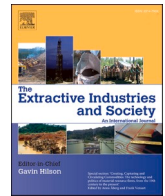




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Mining heritage and community identity in the social licence of proposed renewed mining

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ABSTRACT

Mining legacies are manifest in multiple ways. One of these relates to heritage values of former mining places which may contribute to regional identity and potentially tourism. Changes in mining methods and technologies make it economically feasible to re-open some mines that previously closed due to market factors, ore grades or difficulties in accessing residual mineral deposits. In this paper, we consider the factors affecting the social licence for proposed renewed mining activity in a post-mining town (Kapunda, South Australia). We examined how residents of Kapunda view the mining sector in general and how it fits with town identity. Focus groups and interviews explored the extent to which a potential renewed mining industry would align to community values, considering the possible application of copper in-situ recovery (ISR) for an historic deposit in the town. The research found that participants were open to the prospect of a new copper ISR operation, provided it was well managed, environmentally responsible, and able to align with tourism. The paper concludes that an important dimension of social licence for re-opening mines is whether new mining could occur in a way that doesn't undermine the heritage values associated with a former mining legacy.

1. Introduction

Legacy mines occur in large numbers around the world. There are an estimated 600,000 legacy mines in the US alone (Worrall et al., 2009). In Canada and Australia there are around 10,000 and 50,000 legacy mine sites respectively (Worrall et al., 2009; Pepper et al., 2014). While the problems of legacy mines are well recognised, including soil contamination, acid mine drainage and risks to human safety (Cozzolino et al., 2018; Bennett 2016), it is important to recognise that legacy mine sites are not just viewed as a liability but as a potential asset (Unger 2012). Post-mining land uses often involve agriculture, conservation and forestry (Mborah et al., 2016). However, post-mining land use can also involve recreation and heritage potentially providing social and economic benefits to local residents through mine heritage tourism (Bennet 2016; Lamparska 2019; Jelen 2018; Caamaño-Franco and Suárez, 2020). In a study of legacy mines in Finland, post-mining land use involved recreation and cultural heritage, particularly for former mines located closer to human settlements. Eight of these were classified as having heritage value of national significance, some with museums, accommodation and hospitality services (Kivinen 2017). Other mine-sites re-opened as operating mines, but with different

characteristics. As ore grades decline or minerals become less accessible, renewed mining may use different methods and technologies to extract and process minerals reflecting changes in the price of minerals and the costs of production (Crowson 2003; Kivinen 2017). As technologies evolve, and the value of minerals rises, it becomes increasingly likely that more former mine sites will re-open, including some that are the basis of mining heritage and associated tourism industries attached to those mines. In this paper we consider the social acceptability of re-introducing mining to a town using novel mining technology where mining has been dormant for decades and where mining heritage forms part of the town identity as well as supporting a tourism industry.

1.1. Mining heritage

Mines close when the cost of production exceeds the value of minerals being extracted (Crowson 2003). In certain locations, former mines can develop a heritage value and this can generate a new type of positive legacy and new economic activity (Cole 2004; Kivinen 2017). Mining heritage has traditionally been considered as a category of industrial heritage (Knapp 2002; Moyle et al., 2018; Oakley 2018). For around a century, the historic character of former mining sites have been

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promoted around the world as part of a broader interest in industrial heritage (Oakley 2018). Since the 1980s this interest has accelerated to what has been described as a growing heritage industry in Western countries, focused on heritage experience for visitors (Hewison, 1987). Mining heritage is supported by historians and local historical societies who contribute expertise to the design of pamphlets, guides and the development of heritage walks and activities to attract visitors and enrich their experiences (Partridge 2000).

The elements of post-mining heritage may comprise architectural and technological characteristics, infrastructure, production facilities and other buildings or any residual materials pertaining to the period of industrial mining (Marot and Harfst 2020). Examples of such elements include workers accommodation or mining equipment (Bell, 2002). Previously, industrial buildings may be subsequently used for artistic performances and residual plant and technical equipment can be used to portray the nature of work in the past (Harfst, 2015). Cultural potentials also include non-material remains, such non-material mining traditions and events, specific place-bound identities, and other aspects of industrial transformation (Görmär et al., 2019). Together these tangible and intangible elements represent the legacies and remains of a former mining that can be used for different purposes including new economic activity (Wirth et al., 2012). Heritage tourism is one of the new industries that has developed in many former mining regions around the world as part of a broader interest in industrial heritage (Oakley 2018; Lamparska 2019; Jelen 2018; Caamaño-Franco and Suárez, 2020). In this paper we consider the propensity for a post-mining community, with a strong sense of mining heritage and a small tourism industry, to accept the reintroduction of mining activity based on alternative and novel mining processes that have been invented since the original mine closed.

