closure outcomes. (Respondent 2).*

Adding to the challenge was the issue of what to do with legacy mine land:

> *You cannot ignore the legacies, they are huge and with the [South West region's coal] mining industry in decline there is not the opportunity to offset that risk. (Respondent 1)*

> *If we were going to go back and include legacy sites and do rehab properly in terms of landform design, rehabilitation, reducing risk for public access, etc, etc.... that'd be well up over $500 million easily. (Respondent 2)*

The last quote conveys the enormity of the task.

Respondents perceived a lack of **coherent and integrated engagement among government agencies** – each agency pushing in potentially different directions, with no clear coordination, and no overarching direction from the government, as well as personnel turnover:

Even within agencies, they're often quite big differences of opinion or, or approach, which can make things quite tricky. Especially with annual turnover as well. You might talk to one particular person and go down one path, and then they move on and leave and then the next person comes in, sits in that chair, and they've kind of got a different take on things. (Respondent 6).

The just transition work to support the community and drive economic development is working well however, there is no strategic whole-of-basin strategy or policy for rehabilitation and closure, which adds risk to the holistic approach. (Respondent 2).

It suggests that there's some things that are missing within the broader puzzle and that engagement, that whole systemic overview, that discussion around closure, and how it's going to be effective for Collie is sort of missing – but it's building, it's changing mindsets. (Respondent 2)

A whole-of-government strategy for closure at Collie will provide a framework for everyone to engage and discuss but also provides the advice and the guidance that industry are so desperately seeking from government. There's a need to bring the just transition and rehab closure frameworks together. (Respondent 2)

However, seven of eight respondents appeared to be dissatisfied with mine closure regulatory practice. Regulatory requirements were described as inconsistent with scientific knowledge, or not matched to current social demands. Both mining industry respondents regarded closure criteria (ie performance standards to be met as a condition of lease relinquishment) as inflexible, and practically unattainable:

We need to resolve or negotiate a variable outcome or in some cases, it's a matter of risk acceptance. All land uses have risk, they have risk before you start mining, and they'll have different levels of risk after you finish mining... I think that just seeking a zero-risk outcome is unrealistic, what is required is a net-beneficial outcome. (Respondent 5) (Mineral sands)

Regulators... need to be able to approve whatever we're going to produce at the end. If they're not open to anything else, then we're going to be stuck going in a certain direction. And the same with the business as well. If we're not open to looking at alternative options and just keep going down one path, then that's going to limit us. (Respondent 6) (Coal)

The net result was a lack of clarity among licensees and other stakeholders, and occasionally (as Respondent 6 indicated) within a mining firm.

Related to the above concern about closure criteria, respondents expressed concern around subsequent management of the rehabilitated assets:

There is a concern about [a state government agency] being linked with management of these lakes, as well as all of the closure landforms, they have to manage them and if they're not rehabilitated properly... some of the problems they had with Lake Kepwari were... safety concerns. (Respondent 1)

Collie is really dependent upon its paying ratepayers, and the urban footprint as I indicated is relatively small. And so our ability to pay for a lot of these infrastructure projects is compromised. And so is the workforce. (Respondent 4)

We have to be able to effectively complete our rehabilitation to a standard where beneficial land uses have been reinstated and outweigh any residual liability. (Respondent 5)

The financial and liability responsibility for relinquished assets is thus an important challenge, as local shires do not have adequate resources to manage them. The combined effect of multiple closures and change initiatives compounded the challenge. As Respondent 4 put it: 'there's some real challenges that sit from an organisational perspective, an actual capability to be able to respond to everything else that's going on.'

Another challenge that emerged was related to the **process** of closure – *designing closure and the future*. There was an apparent tension between starting early – to involve all stakeholders and plan effectively – and avoiding workers seeking alternative employment due to the uncertainties (Respondent 6).

Adding to this was the consideration of who to involve in the planning process (touching on the valued outcome of inclusiveness). Respondents considered that ensuring the right people were included, partly for a processual reason of helping change mindsets, and partly in terms of managing the complexity of closure. In addition, respondents referred to the need to accommodate diverse political interests, ranging from concerned residents to elected representatives (Respondents 2, 3, 7, 8).

