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Paper title: **Sustainable mining futures and the liveability of mining villages**

Abstract:

The boom-bust cycles within resources industries in Australia make it difficult to plan for the sustainable development of workforce locations in regional communities. A variety of logistical, financial and lifestyle factors are contributing to an increased use of non-resident work force for both short and long term construction, operational and maintenance, raising a number of issues about the sustainability of mining village accommodation and development that this encourages. Forward planning to meet the needs of resource industries and their workforce requires knowledge of accommodation alternatives and preferences, especially when seeking to attract skilled professionals to regional areas. This requires consideration of factors beyond the simple utility of temporary worker accommodation. Planning for a sustainable mining future involves consideration of the liveability of mining villages and the preferences of mining workers for appropriate accommodation.

This paper will explore these issues and draw upon a recent survey of mining villages in the Bowen Basin region to shed light on three significant issues for non-resident workforces; location choices, accommodation choices, and the impact of these on regional economic and social development within the resources sector in regional Australia.

184 words

Introduction

This paper examines three significant issues regarding non-resident workforces in the mining sector. The first issue regards the location choices of non-resident workers; identifying if it is only housing availability and cost that stops them from locating in mining towns close to work. The second issue looks at the liveability of mining villages and how the current living conditions of the mining villages can be improved. The third section of the paper looks at the regional impact of mining villages in terms of economic and social development of the region, particularly considering the degree to which mining villages should be fully or partially integrated with the nearest regional service centre, regional hub or regional city.

Background

Mining is a resource industry that goes through cyclic fluctuations. These can have significant impacts on employment levels, mining communities and the businesses and communities which rely on mining related business. One aspect of the recent cyclic trend in mining activity in Australia has been a shift in human resource management of mining workforces with the increased formalisation of longer block shifts for mine workers and the increased use of non-resident workforce. This is particularly evident in the coal sector in the Bowen Basin region of Queensland and is triggering a substantial change to the makeup of mining communities.

Mining activity from 2004-2008 in the Bowen Basin region has been characterised by rapid population growth, especially a rapid increase in non-resident workers and rising house prices, both rental and purchase. Dwelling capacity across the Bowen Basin region prior to 2004 was in decline in many areas of the Bowen Basin. During 2004-2008 there was a rapid increase in demand as reflected in the high rental and sale prices for housing and other accommodation (Akbar et al, 2008). This has resulted in increased pressure on existing services and infrastructure in the region. There has also been a significant change in the population dynamics with an increase in the male population and changed community characteristics.

Due to regional labour shortages in the Bowen Basin area there has been an increased reliance on a high non-resident working population to expand mining production in existing mines and to develop new mines. In the Bowen Basin region 11,075 workers or 12 percent of the estimated population of 89,303 are non-resident (PIFU 2007). The 2007 PIFU population survey follows a similar survey in 2006 and a twelve month trend can be drawn from the two surveys. The proportion of non-resident workers in the Bowen Basin has increased by approximately three percent with one in four jobs occupied by non-residents.

Non-resident workers in the Bowen Basin tend to be based in major urban and coastal communities, normally within one to three hours by road travel. The proportion of non-resident workforce varies across mining communities. In many communities in the previous Broadsound and Duaringa local government areas non-resident workers constitute approximately one third of workers, while in the previous Nebo Shire the resident population (2,716) is outnumbered by non-resident workers (2,868) (PIFU 2007).

PIFU (2007) employed a census approach to estimate that there were around 9,200 non-resident workers (or 83% of total) in mining villages across the Bowen Basin on 31 July 2007. Caravan parks

were the next largest source of accommodation (around 1,030 persons, or 10%) followed by hotels/motels (657 workers, or 6%). Mining villages in the Bowen Basin reported a maximum capacity of 13,850 beds in July 2007, an increase of 3,050 beds from June 2006 and accounted for 83 percent of non-resident accommodation. Given that mining employees are often rotated through block shift periods, and rooms are then used by the next group of shift workers, the estimate of 9,200 workers by PIFU (2007) may be an underestimate.

The PIFU 2007 report concludes that while non-resident workers continue to play a significant role in the Bowen Basin economy, representing 25 percent of all jobs, for the foreseeable future there will be a demand for a variety of housing options to supplement permanent housing. Housing options will include non-private accommodation providers such as mining villages, hotels/motels and caravan parks that perform an important function in meeting local housing needs. A broad definition of a mining village within the Bowen Basin drawn from PIFU (2007) is that they are usually a non-private type of accommodation, developed to accommodate unaccompanied mining non-resident company workers and associated contractors.

Mining villages are but one option of temporary accommodation for mining workers. Accommodation options for mining workers have historically included relative primitive forms of accommodation such as tent cities (Murray and Peetz, 2008). During 2004-2008 when there was a sharp increase in coal-related employment, miners and mining contractors utilised caravan parks and other forms of accommodation. On one instance a disused service station was used to house mining workers (personal observation, 2007).