1.2. *In situ recovery*

Throughout history, mining has involved searching for and extracting the most accessible mineral deposits. As more accessible minerals are depleted, mineral prices rise and mining companies may re-open old mines to access deeper deposits or lower ore grades (Crowson 2003). With rising costs of production and declining ore grades, there is increasing attention to employing alternative ways to access minerals (Prior et al., 2012). One of the alternative ways of extracting target metal from minerals is called in-situ recovery (ISR) which is a form of mining without removing the rocks surrounding the target mineral. ISR has sometimes been referred to as ‘keyhole mining’: rather than removing ore from the ground, a solution is pumped underground through boreholes to dissolve the target mineral in place (hence in-situ) then the solution is pumped back to the surface where the metal (e.g. copper) is recovered (Kuhar et al., 2018a; Robinson and Kuhar, 2018). Because it is not necessary to remove the ore, there is considerably less surface disturbance compared with open pit mining, which avoids the creation of large voids, reduces dust and noise, removes the need for tailings dams and requires minimal infrastructure. Despite these benefits, ISR involves pumping a solution underground, which raises other potential issues (Lacey et al., 2019). The solution that is used needs to dissolve the target mineral (based on its chemical properties), and its composition may vary from background groundwater. Therefore, careful solution flow control and containment is required to retain that solution within the mining area and prevent leakage. ISR mining is used commercially in Australia but has not yet been used for copper (Kuhar et al., 2018a; Robinson and Kuhar, 2018).

ISR technology has been around since the mid twentieth century. The technique was primarily developed to reduce the costs of excavating large volumes in order to access target deposits. Introduced initially to the USA in 1959 it has slowly expanded throughout the world since, with significant commercial operations in USA, Russia, Chile, Canada and Kazakhstan. It is more suited to certain rock types than others, with permeability being a key factor, so that the dissolving agent can move

through the rock body and come into contact with the deposit to be extracted (Serendkin et al., 2016). For this reason, it has been associated with some commodities more than others. For example, a significant proportion of uranium (around 50%) is extracted using ISR methods because uranium tends to occur in highly permeable geological formations which are conducive to ISR techniques (Kuhar et al., 2018b). Other metals that have been commercially extracted using ISR include copper, gold, lithium, and zinc (Serendkin et al. 2016). ISR can also be used to extract minerals from waste products generated through conventional mining and thereby contribute to remediation such as tailings and ash (Serendkin et al. 2016). Within Australia, there has been limited uptake of ISR technology, at the time of writing, with only one commercial operation at the Beverley North Uranium Mine in a very remote part of South Australia, separated from the nearest small village by the rugged Flinders Ranges and located approximately 700 km north of the state capital of Adelaide (Douglas et al., 2012; Heathgate 2020). At the time of writing, there were no Australian ISR operations established close to rural towns and the degree to which this type of mining would be acceptable to local communities is unknown.

1.3. *Social licence*

A key concept for unpacking the alignment between mining and regional identity is social licence, referring to the acceptance of a mining development by local community members (Parsons and Luke, 2020; Moffat and Zhang, 2014; Zhang et al., 2018; Prno and Slocombe, 2012). Research has demonstrated that procedural fairness, distributional fairness, perceived impacts and benefits as well as confidence in governance, are critical in determining levels of trust and social acceptability of prospective projects by local communities (Falck, 2016; Moffat and Zhang, 2014; Walton and McCrea, 2020). Industry knowledge is also identified as a determinant but often as a weak predictor of acceptance compared to the other factors (Walton and McCrea, 2020). In the context of resource development at the local level, procedural fairness is about whether community members feel that their voice is heard and respected in the decision-making process (Mercer-Mapstone et al., 2017). Community members’ trust in a mining company represents their confidence that the mining company will act responsibly on issues that matter to them (Jijelava and Vancley, 2017). Confidence in governance refers to whether community members believe that the regulatory and legislative arrangements are capable of ensuring responsible mining development (Zhang et al., 2018). In contrast, distributional fairness reflects the idea that impacts and benefits are shared equitably (Walton and McCrea, 2020). Distributional fairness can occur at local scale, for example, considering potentially different outcomes for segments within a host community, or at regional scale, for example, whether whole regions receive a curse or blessing from their resource base (Fleming et al., 2015). In addition, the role of perceived benefits and impacts has been commonly recognised as affecting acceptance of resources projects (Walton et al., 2017; Measham and Zhang, 2019). In reviewing large numbers of mining projects in Canada, Bergeron (2020) noted that an underlying issue was the overall fit between the identity of a region and its relationship with the mining sector. This paper considers the factors affecting the social licence for proposed renewed mining activity in a post-mining town (Kapunda in South Australia), where alternative methods may make it viable to recommence mining more than a century after mining closed in 1879.