The final challenge centred on developing a shared understanding among non-specialists of the biophysical nuances associated with the complexity of mine land rehabilitation:

The community... can see what we've done and what's been delivered. But there's not an appreciation of what the alternative was. And the alternative was going to be a void of water with deteriorating water quality devoid of any life. (Respondent 2)

Dimensions of actions taken

The three most frequently referred to dimensions of actions taken to enable closure, manage challenges, and move forward were: **knowledge generation, translation or exchange** (six of eight respondents); **stakeholder engagement** (six of eight respondents); and **convening** (bringing different actors together) (five respondents) (Figure 2).
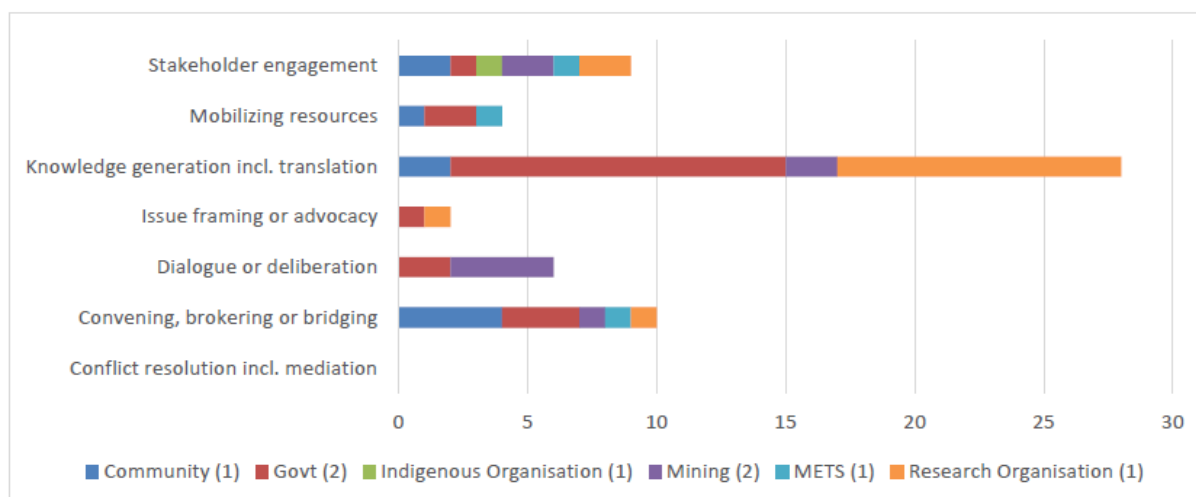

Figure 2: Dimensions of actions to achieve outcome (South West WA). Note: X-axis denotes number of references coded. Number in parenthesis denotes number of respondents per stakeholder category.

Knowledge generation, translation or exchange ties in with the valued intermediate outcome of stakeholder engagement. It refers to the importance of sharing what is going on,

how best to manage the transition, and exchange of scientific evidence underpinning restoration of mine lakes:

Good case studies. Everyone loves a good story... You can throw in some little critiques of how something was done. It's the usual 'criticize privately, praise publicly', but that's the opportunity to show off the companies. (Respondent 1)

The community has, through one of the not-for-profit organizations, done a feasibility report on that land considering what might be used in the future, had a deeper look at the land tenure issues and also considered the possible ownership structures, whether it's DBCA [Department of Biodiversity, Conservation, and Attractions], whether it's Shire, whether it's private land, whether it's used for public use or leased to a private entity, or a combination of those. (Respondent 3)

A lot of research is going on around future employment needs. A lot of that based on ICT. And so the government framework, which is the Collie Delivery Unit and the South West Development Commission, and a series of partnerships between key industry players and the Shire and other interest groups [are] all working towards really packaging and understanding all of that. (Respondent 4)

Stakeholder engagement (a value introduced in Section 6.3 as supporting best possible post-mining outcomes) was the next frequently referenced dimension of action, whether related to workforce redeployment or regional development opportunities:

It's a difficult one because some people [workers] are on very different parts of that journey. Some have their date already, some know that they're being made redundant in the first tranche of closures that we already know about. We did sit down with the state government and say please tell us the plan. Even if it's bad news, people would prefer to know so that they can plan their life. It's like a cancer diagnosis, right? And we saw that because they're not stupid... they know their industry (Respondent 3)