Mining villages were typically referred to as 'work camp' accommodation and have tended to be seen as a temporary sub-standard housing option associated with housing practices within the corrective services or with work compounds in developing countries. Past literature on work camps, housing options and mining reveals research centred on ageing communities dealing with underinvestment in infrastructure and housing, declining mining activity and urban renewal programs found primarily in the UK (Edwards and Webb, 1980). The literature serves to illustrate that the debate around the cost and suitability of mine worker accommodation is not a recent phenomena. The issues raised are similar to the debates that have occurred in the Bowen Basin over the various contributions and obligations that are inherent or to be negotiated within mining developments.

Although a generalisation a typical contemporary mining village is arranged similar to a hostel in which the sleeping and private living areas are separated from communal shared areas that consist of kitchen, laundry and entertainment facilities. Some mining villages contain permanent and semi-permanent dwellings however most of the buildings will be demountable and able to be relocated if necessary. An example of a permanent mining village could be the case of existing commercial accommodation premises being purchased, refurbished and used to supply mining worker demand. Company operated mining villages will typically offer a number of services such as room cleaning and possibly meal and laundry services.

This paper will further examine the necessity and liveability of mining villages.

Rationale for mining villages

Key rationales for mining villages are that they allow for flexibility in mining development and allow accommodation to be constructed in short time frames. Beyond simply catering for a shortfall in accommodation options another proposed rationale for mining villages can be located in the opportunity for mining operations to lessen the on-site capital expenditure required for initial mining development. Alternative accommodation for mining operations that are not located near large urban populations can lessen the front end capital outlays required to build new mining operations.

This is partially evidenced by the last exclusive mining town in Australia, Roxby Downs which was built in the 1970's in South Australia. According to Houghton (1993) a feasibility study in 1984/85 estimated the capital costs for constructing a mining village for fly in/fly out operations at $A37.1 million compared to $A56.9 million for the construction of a conventional township. The recurrent annual operating costs were put at $A1.7 million and $A5.7 million meaning that the additional cost of operating a fly in/fly out operation would limit economic viability of the mining village to a five year period. A significant factor in the recurrent operating costs was the distance from an appropriately sized service centre and the impact of travel costs.

Another equally important issue is that of decision making at the political level. One example was opposition to the proposed introduction of fly in/fly out operations in the Bowen Basin in the early 1990's which resulted in considerable political pressure and the eventual construction of additional housing in the town of Emerald (Gillies, 1993). The cost effectiveness of mining village options or conventional housing construction would appear to relate in many cases to the size and profitability of the mining operation, the life span of the mine and the level of political influence. Communities are part of the political influence that can be leveraged, with varying degrees of success, to shape the eventual mix of housing options for mining operations.

Mining villages in the Bowen Basin

Obtaining reliable data on the trends associated with mining villages in the Bowen Basin is limited by the few studies undertaken to date. This brief review relies primarily on the PIFU (2007) study and an examination of local government data sources. The PIFU (2007) study highlights that the housing options incorporated by mining companies and contractors differs across the Bowen Basin and is subject to demand preferences of resident and non-resident populations, housing availability and opportunities; and demand fluctuations in a dynamic housing market.

Overall mining village trends in the Bowen Basin can be discerned via the percentage of non-resident workers residing in mining villages, compared with other housing alternatives. Five local government shires[1] in the Bowen Basin region in 2007 had eighty five percent or more of their non-resident population residing in mining villages, including Nebo Shire (95%), Broadsound Shire (93%), Duaringa Shire (90%), Bauhinia (90%) and Peak Downs (85%) (PIFU, 2007). This can be contrasted with the lower figures of the Bowen Shire (48%), Banana Shire (65%) and Emerald Shire (63%) which reflects the ready supply of alternative housing options in larger centres, and the lower proportion

[1] Local government boundaries are pre-amalgamation local government areas

of mining given a maturing mix of industry within these shires. Competing pressures are an important part of understanding the characterisation of the housing markets within the various shires of the Bowen Basin.

Other reasons for relying on mining villages include distance between towns and mines, transport and geographic factors, and the time frame involved in town planning processes. For example, Glenden in the north of the Bowen Basin has several large mining villages located on private land or on nearby mining leases (Table 1) as opposed to being within the township planning scheme. This is also the case in Moura in the southern part of the Bowen Basin. A key factor in choosing the location of a mining village would appear to be the intended life expectancy of the mining village as well as the immediacy of the need for the mining village. There is evidence that in some cases the time lag involved in the formal planning process predisposes the mining village operators to choose locations outside of township planning schemes. Table 1 is included to illustrate the different tenure arrangements; an examination of all mining villages and their tenure arrangements has not been included in this paper.