2. Case study

Kapunda is a town of around 3000 people (ABS, 2016) located approximately 80 km from the state capital of Adelaide north of the Barossa Valley as shown in Fig. 1. Mining was central to the early development of the town during the 1840s where Australia’s first commercially successful copper mine was established and operated for several decades and played an important role in the state economy.



Fig. 1. Location of Kapunda in South Australia (source: De Leuien and Arthure, 2016).

Cornish miners were attracted to the town of Kapunda, partly enticed by the availability of company housing during the early years of recruiting workforces from overseas as part of establishing the Australian mining industry (Bell, 2002). Substantial numbers of Welsh and post-famine Irish Catholics also came to Kapunda to work on the copper mine (De Leuien and Arthure, 2016). The town developed adjacent to the mine and to this day the town is situated very close to the mine, with most residents within two kilometres of the mine site and several within a few hundred metres. Mining history continues to play an important part in the town's identity (Bell, 2008). The town also played a significant role in the pastoral (ranching) industry, serving for many years as the headquarters for the Kidman Pastoral Company, one of Australia's pioneering pastoral companies.

The town itself embraces its history with a substantial local museum and a strong historical society. A dedicated mine heritage trail has been established on the site of the former mine and road signs encourage tourists to engage with the mining history of the town (Fig. 2). If renewed mining were to occur in Kapunda, it would likely be near this heritage trail which is close to the residual deposit. The historic mine site is also a place of recreation and fitness for dog walkers, joggers and fitness instructors who conduct classes at the site. Photographers are attracted to the striking scenes when water pools in the residual mining pits after rain and is coloured by the minerals leaching from the surrounding rocks as shown in Fig. 3. In terms of its contribution to the local economy, heritage tourism is modest. The combined value of all accommodation and hospitality (including heritage tourism) is around 3% of the local economy (ABS, 2016). The town is primarily a service town hosting staff who work in the nearby wine growing region of the Barossa, with the highest employment sector in town being wine making, followed by aged care residential services, secondary education and road freight transport (ABS, 2016).

In addition to attracting attention for its heritage character, the historic mine site has also been the focus of remediation research. Copper is a recognised soil contaminant and the levels in the soil around the historic mine site have been considered high (Nirola et al., 2015; 2016). Because ISR can be used as part of remediation processes, there may be potential to extract copper from the site while reducing copper levels in the surrounding area.



Fig. 2. Road signage on approach to Kapunda emphasises the connection to mining heritage © CSIRO.

The research was funded as part of a Cooperative Research Centre Project (CRC-P) which also comprised research on groundwater flow, water and soil characteristics, chemistry of potential lixiviants (dissolving agents) and the geological structure of the remaining copper deposit in the town, including hydrogeological characteristics. These components have been designed to develop an integrated approach to researching the feasibility of extracting copper through in-situ recovery methods in Kapunda (Measham et al., 2019). Recognising the importance of early engagement, social research was commissioned to understand community perceptions of potential renewed copper mining well in advance of any formal mine development proposal (Hartley and Wood, 2005; 2017; Zhang et al., 2018).

3. Methods

The data were collected at two focus groups and four key participant interviews. There was a total of 18 key informants reflecting a wide range of people across different community segments, seeking to represent a breadth of perspectives in line with qualitative research designs, rather than a statistically representative sample (Beitin, 2012). In the two focus groups there were respectively, 8 and 5 participants. Across the four interviews there were five participants, which included two participants in one interview. Despite sending invitations to equal numbers of males and females, the sample was skewed towards males with 15 men and 3 women participating. Participants ages ranged from approximately 40 to 85 years. The participants represented a range of positions within the community, including local government councillors (i.e. elected representatives for the municipality), leaders of local community groups and other key roles in the community, such as local business and educators. The participants also represented a range of connections with the site where potential mining operation would occur.



Fig. 3. Photographers are attracted by the coloured water that pools at the historic mine site (photo credit: AC Thiele of Kapunda).

Several of the participants had a connection to the historic mine site, either through their interest in local history, where they lived, or through their recreational activities which involved frequent visits to the site and its historical walking trail.