I think in part some of that is going to be more engagement into the Indigenous community and Indigenous rangers and better management of that land. Back to the way that it was managed in the generations previous prior to European settlement' (Respondent 4)

The Chamber of Commerce in local government, the Shire held a 'what's down the track' [type of] event where they shared information on new businesses that are coming into town, people that are exploring new businesses. For example, there is a business that's involved in manufacturing batteries, another business exploring being here is a medicinal cannabis business that has leased some land and a processing plant. The South West Development Commission has brought in someone, that's been to me directly just to have a chat, that is looking at a refinery in the Collie region. And, they are doing a very good job at facilitating those conversations and helping change that mindset. (Respondent 8)

I'm very cautious about speaking on behalf of future generations. What they should have, because we're living now with what previous generations thought we should have. Things change, opportunities change, technologies change, expectations change, and that discussion needs to be had [with all stakeholders]. (Respondent 1)

Convening (bringing actors together) touched on coordination (eg the actions referred to by Respondent 8 above) but also included the formation of the Just Transition Working Group, alongside the Collie Coal Mines Environment Committee (CCMEC), and other bodies focusing on transition. It also reflected the need for the different state and local governmental bodies to meet and develop an overarching direction (cf. the challenge of policy and administrative coherence described in Section 6.4). Convening also reflected a need for

each of these bodies to work together to ensure a coherent way forward, which attends to all the necessary scientific and human considerations:

There's a point in time when they'll need to come to the table and the others will start to not be needed at the table. So that table will change depending on what phase we are at. Right now we've got around the table, the major employers of the impacted workforces, plus South 32 is another major employer because they are somebody who could bring some of those guys on. (Respondent 3)
What they need to do is change policy because the only thing stopping that [project] from happening is policy. So this is where government needs to think differently. Trying to get government agencies together, because you are crossing across a whole bunch of agencies there. (Respondent 3)

And this is where I'm currently working, trying to bring together that CCMEC and Just Transition Working Group because they're beavering away over here going, 'we are going to replace that with industry, we're going to do this' and there's us over here saying, 'Well hang on guys. There's some pretty significant issues you need to consider and understand in context of closure and legacy.' (Respondent 2)

Notwithstanding the interdependence of actors, and tensions implicit in remarks from Respondent 3 and Respondent 2 above, there was little reference to conflict resolution as a dimension of action.

Other main stakeholders

The two categories of actors referred to as 'other main stakeholders' by our interview respondents were:

- Mine licensees or operators (nominated by five of six categories of respondent [seven of eight individual respondents]).
- Community organisations/individuals in the community (nominated by four of six categories of respondent; five of eight individual respondents).