Table 1 Mining village tenure: private land or mining lease

LGA	Mining village	Location	Nearest town	Comments
Emerald	Ensham Village	Mining lease	Comet	Mining lease straddles Peak Downs and Emerald Shires. Mining village created for construction workforce - closed in 2006-07
Nebo	The MAC Coppabella	AMCI	Coppabella	Not a designated locality
Nebo	Hail Creek Village	Pastoral lease adjacent to Hail Creek mining lease	Glenden	Mining village in private land near lease.
Nebo	Kerlong Village	Mining lease	Glenden	Mining village in private land near lease.
Nebo	North Goonyella Village	North Goonyella mining lease	Glenden	Mining village in private land near lease.
Banana	Cracow	Newcrest mining lease	Cracow	Mining village on mining lease
Banana	Kotti Doon	Kotti Doon Station	Moura	Mining village on private land. Built for construction workforce to be closed in 2007-08

Source: PIFU, 2007, Appendix F

Types of mining villages

A trend identified in the management of mining villages is the shift from individual mining companies providing various forms of mining village accommodation for its employees to commercial accommodation providers developing accommodation villages of mainly relocatable demountables instead of permanent accommodation (DoH, 2007). A proposed typology of mining village functionality is shown (Figure 1) which differentiates mining villages on the basis of function for existence based on the purpose the mining village was constructed for or on the basis of project

that it is catering for. On this basis mining villages are designed for an expected timeframe either short term, generally for a construction workforce or longer term for mining extraction activities. Another key factor of the typology is whether the mining village is owned and operated by a single mining company or whether it is a commercial facility. Commercial facilities are able to function to accommodate multiple projects and purposes more so than mining company owned facilities, although there is a trend for single mining company operated facilities to be managed for multiple projects in some circumstances. This is often important when different contractors and other supply firms are involved in mining operations and need workforce accommodation.

Figure 1 Typology of Mining Villages

Function of Mining village		
	Expected Timeframe	
Single company/Commercial	**Short-term construction camp (commercial)**	**Long - term on-going accommodation - alternative to township (commercial)**
	Short-term construction camp (single company)	**Long - term on-going accommodation - alternative to township (single company)**

Adapted from: Greer, Yabsley & Rolfe 2008

The mining villages therefore take different forms within the mining industry dependent on the specific or general need, the tenure arrangements, whether they are company controlled or commercial, the number of operations catered for, and the proximity to existing settlements. On this basis we could generalise that short term mining operations that were not close to an existing substantive settlement would favour the construction of temporary mining villages over more permanent arrangements.

Social impacts of mining villages

The research to date on the social impacts of mining villages is limited as most studies have concentrated on permanent mining communities. In general fly in/fly out mining workers utilising mining villages have expressed satisfaction with their situations citing high income levels and increased leisure time due to the compressed working hours of block shifts (Houghton, 1993; Clark et al 1985). In contrast Pollard (1990) identifies that increased stress for spouses who are left for longer periods with the sole decision making for families has been cited as a negative factor of block shift work cycles and consequently the mining village model.

Qualitative research (Allan, 2007) into the recruitment and retention in the mining industry has focused on the social impact of mining worker relocations. The focus of the research was the families of mining workers who had experienced the frequent relocations that characterise sectors of the mining industry. An insight into the social implications of frequent relocations suggested that

'social isolation, life stages and family demands affected each move' (Allan, 2007). Although not directly elaborated on by Allan, the findings could be reflected in the experiences of those workers who 'relocate' on a regular basis such as through the block shift system.

Furthermore the research suggested that locations that experience a high level of population migration can become more attractive to, and supportive of, their newcomers. This would suggest that those locations in which there are frequent relocations such as mining village communities may be more adaptive and subsequently supportive of the arrangement. Allan (2007) also argues for a greater recognition that women and children are the community members and service users with the greatest need for integration.

Regional development and mining villages

The connection between the provision of substantive and permanent housing and sustainable regional development although under-explored is generally inferred within the current literature on regional development (Beer and Maude, 2002). For example, the availability of affordable housing can increase or compensate for deficits in social cohesion that arise because of other reasons (Hulse and Stone 2006). According to Beer and Maude (2002) permanent housing can impact on the economic development of non-metropolitan communities in three significant ways; non-metropolitan communities typically have lower housing costs which in turn increases the ability to attract and retain labour and encourage businesses to the communities. Second a possible negative influence is an over supply of (public) housing in metropolitan locations and regional cities acting as an impediment to labour mobility and to encourage relocation away from regional employment opportunities. Thirdly insufficient regional housing supply can force business to relocate and/or encourage leakage of expenditure from the region as workers located in metropolitan or regional cities and commute for employment.

The lack of available housing in mining communities and the increased use of regional hubs to supply non-resident workforce poses a number of tradeoffs and regional development issues (Rolfe and Ivanova, 2007a). Development of the Bowen Basin involving significant increases in labour capacity could involve building or expanding existing townships close to the development site. Another option is the "regional hub" model, where employees are based at a larger centre in a region and then travel (drive in/drive out) to the work site for the period of the shift. This is currently a major option in the Bowen Basin, with Mackay, Rockhampton, Emerald, and the Capricorn Coast emerging as regional hubs (Akbar et al, 2008). The other main option is to base employees outside of a region, with transport by air (fly in/fly out) back to major cities after the completion of the shift. This model is commonly used in Western Australia, where many mine employees are based in Perth. It could potentially be used in the Bowen Basin, with employees based in Brisbane or other centres.