In line with the aims of the research, the guiding questions for the focus groups and interviews centred on understanding the character and identity of the town and views of the mining sector in general. The focus groups were conducted in Kapunda by the authors' project team with skills in qualitative research methods and experience in facilitation of focus groups. The focus group sessions included a technical presentation given by a mine-processing chemistry expert outlining ISR mining in general and describing examples of other ISR mining projects in other countries. The presentation provided information about the technical components of ISR and how the Cooperative Research Centre-Project was investigating how these could be applied in Kapunda. The presentation also explained the dissolving process and discussed a range of potential dissolving agents (lixiviants) that could be employed, depending on the environmental characteristics of the site. This presentation was seen by participants as very helpful in developing an understanding of what an ISR operation in Kapunda could look like. Following the technical presentation, the focus groups and interviews proceeded to discuss concerns and perceived benefits from a potential ISR operation in Kapunda. The full set of guiding questions from the focus groups and interviews is presented in the Appendix. The interviews proceeded in a similar format as the focus groups with the same questions explored. Each focus group took approximately two hours to conduct and the face to face interviews ninety minutes to complete. All data collection adhered to ethical clearance approvals.

The interviews and focus groups were transcribed and imported into qualitative data management software (NVivo v12). Analysis involved systematically grouping the transcribed responses into themes and then aggregating these themes. Considering the extent of research on established dimensions of social licence and consolidation in literature around some key elements including procedural fairness, distributive fairness, confidence in governance, trust, perceived impacts and benefits as discussed in the introduction, the research team decided that an adaptive theory approach (Layder, 1998) was more appropriate than a completely inductive process. Adaptive theory starts with recognised key concepts to orientate new qualitative coding and seeing how well the data fit these concepts. Where the data do not fit recognised concepts, additional coding is required (Layder, 1998). In our case we started with a code for each of the widely recognised elements of social licence (procedural fairness, distributive fairness, governance, trust, perceived impacts and perceived benefits, and knowledge), as well as town identity which was a main focus of the research. The coding was conducted individually by two members of the research team and then

cross-checked by other team members to confirm the robustness of the coding process.

4. Results

The analysis clustered the perspectives of residents around several themes that contributed to the level of acceptance towards an ISR copper operation in Kapunda, presented in Fig. 4 and expanded below.

4.1. Local town identity

Participants described Kapunda as friendly and relaxed with a strong sense of community. It was seen as located relatively close to Adelaide for those who commuted into the city for work or business yet it had a quiet country feel where most people knew each other and took the time to ask how they were going when they passed in the street. Participants stated a high regard for the infrastructure and services in the town including good medical facilities, excellent schools and high-quality sport facilities. Though generally well serviced, including several pubs, there were exceptions including a lack of retail options and limited choice of cafes and restaurants.

Town identity was strongly linked to mining, where the first commercially successful copper mine was established in the country. They were proud that the town had played an important role in the prosperity of the state during the 19th Century. As one participant expressed: "*It's what the town was based on. The mine site is very important*". Town residents maintain a connection to the historic mine site, either through involvement in the local history society, or by going for walks on the heritage trail which is also used for local business in the form of fitness classes operating at the old mine site. Participants also highlighted the role of the historic Kidman pastoral company. The heritage-listed home built by Sir Sydney Kidman (the company founder) continues to be used as an important building in the local high school to this day.

However, participants also described how some residents are not interested in the history of the town (neither for mining nor pastoralism). Many people live in Kapunda because it is affordable and an easy drive to work in the Barossa Valley, Gawler, Elizabeth and Adelaide. While Kapunda was seen as convenient for commuting to other places for work, there were relatively few employment options within the town itself, particularly for young people. There were other downsides to living in Kapunda.

4.2. Knowledge of ISR

Participants had diverse levels of understanding about ISR methods

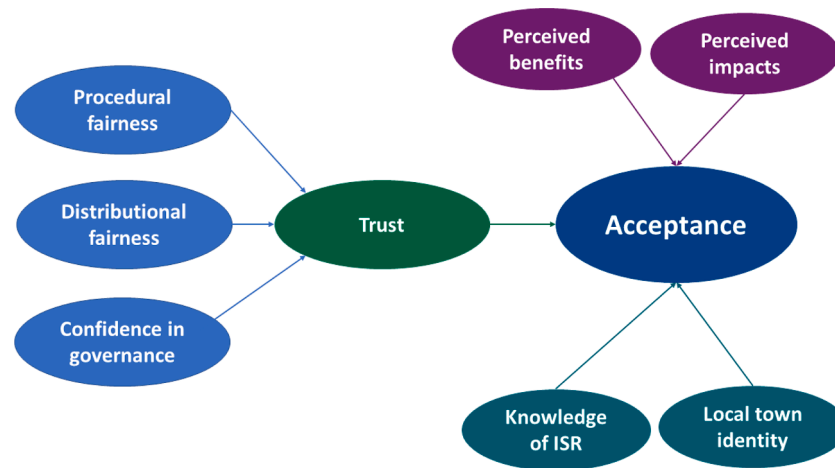


Fig. 4. Factors affecting acceptance of potential new ISR mining activity.

from none through to moderate levels. Those with knowledge about ISR had gained their understanding through previous presentations given by the proponents, internet searches and discussions with other residents. For some participants, the presentation provided by the research team during the focus groups and interviews was their only source of information about the proposed development and ISR mining.