In addition, state environment or water agencies; state government (unspecified); and local government were each regarded as main stakeholders, by three of six categories of respondent.
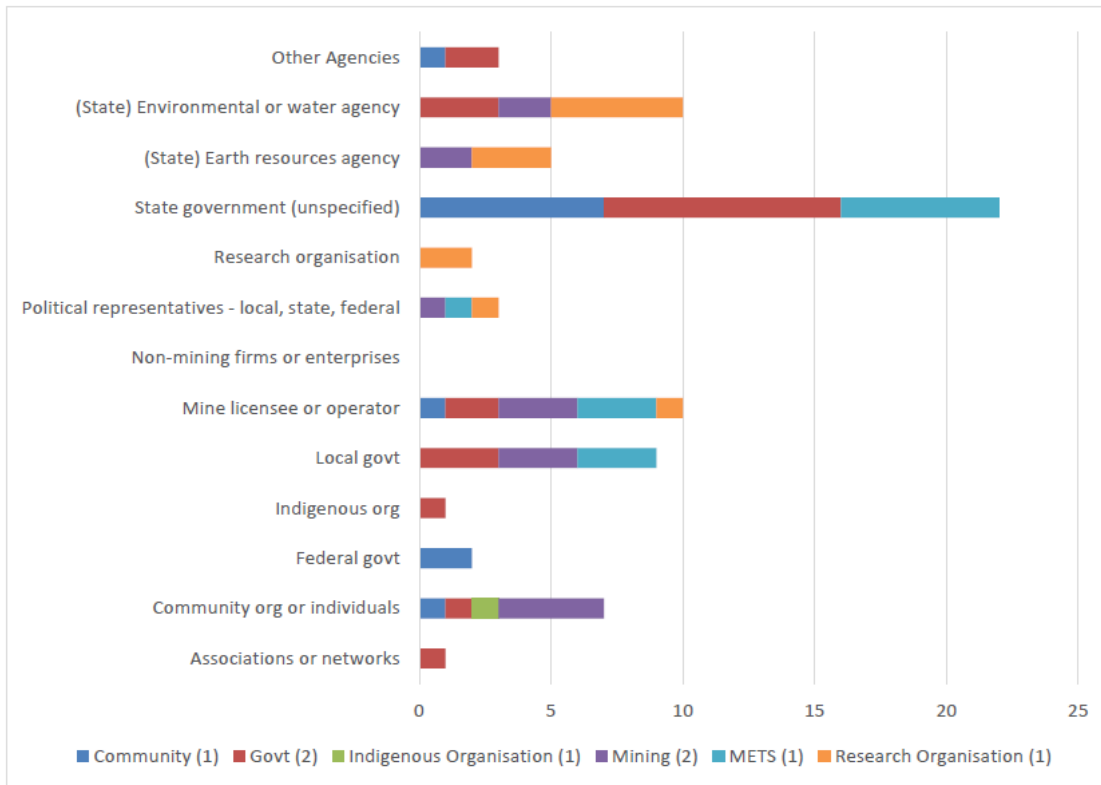
Figure 3: Other main stakeholders (South West WA). Note: X-axis denotes number of references coded. Number in parenthesis denotes number of respondent per stakeholder category

Figure 3 shows that state government (unspecified) was the category of actor receiving the highest number of discrete references (i.e. remarks) in interviews:

I think the state will need to play, and I think accelerated through climate change decisions around the role of coal in the national agenda. I think there needs to be a continued if not increased presence of the state into this area and so that will mean that the South West Development Commission and the Collie Delivery Unit through Premier and Cabinet and JTSI [Department of Jobs, Tourism, Science and Innovation] will need to continue their journey with us for more time to come. And I think that the current commitments in the order of $100 million will probably need to be sort of stage two. I think the critical part is that we can't let government walk away without a continued and longer-term presence to make sure that this transition does take effect. (Respondent 4)

So, the role of the Premier and Cabinet down through the Collie Delivery Unit, which is an all-agency type of network, but JTSI particularly in terms of the heavy lifting that they've been doing on funding the analysis of those areas. (Respondent 4)

So you've got all three levels of government. Right now we've got a very involved and invested state government. It would be great if we had a more involved and invested federal government in this space and obviously local government plays its part. (Respondent 3)

JTSI, DWER [Department of Water and Environmental Regulation], DBCA, and DMIRS [Department of Mines, Industry Regulation and Safety] – we have to engage with all of them (Respondent 5) (Mineral sands)

So local businesses would be a big one, and that covers a broad range. You've also got things like schools, shopping centres, and all that in town, if there's a big exodus of employees. (Respondent 6)

And that's why I think there needs to be a core number of locals at the table because they will have to live in whatever the outcome is – good or bad. Whereas people who are coming from the outside in with good intentions, they're trying to do good jobs, but if it doesn't go well, they'll just move on to something else. (Respondent 3)

We need to ensure diversity of inclusion – there isn't a single 'king', a single view. We have the same people on the committees – a lot of rogues in our community who have not done a day's work in their life. It is important to talk to many, break out from the familiar faces. (Respondent 7)

For mineral sands mining transition in the South West, additional nominated stakeholders include agricultural landowners or managers. In State Forest land mined for mineral sands, DBCA are the land manager and regulator; other key regulators include DMIRS and the Radiological Council. Engagement with local community and shires was also regarded as important (Respondent 5).

Overall, Respondents gave considerable significance to investment and attention by the Department of Premier and Cabinet, which enabled infrastructure (trails) to be developed, providing incentives to attract business but that this attention needed to be maintained for some time.