These options mean that the further development of some small towns in the Bowen Basin will not automatically occur as a consequence of increased production in the mining industry. For these towns growth from potential mining developments will be dependent on the attractiveness of the town to potential employees. Identifying the factors that contribute to the attractiveness of locations to industry sector workers is an important factor in facilitating regional development.

Some forms of temporary accommodation options may be a preferred model of regional development on many levels. At a policy level temporary accommodation for large scale resource projects brings to question both the broad debates around the sustainability of regional communities as well as the efficiency and flexibility of the mining sector to respond to global contagions such as the global financial crisis. Of concern is the risk of infrastructure investment that is a liability for declining regions coupled within lifestyle and liveability for future generations.

In addition to these explanatory factors the characterisation of mine workers as active agents is important in understanding the housing and locational choices that are made. Active agents are influenced by lifestyle factors and make decisions that may seem contradictory in the short term however appear logical in terms of long term investment strategies. Given these insights it is worth debating the regional development options to consider sustainable development options that are transitory and ephemeral. Some understanding of liveability issues and location choices are provided in the next section.

Liveability in work camps: a comparison

Research into the perception of liveability within mining villages has been limited. Rolfe and Ivanova (2007b) included the mining village (work camp) issue in their study of community choices for the development of the Moranbah Township in the Bowen Basin. This study confirmed the importance of mining villages to the perception of liveability in the township for permanent residents of the town. An increase in the mining village population was seen as unfavourable in terms of town development and although not directly examined was proposed as a reduction in community stability by the residents (Rolfe and Ivanova, 2007b). This paper represents an opportunity to address this issue and add to this important debate by surveying non-resident populations with the mining villages.

The research presented in this paper was conducted in partnership with the MAC Services Group Limited (The MAC). The MAC is an Australian owned public company established in 1988 to supply accommodation services to the coal mining, construction, resource and tourism industries. The MAC Accommodation portfolio has 4,500 permanent rooms under ownership and management in the townships of Nebo, Coppabella, Moranbah, Middlemount and Dysart in the Central Bowen Basin region of North Queensland and Kambalda in WA. The MAC also have involvement in the construction and design of portable accommodation solution (mining villages), as well as involvement in property maintenance, travel services, and linen services.

Research was conducted in 2008/09 in partnership with the MAC Group at the mining villages of Coppabella, Dysart, Middlemount, Moura and Nebo, located within the Bowen Basin, Queensland. The research involved a short paper-based survey conducted on-site at the mining villages with the assistance of the MAC group and CQUniversity researchers. A total of 287 completed surveys were collected by researchers visiting the mining villages and recruiting participation from the mining village occupants. The data collection occurred during the second week of February 2009 with the assistance of a senior MACS Services Group employee. The data was manually entered into SPSS and analysed.

The research questionnaire was designed to elicit responses to three areas of concern for the researchers. Current work and accommodation preferences were examined together with an evaluation of the liveability of the mining village and the level of satisfaction of services within the mining villages. Comparative analysis was possible in the case of the liveability assessments with previous data collections of liveability performance of the Mackay, Whitsunday and Isaac regions and of south east Queensland households.

Mining village survey respondents

The mining village survey respondents were mostly male (94%) with an average age of 37.5 years. Sixty percent of the respondents reported working between 41-60 hours a week with twenty nine percent working more than 60 hours per week. Sixty percent of respondents were married or in a de facto relationship, with thirty percent single and ten percent divorced or separated. Approximately half of the respondents had children, and only twenty four percent indicated that their children were living with them. Just over sixty percent of the miners had secondary school education with 9.5 percent having a tertiary qualification. Twenty seven percent had a non-tertiary post secondary qualification.

The majority of the respondents had been working at their current mine site for less than a year (74.5%) and had been working in the Bowen Basin for less than five years (80%). Sixty four percent of respondents plan to be in the mining industry for less than ten years with seventy five percent planning to leave the region in the same time period. Of the 287 respondents in excess of forty different companies were listed as the employers. This highlights the diversity of companies involved in the mining activities within the Bowen Basin region and also the complexity in characterising the workforces involved. The MAC mining villages can be characterised as commercial accommodation operations.

Location factors

Just over half of the respondents had lived at their current main residence for less than two years, with sixty two percent planning to leave the residence in the next five years. Eighty seven percent of respondents lived in a separate dwelling, similar to the national average. However the survey cohort can be described as upwardly mobile with few of the respondent's intent on staying in their current accommodation. Respondents were asked if they would prefer to move their main residence closer to a town near their place of work and whilst they indicated a preference for moving in general less than a third would consider moving closer to the mine site. Of those respondents who would like to move closer to their workplace 32 percent defined being closer as within 20 kilometres, with thirty six percent between 21-100 kilometres, and the remainder 101 kilometres or more.

The majority of respondents had their main residence within the central Queensland region (53%), with almost seventy percent living in central, northern or western Queensland (Table 2). Twenty percent were located in south East Queensland and less than ten percent resided interstate or overseas. Over seventy two percent lived in locations that could be described as coastal with the remainder in either the hinterland or out west.