Those with some knowledge about ISR methods described potential benefits suggesting that ISR mining would involve less noise, minimal dust and reduced disruption compared to conventional mining and avoid the creation of pits or voids. As expressed by one participant: “*in-situ recovery is different ... if it was conventional mining, you would have people up in arms...*”. These participants felt that the range of lixivants considered for the Kapunda project would be low risk, compared with other operations that had been conducted in other countries. One important knowledge gap for many participants was the physical properties of ISR mining. In particular, they wanted to know what happens when the copper is removed from the ground and whether this would leave gaps in the integrity of the underground rock that could lead to subsidence. Having technical expertise on hand during the focus groups and interviews allowed the research team to answer these questions on the day.

The participants indicated there was a general lack of clarity around size and scope of project and the timeframes involved. These uncertainties largely reflect the early stage of the project proposal and the types of details that are not yet known. Some people found this lack of information frustrating, because it was more difficult to form a view about a potential development when the details were not yet concrete. However, most participants were comfortable in the knowledge and belief that these details would emerge in due course as a proposal took shape and the research results come to light. These participants tended to reserve judgement about the project until the facts were in. Others expected the project would be a net gain for the community, thinking it was likely that the eventual specifications for the project would be advantageous to the town.

4.3. Procedural fairness

From the perspective of some participants, procedural fairness was high, in terms of having a voice and building relationships. These participants described how the project proponents have made a commitment to making themselves available to the public by opening an office in the main street and being proactive about providing information and responding to queries. Participants noted that the proponents had engaged extensively with Council and built good relationships particularly with potential suppliers and those who could provide professional services to the project, if it goes ahead. In contrast, other participants

had never heard of the proponents and had no previous knowledge of the a potential ISR operation prior to the focus groups. They came with an open mind and many questions about ISR methods and details of the project. For these participants there was an appetite for increased interaction, reflecting a need for expanding the range of people who have been engaged on the project. For these participants, inclusiveness was important for procedural fairness. One participant said: “*I think they need to invite the general public...not just a select few*”. Other participants raised concerns about procedural fairness and described its effect on trust, in particular, they thought they may have received a ‘sanitised’ version of the benefits and risks. Although they didn’t articulate a tangible problem, they expressed a feeling of not having received the full picture and expressed a general sense of suspicion.

4.4. Distributional fairness

The focus groups and interviews highlighted that a new mining operation in the form of In-Situ Recovery would be generally beneficial to the town, with a wide range of benefits summarised below in the perceived benefits section. However, participants also acknowledged that renewed mining could affect some people differently from others. Several participants thought that some sectors of the economy may be more negatively affected than others. This was particularly a concern for the tourism sector, notably those operators servicing heritage tourism. If the heritage appeal of the site was diminished, or the site was closed for a prolonged period, then this could have a negative impact on those businesses. It was also noted that some businesses use the site for different purposes other than tourism, including fitness classes at the mine site and these businesses would be particularly affected.

Other participants spoke about the spatial concentration of impacts within a particular area. Many residents live within a kilometre of the mine site (and several within a few hundred metres). There was a concern that residents living close to the mine site could be more affected by potential issues such as noise, dust and visual impacts particularly during the construction phase which could involve truck movements, fence construction and other types of disruption. As one participant expressed: “*the only thing I could see as being a problem is those people who are affected by that particular area...*” The quote highlights how the potential downsides to a new operation could be unevenly spread across the community due to relative proximity within the town.

Distributional fairness also arose as an issue during discussion about recreation. Participants identified communities of joggers and dog walkers using the site for recreation. These people would be proportionally more disrupted compared to others. In considering the issue of distributional fairness, it was clear that timeframes were also an important factor. Participants conveyed that a relatively short

disruption (e.g. up to a few months) would be an inconvenience that residents, businesses and recreationists should be able to tolerate. Conversely, anything longer than that would represent an unfair burden on those members of town who would bear the brunt of the impacts. Evaluating the 'pros and the cons' would be an important step for some participants, indicating they would undertake this carefully before forming a firm view about the project proposal overall.

4.5. Confidence in governance

The participants clearly indicated a high degree of confidence that approval processes in place were rigorous and evidence-based. There was a strong sense that the project would only proceed following careful assessment at local and state levels drawing on rigorous research provided by universities and government institutes noting University of Adelaide and CSIRO respectively. One participant said: *"I am convinced [by] the process that we are going through in terms of the research and the approval process... it won't go ahead unless it's safe."* There was also a sense that confidence in governance could be further strengthened by providing more information about the steps in the decision-making process which were not always well understood by the local community. Some participants sought more information about the sequence and timelines for decision-making in any pre-approval or approval phases of a project development.