In addition, and as reflected on when considering challenges, the diversity of regulatory bodies – notably, DMIRS, DWER, DBCA – made mine closure challenging as each had different objectives. As with water, it is hard to draw a boundary in terms of who is a stakeholder, as Tourism WA and Oz Industries also could be considered, as well as education (school and TAFE colleges) and researchers. And it is key to consider the values of those who will be the recipients of the transition.

Understanding of other stakeholders' best possible outcomes

As noted above, we invited interviewees to express their understanding of best possible outcomes for any two other categories of stakeholder, whose values they wished to discuss. Table 1 summarises the values associated with responses to this question.

Table 1: Respondents' understanding of other stakeholders' best possible outcomes (South West WA)

RESPONDENT	OTHER STAKEHOLDER NOMINATED	OTHER STAKEHOLDERS' VALUE
Respondent 3 (Community)	Workers in community	Employment
Respondent 2 (Government – State)	Government – State (generalised)	Fair distribution of responsibility and liability Safety and risk
Respondent 4 (Government – Local)	Government – State (Department of Premier and Cabinet)	Economic values of place (generalised) Physical infrastructure
Respondent 5 (Mining industry – mineral sands)	Government – Local	Realisation of regional LU plan
Respondent 6 (Mining industry – coal)	Local businesses	Employment or Recreational value
	DBCA	Biodiversity values with low liability
	Government – Local	Economic innovation
Respondent 8 (METS)	Miners	Employment

	Government (State and Local)	Net-positive outcome

Direct responses to this question were obtained from interviewees in four out of the six stakeholder categories (six of eight individual respondents). Table 9 shows that five of the six Respondents (in three of the four responding stakeholder categories) referred to economic values of place as a best possible outcome for the stakeholders they nominated. Specific expressions of this value ranged from a concern with redeployment of mining and associated industry workers (Respondent 8) to the value of business-ready industrial estate land, which requires business case analysis and state government commitment to invest in necessary infrastructure (Respondent 4).

In some cases, the best possible outcome for other stakeholders depends on knowledge of what is possible. For example, Respondent 5 (Mineral sands industry) believed that local government in the South West would like 'reinstatement' of their predominately agricultural regional land use plan as the post-mining land use. The Respondent however also acknowledged that in non-agricultural areas there are other land use opportunities, whose feasibility remains uncertain:

We have by-product disposal facilities associated with processing plants for which we haven't yet determined our final land use. We'll need to do more work to determine our strategy for achieving a beneficial land use from those facilities in the long term. (Respondent 5) (Mineral sands)

Implicit in the above comment is the value of a **fair distribution of responsibility and liability**.

Given the region's challenge of rehabilitating legacy mine sites (Section 6.4), a belief that addressing liability fairly is a best possible outcome for the state is apparent in the following comment:

We need to improve engagement between the various stakeholders so the beliefs and expectations are known alongside some of the legacy risks and environmental issues. (Respondent 2)

The achievement of a fair distribution of responsibility and liability presumably would realise the values of **community support** (i.e., policy legitimacy) and **net-positive outcome**. These two values are clearly expressed by Respondent 8 as a best possible outcome for miners and government respectively:

[Miners and government seek] the perception of the wider community... that they are seen to be doing the right thing, in that community is supportive of what the end looks like... from a state and local government point of view... they want their community to be comfortable that the decisions made along the way, and the outcomes have been the best and all they could ever hope for. (Respondent 8)