Table 2 Location of main residence by regions

		Percent
Central Qld	149	52.65
South East Qld	60	21.20
Northern Qld	30	10.60
Interstate	28	9.89
Western Qld	14	4.95
Overseas	2	0.71
Total	N=283	100

The main resident location was recoded to reflect coastal and non-coastal preferences (Table 3).

Table 3 Main residence by non/coastal location

		Percent
Coastal	205	72.44
Non-coastal	78	27.56
Total	N=283	100

The main reasons given for their location choices were that the family liked the lifestyle, that the location was close enough to the coast and that the town was large enough to have most of the required services. The respondents were asked why they preferred not to move closer to the mine locations (situated inland from the coast and some distance from the major regional hubs). The main reason was housing affordability with housing costs close to the mine prohibitively expensive (Table 4). This was followed by the reluctance of family members wishing to relocate and a perceived lack of retail and recreation facilities.

Table 4 Main reasons not to move closer to the mine site

		Percent
Housing is too expensive	108	18.31
Family will not move	76	12.88
Lack of retail and other commercial services	66	11.19
Lack of recreation/entertainment facilities	63	10.68
Lack of housing for rent	55	9.32
Lack of jobs for partner/children	50	8.47
Lack of education facilities	39	6.61
Lack of health and other human services	38	6.44
Lack of housing for purchase	33	5.59
Other factors	32	5.42
Already live in closest location	30	5.08
Total	N=590*	100

*Multiple responses

Part of the puzzle with housing choices for mining employees is that while they indicate a desire for upward mobility and possibly reflect a cohort with the financial capacity for this, but the majority of the employees wish to stay relatively close to their current locations. For example, the highest

preference of those choosing to shift would be to relocate within the central Queensland region (30%).

In an attempt to elicit the importance of issues involved in work and housing choices the respondents were asked to rate the importance of the following issues if they were offered work in a different location. In Table 5 the importance of the issues is shown ranked by the mean scores (5 point likert scale) where one equals 'not very important at all' and five equals 'very important'. The highest ranking factors scoring above four (very important) are; a shift work pattern that suited their lifestyle, increase in salary, working in a stimulating job, working in a supportive company, having block work periods and then time off, and the quality of housing available.

Of the issues presented to the mining village residents the only one which rated as only 'slightly important' was *not living in a work camp (mining village)* which supported the preference of the mining village option for the mining workers.

Table 5 Importance of work and housing choices

	Mean
Having a shift work pattern that suits my lifestyle	4.41
Increased salary	4.31
Working in a stimulating job	4.24
Working in a supportive company environment	4.21
Having block work periods and then time off	4.06
Quality of housing available	4.00
Access to family and friends	3.97
Career path development or promotion	3.96
Travel and other living costs	3.95
Type of community to live in	3.92
Being somewhere that suited the family	3.77
Having access to health and other human services	3.76
Housing costs	3.72
Having access to recreation services	3.66
Having access to retail and other commercial services	3.50
Able to get to work each day from the family home	3.48
Able to live where there are social opportunities	3.27
Not have to drive to and from work each day	3.17
Having access to education services	3.12
Not living in a work camp (mining village)	2.78

Mining village liveability

The mining village respondents were asked to rate the liveability of the region in which the mining village is located on a ten point scale with one equal to *poor liveability* and ten equal to *excellent liveability*. The score out of 10 was compared to the same question asked of a random selection of households of the Mackay, Whitsunday and Isaac regional council areas in central Queensland. Overall the mining village respondents scored the liveability of the region lower than the regional council areas with the mining village occupants scoring 6.25/10 and the regional council residents

scoring 7.22/10. However, the mining village occupants rating for the mining village was slightly higher than the region with 6.59/10 but was still less than the residents of the region.

In addition to the single measure of liveability of the mining village and the region, the mining village respondents were asked to rate nine key factors of liveability on a five point likert scale with one equal to *very dissatisfied* and 5 equal to *very satisfied*. The results are present in Table 6 with the comparable results in parenthesis from the 2008 Mackay Whitsunday REDC: Liveability Survey (Mackay, Whitsunday and Isaac regions only N=900). Significantly the environment factors of the regions climate (Mean 3.59) and the management of the natural environment (Mean 3.45) rated the highest. The least satisfaction was with the level of entertainment and feeling part of the community. In comparison with the regional community liveability survey the mining village cohort expressed less satisfaction with '*feeling part of the local community'* which is to be expected considering they live separated from the main townships in the region in most cases. They were also less satisfied with the local hospital services and the regions climate. Overall they expressed less satisfaction then the resident population apart from a slightly higher rating for telecommunication services.

In comparing the satisfaction of the variables of liveability between the non-resident mining village cohort and the resident cohort there are three factors which show a difference. The largest difference in mean values with the resident sample indicating a higher level of satisfaction is not surprisingly for 'feeling part of the local community', the 'regions climate' and the local sport and exercise facilities (Table 6).