The issue of maintaining independence was also raised, particularly for monitoring the site over time if the ISR project were to proceed. In order to maintain confidence in decision making, some participants emphasised that certain tasks like taking measurements for monitoring purposes should not be completed by the proponents themselves in order to rule out any potential conflict of interest. Another aspect of further improving confidence in governance concerned transparency about financial gains. For example, if it turned out that decision making bodies (such as the local council or the state government) withheld information about revenues they may receive from the project, then this could reduce resident confidence in governance because by introducing doubt and a sense of potential bias in decision making. Therefore, maintaining transparency was an important factor in sustaining confidence in governance over time.

4.6. Trust

A range of factors emerged through the focus groups and interviews related to trust in the proponents. Some were factors that contribute to increasing trust and others to reducing trust. For some, trust was created through getting to know the proponents and seeing them as part of the town. This included establishing a physical presence in the main street, frequenting local businesses and interacting regularly with the Council.

The Cooperative Research Centre Project which funded the social research presented in this paper, along with other research about the chemistry of ISR and the environmental implications of the project, was seen to be thorough, independent and multi-dimensional. All of these aspects were raised by participants as contributing to trust in the research findings. The provision of technical information about ISR mining methods during the focus groups reinforced confidence in the wider goals of the research program. An important aspect to building trust was that any application for permitting to undertake an ISR operation at Kapunda operation would only occur after key research questions had been answered and findings considered and incorporated into a development application. Participants felt the town was several steps away from a possible project and not locked into any particular outcome. This precautionary approach contributed to building trust.

Conversely, participants felt that trust was undermined because many of the details about the project were lacking at the time of the focus groups and interviews. They reported, it was hard to accurately gauge what the effect on the town would be and some participants felt that the proponents were holding back relevant details. One participant

expressed: *"trust is an issue...do we gild the lily somewhat? ... understate the dangers and overstate the potential?"* The sorts of details that people felt were missing included expected timeframes, scale of operations and the scope of the development.

4.7. Perceived benefits

The focus groups and interviews raised a broad range of possible benefits that participants believed could emerge from the proposed development. Some of these were tangible benefits such as direct employment. Participants' views on the numbers for potential jobs stemming from the project varied, but tended to be modest, with estimates up to a maximum of 25 jobs. Some participants indicated they need these benefits to be clearly quantified prior to deciding on whether the net value of the project outweighs the disadvantages from their perspective. In a small town like Kapunda where local school leavers had limited options, any growth in employment was seen as valuable. Participants also thought there would be indirect benefits in the form of stimulus to local businesses due to increased demand for local goods and services, many of which were struggling to stay open. Another potential perceived benefit was revenue to Council in exchange for site access, which could be reinvested in the town.

Other perceived benefits were intangible. Participants expressed that the development could build on their pride in the mining history of the town and the significant role the town once played in supporting the state's economy. Opening the first copper ISR operation could be good for the town's image and would put Kapunda 'on the map' once again, as expressed by one participant: *"it's a great thing for our town...an in-situ business... would be of worldwide interest... we want to be on the map..."*. This was partly symbolic – in terms of renewing the mining identity of the town and having a sense of relevance in the wider state economy. However, it was also partly practical, in terms of the potential to attract visitors to come and view the mining operation and put money through the local economy. For example, some participants thought an ISR operation could attract significant visitation in the form of study tours for students and researchers and potentially government agency staff interested in seeing how ISR copper extraction works and its potential remediation effects, for example through educational or interactive displays for visitors.

In addition to the focus on the town itself, another potential yet wider benefit was the advancement of knowledge relating to ISR methods and potentially environmentally friendly mining methods for use in other contexts. This benefit was not dependant on the ISR mine proceeding. It was thought that the research process itself involving university staff and institutes would produce valuable insights, even if the Kapunda ISR mine doesn't proceed.

4.8. Perceived impacts

Some participants were concerned about the potential for negative impacts on other sectors, particularly tourism. A new ISR operation would be located on the same site as the original mine which is now a heritage site. Visitors were currently drawn to the town to visit the historic mine providing a source of business for food and accommodation providers in the town. Participants expected that access to the site would be impacted and this could lead to reduced demand for businesses servicing the tourism industry. As expressed by one participant: *"I think there's some scepticism in the town as to whether tourism and mining can coexist in one big happy family"*. Participants also emphasised that the council had recently invested in making the site more suitable for visitors, including the provision of signs and explanations plus physical improvements to increase site accessibility. Some participants were concerned these efforts would be diminished if the ISR operation went ahead.