Key values and their alignment

Place-related values

Touching on the earlier discussion regarding the best possible outcomes (Section 6.3), the place-related values that dominated the discussions were: Economic value of the place (all eight respondents), safety and risk (seven of eight respondents), and Biodiversity or ecosystem services (six of eight respondents) (Figure 4).
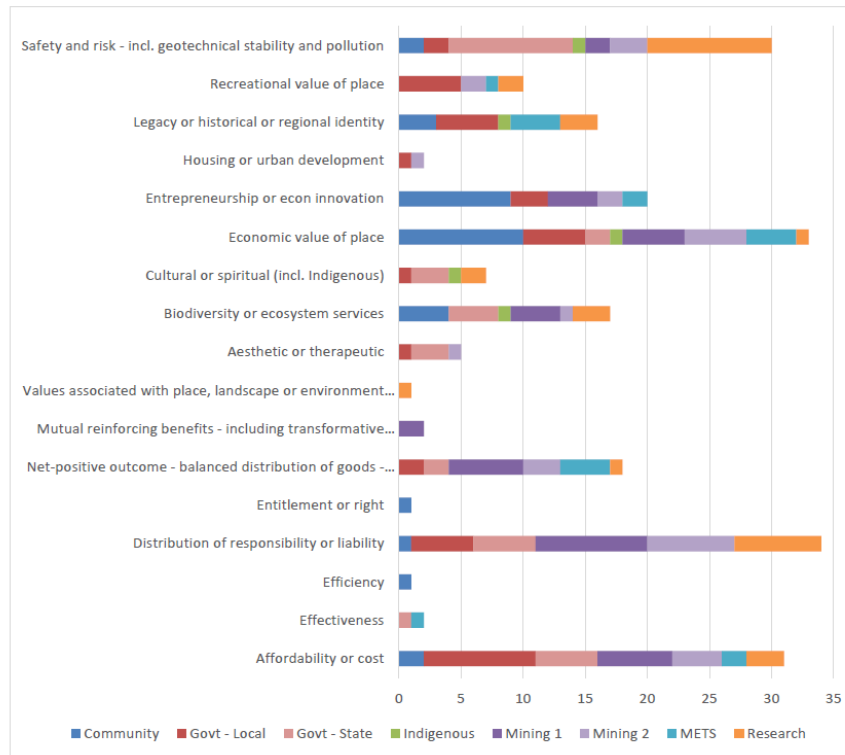
Figure 4: Distribution of place-related, substantive or procedural values by respondent (South West WA). Note: X-axis denotes number of references

Economic values

Economic value as viewed by the Interviewees extends from the past and present, out to the future, taking into account system context elements consisting of: the region's existing population, natural resources, human population, industry critical mass, and commercial recreational sector.

We [a METS firm] looked at [Collie] from a point of view of population and potential access to population. We knew that the [workforce] we would be training would be predominantly FIFO to the Northwest and FIFO is not only Perth Metro residents, there's also a significant population in the southwest. And we knew that the likes of Rio and others were either utilizing or looking to use Busselton and create that as an alternate FIFO area as well. So, we figured that a South West location from an impact point of view... and the availability of funding was a good decision to bring it down here. (Respondent 8)

There are opportunities for [mineral sands mining] process by-products (i.e. 'waste') to become a beneficial product – that's been very encouraging. We've got an iron oxide by-product, which had been stockpiled as a waste for many years. Now that we've dealt with its handling issues it's making money for the operation, being exported as an iron concentrate product. Similarly, we had char waste that represented a closure liability, but is now a valuable product, being sold into the activated carbon market. (Respondent 5)

The community organisation respondent noted that place-related values which enable tourism also make a place 'liveable' to workers:

Tourism... makes the job of attracting investment much easier. And when you're looking at people who are investing decent amounts of money and want to [attract and retain] a decent workforce, they're also very interested in liveability. Tourism has helped with that as well in

terms of improving the liveability and the perception of the town in order to tip over to that 'yes' investment decision for some of the other bigger projects that we're chasing. (Respondent 3)

Safety and risk

We found a clear alignment of values in terms of making the pit lakes safe for people to enjoy, and in terms of management of pollution caused by AMD. References to waste management (noted by seven of eight respondents) reveals the important benefit of continuing to be open to new ideas. One notable project is developing local manufacturing of geopolymer cement, making beneficial use of fly-ash. Fly-ash, a by-product of coal combustion, otherwise requires safe disposal:

[There is an] eco-concrete project as well – Colliecrete. So instead of having to bake the Portland cement at 1,200 degrees, which is incredibly energy-intensive, [the project has] a chemical geopolymer process, which is exothermic in itself, so it creates its own heat, rather than having to put it in the kiln, so it happens at ambient temperature. It's using fly ash which is a waste product from power stations. (Respondent 3)

Biodiversity or ecosystem services

A proposed post-transition landscape, whilst not returned to a prior state, can provide benefit:

These mine rehabilitation plans don't give the best habitat, but they have habitat. If you can put back some habitat and that habitat will buffer some of the better habitat, for example, will provide corridors for just managing that habitat and will protect other habitat in the area. (Respondent 1)