Table 6 Satisfaction with liveability variables

	Mean[2]
The regions climate	3.59 (4.22[3])
The management of the natural environment in your community	3.45 (3.35)
Telecommunications services such as (mobile phone coverage, internet services)	3.24 (3.16)
Availability of everyday goods	3.04(3.54)
Access to local GP/Allied health services	2.81 (3.37)
The local sport and exercise facilities	2.80 (3.58)
Local hospital services	2.79 (3.29)
Feeling part of your local community	2.68 (3.66)
The level of entertainment available in your community	2.38 (2.74)

The mining village respondents were also asked their level of agreement with a series of statements about the liveability of the location they live whilst at work. The results shown in Table 7 are again compared to the results from the Mackay Whitsunday REDC Liveability Survey 2008. The highest levels of agreement being that 'work is accessible' (Mean 3.54) and that there are 'good career path' (Mean 3.32) and 'good employment opportunities' (Mean 3.26). The liveability statement with the least amount of agreement from the non-resident mining village occupants was the affordability of housing in the region (Mean 2.30).

[2] Independent T-Test are shown in the appendix

[3] Figures in parenthesis relate to the Mackay Whitsunday REDC: Liveability Survey 2008 Mackay, Whitsunday and Isaac regions only (N=900)

The level of agreement by the non-residents for the statement that 'I enjoy living in this area' differed most from the resident population with the mining village occupants indicating less agreement than residents. There was also a notable difference on the statement that 'the local community has a distinct character, it's a special place', with non-residents agreeing less with this statement.

There were two statements which the mining village occupants agreed with more than the resident population and they were that 'pollution is a problem in the area' and that the 'maintenance of rural/urban road infrastructure is very good'.

Table 7 Agreement with liveability statements

	Mean
Work is accessible where I reside	3.54 (3.78[4])
There are good career pathways in region	3.32 (3.46)
There are good employment opportunities in the region	3.26 (3.79)
Schools are conveniently located	3.20 (4.10)
Parks and open spaces in your area are usable and friendly	3.18 (3.84)
The region has the right balance between industrial development and environmental management	3.09 (3.15)
I enjoy living in this area	3.05 (4.30)
My community is an accepting place for people from diverse cultures and backgrounds	3.02 (3.78)
The quality of schools in my area are excellent	3.00 (3.82)
The local community has a distinct character, its a special	2.90 (3.91)
The community where I reside is supportive of newcomers	2.88 (3.66)
Pollution is a problem in my area	2.75 (2.34)
The maintenance of rural/urban road infrastructure is very good	2.63 (2.18)
There are good public services (government agencies, banks, post office etc.)	2.62 (3.37)
The range of housing choices available in my area is good	2.26 (2.58)
Housing is affordable in the region	2.03 (4.15[5])

A satisfaction rating was compiled for aspect of the mining village. The five point likert scale ranged from one equal to 'least satisfied' to five equal to 'most satisfied'. The highest rated item was the general facilities (Mean 3.69) and location of the villages (Mean 3.55). The services provided and the village environment all score above a neutral score of three however the least amount of satisfaction was expressed with the recreation facilities within the miner village (Table 8).

Table 8 Satisfaction with mining village facilities and location

	Mean
General facilities of the MAC village (room, canteen, etc)	3.69
The location of the MAC village	3.55
Services provided at the MAC village (laundry, meals etc.)	3.45
MAC village environment (water/air quality, open green space, parking etc.)	3.38
Recreation facilities provided at the MAC village	2.79

[4] Figures in parenthesis relate to the Mackay Whitsunday REDC: Liveability Survey 2008 Mackay, Whitsunday and Isaac regions only (N=900)

[5] This item was presented differently in the Mackay Whitsunday 2008 survey

Whilst the mining village survey as part of this research were administered from the one company the experience of the miners was broader with three out of four of the miners having resided in another mining village.

Conclusion

The acceptance of the mining village accommodation solution by the surveyed mining village residents and the reluctance of mine workers to express the desire to locate to more permanent housing options within the Bowen Basin region is not an unexpected outcome. The location choices of the non-resident workers in the first instance reflects the limited options available considering the high cost of private rental options in the region. Of concern however is that those choices, or trade-offs, may underplay the possible negative social consequences that can stem from the dislocation of families, in particular absent fathers and the impact this has on families.

The locational choice in the second instance illustrates the ability of active agents to engage in substantive tradeoffs and reflect a strong social resilience in order to gain a significant financial advantage, especially in highly competitive labour markets.

That mining villages appear to be changing from the appearance of desolate 'correction facilities' to mining villages that resemble a 'softened' work environment is a positive move and is reflected cautiously in the survey results. The liveability of mining villages is becoming a concern and while there is substantial work to be completed, at a minimum the design and environment of mining villages is being considered in new development and assessment processes.

At the regional level the support for mining villages within Bowen Basin townships would appear less than favourable. These concerns need to be engaged with in a positive way that looks for innovative and sustainable solution. This research has shown that there is substantial support for flexible, highly mobile accommodation solutions for modern mine workers. There is also likely to be continued growth of the non-resident workforce in the Bowen Basin area as well as other resource intensive areas in Australia. Mining villages are likely to become a standard feature of these areas.

An increased focus on improving the liveability of mining villages in terms of service provision and environmentally sensitive design can be of benefit for not only the mining village occupants but also for the existing communities located nearby. By careful examination of the points of difference in the debate over non-resident accommodation options it should be possible to develop sustainable benefits for all who enjoy the Bowen Basin region.