A related issue raised by participants was the negative impact on the visual amenity of the site, for example through unappealing fencing or

unsightly or noisy infrastructure, vehicles and plant equipment. A key consideration here would be the expected duration and extension of disruption to the existing amenity of the site. These issues could also affect the fitness classes which currently occur at the site. The amenity of the site was not only an economic issue affecting other industries but also valued as a place of recreation, exercise and where people go to admire the beauty of the coloured water that accumulates in the voids from the heritage mine.

A further set of potential perceived impacts related to the natural environment, in particular the possibility of polluting the aquifer or downstream water quality and possible subsidence. Even so, participants were generally confident that the risk of potential impacts to the natural environment would be managed through the research, approval and assessment process and not proceed if the risks were considered unmanageable.

Finally, a concern was raised that the project may evolve into something bigger or different from the initial ISR proposal. For example, if the proponents commenced by extracting copper but over time they proceeded to extracting gold. This was seen as potentially having greater impacts because gold extraction may require different processing and potentially greater risks. In a similar way, if the ISR operation went ahead and started out small with a handful of wells, over time it could end up much bigger in terms of number of drill holes and impact on the landscape. Participants sought reassurance that the opportunity to say 'no' wouldn't be reduced if the scope of the project changed over time.

5. Discussion

The paper started out by emphasising that legacy mine sites are not just a liability but may also be a potential asset (Unger 2012). Although legacy mine sites may have problems such as soil contamination, acid mine drainage or risks to human safety (Cozzolino et al., 2018; Bennett 2016), they may also form the basis of new activities or industries including recreation or tourism. amongst these, there are cases around the world of legacy mines supporting heritage tourism (Oakley 2018; Lamparska 2019; Jelen 2018; Caamaño-Franco and Suárez, 2020). There have also been cases where former mines re-introduce mining, often in a different format or using different technology which make it feasible to re-mine in locations where ore grades or logistics had previously made it unprofitable (Crowson 2003). However, the commencement of mining in legacy sites has tended to occur in locations where other land uses have been less feasible either due to remoteness or due to the lack of public interest in the heritage of the those areas (Bell, 2002; Kivinen 2017).

To date, there has been something of a dichotomy between those legacy mine sites that can sustain heritage tourism and those that can sustain a renewed mining industry. It has been rare for a single site to have both options available (Kivinen 2017; Pepper et al., 2014). This is likely to change as demand for minerals continues to grow at the same time that minerals are becoming less accessible around the world, with increasing attention to the number of legacy mine sites around the world (Worrall et al., 2009; Prior et al., 2012). Alternative mining methods such as ISR are likely to play an increasing role in re-mining and rehabilitation of legacy sites where it is socially acceptable to do so (Seredkin et al., 2016).

The research presented in this paper found that most participants were open to the prospect of a new copper ISR operation, provided it is well managed and environmentally responsible, and that the benefits to be gained outweighed any negative impacts, including the impacts on local tourism and recreation. These findings build on prior research about the drivers of social licence. The established dimensions of procedural fairness, distributional fairness and confidence in governance and their effects on trust were all found to be major elements in the context of social acceptance of a potential new ISR operation in Kapunda (Prno and Slocumbe, 2012; Moffat and Zhang, 2014; Parsons and Luke, 2020). In addition, there were strong themes around perceived impacts

and benefits that resonated with previous research particularly in the energy industry (Haslam McKenzie, 2013; Luke et al., 2014; Luke et al., 2018; Measham and Fleming 2014). Another important factor was that ISR methods were relatively unfamiliar to many of the participants, with many hearing about these methods for the first time in the focus groups and interviews.

The importance of knowledge about a potential development is increasingly recognised as a distinct factor in its own right which can interact with other drivers of social licence in different ways (Lacey et al., 2019; Walton and McCrea 2020). It is important that knowledge is based on rigorous and transparent research and goes beyond industry related knowledge (Parsons and Luke 2020). Within this context, the broader CRC-P research program played a crucial role in addressing knowledge gaps from an early stage of the project lifecycle, well before any development proposal or permitting application. In doing so, the research program contributed to increased trust and confidence in the process. In terms of social licence, knowledge needs to address the issues of concern raised by communities about possible impacts, accurately explain possible benefits, and outline how governance is instituted to safeguard the community and its landscapes (Walton and McCrea, 2020). Effectively communicating these types of information and addressing concerns depends on community engagement and involvement, which needs to be early, ongoing and meaningful.

It is also worth noting Bergeron (2020) observed that the propensity of a community to accept a new mining project was often an issue of the overall fit between the identity of a region and its relationship with the mining sector. In our case study, the role of regional identity was such an important driver that it was appropriate to recognise it as an independent driver of acceptance in its own right, as shown in Fig. 4.