In the context of wetland conversion occurring at wider scale, a transition from coastal pine forest to aquatic ecosystem, at the end of mineral sands mining was valued:

There had been a lot of clearance of wetland ecosystems across the Swan coastal plain. So it was agreed at the time [1980s], that rehabbing from a pine forest to a series of wetland lakes would be a good outcome. And so that's what happened. Following the mining of the pine forest, the [mineral sands] mine pits were retained to form a series of lakes, which now provide good habitat for aquatic ecosystems. (Respondent 5)

Realisation of biodiversity or ecosystem service values aligned with sustaining landscape assets (Section 6.3, best possible outcomes).

Substantive or procedural values

The realisation of innovative biodiversity or ecosystem service values referred to above implies a need for multi-stakeholder collaboration. As we saw in Section 6.5, the action of convening multi-stakeholder dialogue was perceived as effective for catalysing innovative action. Yet, as indicated by references to need for whole-of government integration (Section 6.4) such action is not supported by prevailing institutional arrangements.

The institutional arrangements around mine closure appear to be dominated by values of **risk mitigation**, as opposed to **adaptability, pragmatism, and risk-taking** related to post-mining land use:

Historically we agreed to a quasi-native habitat, which was a pragmatic view, but in more recent discussions they're far more inflexible, and they're calling for a pristine state and bear in mind, this was pine plantation. So that's where we've been at loggerheads. (Respondent 5) (Mineral sands)

There is a disincentive to rehandle all this waste, and basically to backfill all of your pits. It would be cost prohibitive to the point where you couldn't afford to. It's a fine balance between not just rehabbing and operating in certain ways.' (Respondent 6) (Coal)

Regulators] are not going to accept any risk because they might get burned. But it results in this zero-risk approach... They're not interested in considering what's the best use of that land for the community, they just want to follow their rulebook'. (Respondent 5) (Mineral sands)

We might already have sign-off from the farmer. He's accepted the land 10 years ago, and as far as he's concerned, mining's long gone. But the final relinquishment by the regulator, is rarely worth the effort. (Respondent 5) (Mineral sands)

Respondent 5 indicates that in certain situations, licensees regard the option to cease operations and retain the lease (keeping the site under care and maintenance) as preferable.

Summary

As illustrated throughout the case study, a re-occurring theme when considering mine closure and transition, was the importance of **taking a systemic, integrated, approach**. Economic value was intertwined with considerations relating to the environment, and to social and cultural considerations. It is important to embrace this complexity in a manner that is manageable. In turn this demands the design and development of processes that effectively facilitate closure.

Another theme relating to mine closure planning centred on the **planning process** itself. Timing is important and given the complexity, planning early is important. Planning would reduce uncertainty and if managed appropriately avoid workers leaving prematurely. This then touches on the need to ensure inclusive planning where all stakeholders have a working understanding of the breadth and nuance of the different challenges, options and values. This includes understanding an option's technical requirements and timeframe.

Rehabilitation of mine sites requires taking a nuanced approach, reflecting not only the challenges relating to rehabilitation (e.g., acidification of water, subsidence, etc.) but also to maintenance and liability of the resultant asset. There is an important opportunity to relate this to socio-cultural 'rehabilitation', as residents shift mental conceptions and emotions. Involving stakeholders in the closure process helps build ownership in the outcomes and manage the 'grief' of transition.

By involving a wide range of stakeholders **creative and innovative thinking** can take place, allowing for example for ideas such as the conversion of waste products into useful resources, the conversion of mine pits into motor-cross tracks and autonomous trucking driving learning spaces, and other options.

REFERENCES

Foran, T., Barber, M. and Ackermann, F. (2022). Understanding the values of stakeholders in Australian post-mining economies. CRC TiME Limited, Perth.

ABOUT US

The Cooperative Research Centre for Transformations in Mining Economies is part of Australia's national innovation ecosystem. Our diverse partnership brings scale, collaboration and coordinated investment to tackle the most complex mine closure and post-mine transition challenges. Together we're rethinking what's possible to improve outcomes for people, communities, the environment and industry.

We acknowledge the traditional custodians across all the lands on which we live and work, and we pay our respects to Elders both past and present.

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