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Appendices

INDEPENDENT T-TEST

Method: Independent t test is used to compare the mean of two independent samples on a single dependent variable. This is used to test the hypothesis that the difference between the overall means of data of two samples is equal to 0. When the *p*-value is less than the conventional 0.05, the null hypothesis is rejected and the conclusion is that the two means indeed differ significantly.

Findings:

Table 9: Satisfaction with the liveability variables: Group 1 (Table 6)

Liveability variable	Mining villages			WMI Community			p-value*	Comment (on difference)
	n	Mean	Std. Dev.	n	Mean	Std. Dev.		
Regions climate	244	3.5902	1.0164	1200	4.1817	0.8950	>0.0001	Significant
Management of natural environment	242	3.4504	1.0142	1200	3.1483	1.3151	0.0008	Significant
Telecommunication services	216	3.2407	1.3285	1200	2.9333	1.4711	0.0042	Significant
Availability of everyday goods	246	3.0407	1.1528	1200	3.4800	1.2066	>0.0001	Significant
Access to allied health	229	2.8079	1.3105	1200	2.9858	1.5003	0.0939	Insignificant
Sport and exercise facilities	231	2.8009	1.2280	1200	3.2050	1.5088	0.0001	Significant
Local hospital services	228	2.7895	1.2164	1200	3.3242	1.3585	>0.0001	Significant
Feeling part of community	236	2.6822	1.1507	1200	3.6592	0.9994	>0.0001	Significant
Level of entertainment	235	2.3787	1.2006	1200	2.6517	1.2955	>0.0028	Significant

**Two-sample t test with equal variance*

Table 10: Satisfaction with liveability variables: Group 2 (Table 7)

Liveability variable	Mining villages			WMI Community			*p*-value*	Comment (on difference)
	n	Mean	Std. Dev.	n	Mean	Std. Dev.		
Work is accessible	238	3.5378	1.0969	1200	3.4650	1.4055	0.4505	Significant
Good career pathways in region	233	3.3219	1.1388	1200	3.1917	1.4514	0.1959	Significant
Good employment in region	234	3.2607	1.2099	1200	3.5217	1.4628	0.0105	Significant
Schools are conveniently located	222	3.2027	1.0927	1200	3.4900	1.6398	0.0122	Significant
Parks/open spaces are usable	220	3.1773	1.0856	1200	3.6625	1.3006	>0.0001	Significant

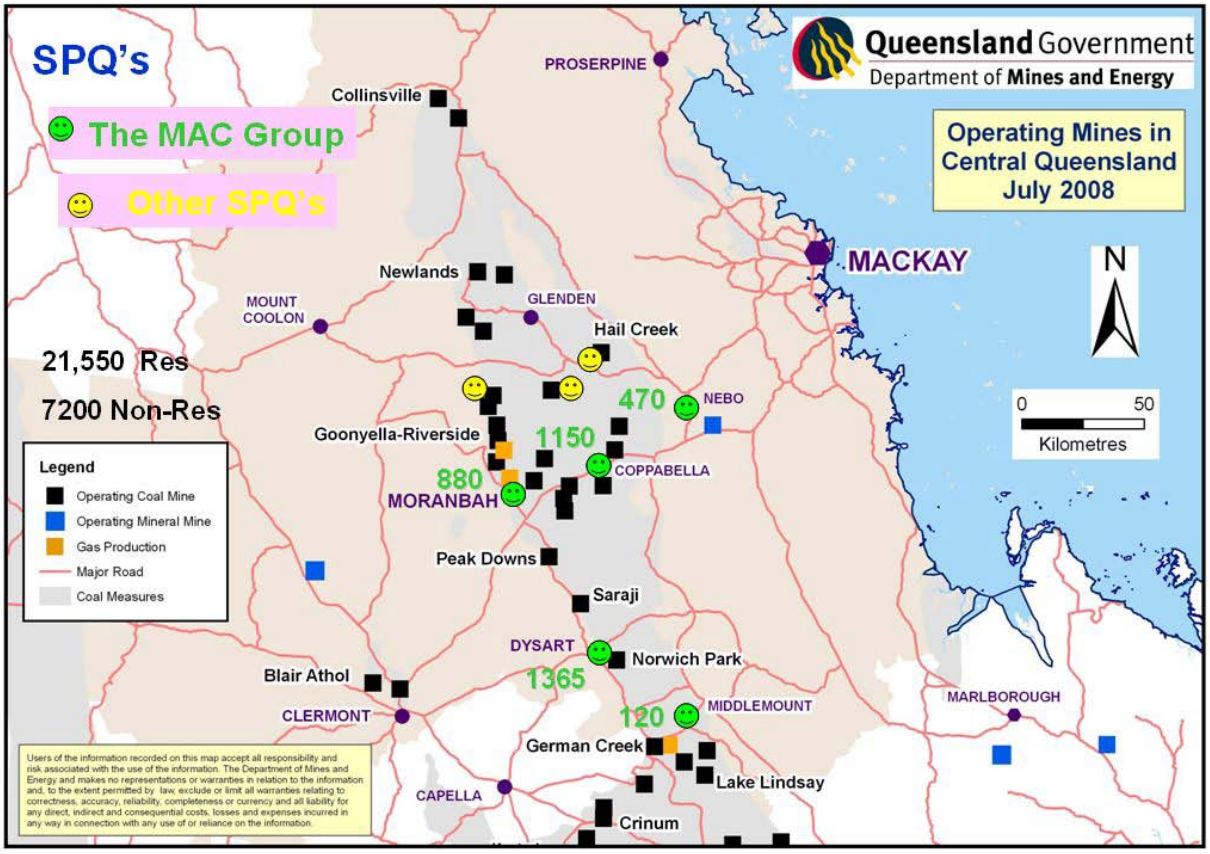
Right development balance	223	3.0942	1.0376	1200	2.8233	1.4244	0.0068	Significant
Enjoy living in area	231	3.0476	1.2095	1200	4.0842	1.1430	>0.0001	Significant
Community is accepting place	228	3.0219	1.1084	1200	3.5475	1.2835	>0.0001	Significant
Quality of schools are excellent	205	3.0049	1.0595	1200	3.0017	1.7727	0.9800	Insignificant
Community has a special character	233	2.9013	1.1000	1200	3.9233	1.0575	>0.0001	Significant
Community is supportive	230	2.8783	1.1265	1200	3.3892	1.3617	>0.0001	Significant
Pollution is a problem	231	2.7489	1.1062	1200	2.2100	1.3073	>0.0001	Significant
Road infrastructure is good	235	2.6340	1.2584	1200	2.2275	1.2814	>0.0001	Significant
Good public services	234	2.6239	1.1514	1200	3.1900	1.3990	>0.0001	Significant
Housing choices is good	230	2.2565	1.0936	1200	2.4333	1.4407	0.0776	Insignificant
Housing is affordable	233	2.0300	1.2084	1200	3.7075	1.6245	>0.0001	Significant