The Kapunda of 2019 when this research took place was very different from the Kapunda of the mid-nineteenth century when the original mine was in full operation. Mining activities have changed with novel techniques such as ISR under consideration to extract the mineral deposits. The results of this study indicate that the heritage created from past mining operations are valued by the local community in such a way that this may impede the development of any further mining activities. Community concerns that the perceived impacts of a new ISR mine could have a negative effect on the tourism and recreation that has developed from their existing mining heritage could limit the feasibility of a potential new ISR mine. This paradox highlights the principle that mining heritage is not something that happens randomly, rather it is an active process constructed over time which has sometimes been called "heritagization" referring to the conversion to a cultural phenomenon that can form the basis of new economic activity (Caamaño-Franco and Suárez, 2020).

With the potential for mining to return to many previously mined locations, it is important to understand the factors important to communities and their expectations of industry and government if residents are to accept renewed mining operations. The results highlight that co-existence was a key issue between tourism and mining. If ISR mining can be conducted in a way that doesn't interfere with tourism based on past mining, and that new mining is sufficiently different so as not to interfere with the past, then it is much more likely to be accepted. In this regard, participants saw a distinction between conventional mining which would have many people 'up in arms' and ISR mining which was seen as less disruptive. There was also a perception that ISR mining could introduce new types of visitors who might also support hospitality and accommodation services. This focus on co-existence is partly about time: that new mining should not erase old mining.

Past research from conventional mining has shown that trust between mining and tourism can be improved through dialogue and joint planning (Moyle et al., 2018). We build on previous research to show that, in a heritage town such as Kapunda, it is much more likely that a future mining operation would be locally accepted if it can be developed in a way that doesn't put the past at risk. While this finding was highlighted in the context of ISR and heritage tourism, it has wider

applicability. As demand for minerals increases and mining methods continue to evolve, there is potential for legacy mines to re-open in a wide range of contexts. Globally, legacy mine sites currently used for recreation, nature conservation, grazing or other land uses may once again become commercially viable for mining (Caamaño-Franco and Suárez, 2020; Kivinen 2017; Crowson 2003). Where legacy sites have taken on new identities and values, returning them to places of extraction will likely depend on the ability for different values (extractive and otherwise) to co-exist. Re-introducing mining to previously mined places may be much more complicated than introducing mining for the first time.

6. Conclusion

This paper considered the factors affecting the social licence for proposed renewed mining activity in a post-mining town, namely Kapunda in South Australia. The paper examined how residents of Kapunda view the mining sector in general and how it fits with town identity. Focus groups and interviews explored the extent to which a potential renewed mining industry would align to community values, considering the possible application of copper in-situ recovery (ISR) from an historic deposit in the town. The research found that participants were open to the prospect of a new copper ISR operation, provided it is well managed, environmentally responsible, and able to co-exist with the mining tourism that has developed on the site. The results highlight that co-existence was a key issue between tourism and mining. If ISR mining can be conducted in a way that doesn't interfere with a tourism based on past mining, and that new mining is sufficiently different so as not to interfere with the past, then it is much more likely to be accepted. At the same time, if an ISR operation were to proceed,

there was a perception that this could introduce new types of visitors who might also support hospitality and accommodation services.

While the potential for co-existing with other industries is likely to be higher with less invasive re-mining technologies like ISR, the findings have wider applicability. Many legacy mine sites are used for a wide range of purposes including recreation, nature conservation or tourism. In such places where values have continued to evolve since the original mining operation, any return to mineral extraction will involve finding a way for extractive and newer, non-extractive values to co-exist.

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Appendix

Guiding questions for focus groups and interviews

Topics
Initial identity exploration
<i>What do you like about living here in Kapunda?</i>
<i>What's not so good?</i>
<i>How do you generally view the mining sector?</i>
<i>How does mining fit with the town's identity?</i>
<i>How would a renewed mining industry align with town values?</i>
Introduction to proposed renewed activity, including ISR technology
<i>Presentation about ISR technology</i>
<i>The CRC and proposed activity in Kapunda</i>
Exploration of perceptions of ISR
<i>Do you have concerns about ISR:</i>
<i>In general?</i>
<i>As part of renewed mining activity in Kapunda?</i>
<i>Do you see benefits from ISR:</i>
<i>In general?</i>
<i>As part of renewed mining activity in Kapunda?</i>
Concluding interactions
<i>Do you have any other comments:</i>
<i>About Kapunda?</i>
<i>Mining in general?</i>
<i>ISR?</i>
<i>The proposed mining activity for Kapunda, using ISR?</i>

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