**Two-sample t test with equal variance*

Discussion: The independent sample t-test investigated that there is a significant difference by opinion or by standard in all Group-1 liveability variables (Table 9) except access to allied health; also within these variables of significant difference, there is extremely significant difference by opinion or standard between Mining Villages' residents and WMI residents in five different variables: regions climate, availability of everyday goods, local hospital services, community feelings and level of entertainment. So local climate, goods and services and social cohesion make significant differences in liveability between living in the mining villages and within the WMI region.

The same test also investigated that there is a significant difference by opinion or by standard in all Group-2 liveability variables (Table 10) except quality of schools and housing choices; also within these variables of significant difference, there is extremely significant difference by opinion or standard between Mining Villages' residents and WMI residents in nine different variables: usable park and open spaces, enjoy living in area, community's spatial accepting, special character and supportiveness of the community, good road infrastructure and public services, and affordable housing. This indicates that access to social and recreational services, community's spatial feelings and affordable housing make significant differences in liveability between living in the mining villages and within the WMI region.

Location of The MAC Service Group mining villages



The ***MAC Coppabella***, established in March 2006 is situated at the opposite side of the Peak Downs Highway to the Coppabella Township, 150kms west of Mackay. Coppabella is midway between Nebo and Moranbah and it services surrounding coal mines. It has 900 rooms situated on 80ha land site.

The ***MAC Nebo***, established in October 1998 is situated on the outskirts of Nebo, 91kms west of Mackay. Nebo, a historical town surrounded by cattle grazing and agricultural crops, has a population of 2,100 people. There are currently 628 rooms at the Nebo Village on 8.78ha site. The Nebo facility houses the "Coolibah Tavern" which is available for use by both village guests and the general public.

The ***MAC Moranbah***, established in August 1996, is situated in the township of Moranbah, 191km west of Mackay. Moranbah is a thriving, single-purpose mining town with a population of nearly 8,000 people. It has a multitude of shops and facilities available. The village has 1056 rooms on 6.71ha site.

The ***MAC Dysart***, established in June 1997, is situated within the township of Dysart, 280km south west of Mackay. Dysart is a friendly community with a current population of 4,000. It has 733 rooms on 19.57ha land area. In addition to the standard accommodation, The MAC Dysart also includes a caravan park. Additional facilities include dining room, recreation room, internet café, retail outlet and a new administration building.

The ***MAC Middlemount***, established in October 2007 when the lease of the Middlemount Caravan Park was acquired from CapCoal. The park includes new villas (24) and new cabins to accommodate short-term contractor and consultants.

Standard mining village facilities

The newly constructed MAC Service Group mining villages are modern, en-suited and in varying sizes (15.5 sq. m, 24 sq. m. and 48 sq. m.). The minimum industry standard is a single room (11 sq. m) with private shower and toilet facilities. There are three options available:

1. Rooms are reserved for use by a single employee, with the room remaining unoccupied on the employee's non-rostered shifts.
2. Motelling of rooms, where employees are allocated rooms from a contracted pool for each period that they are working. They are allocated different rooms each time they stay and need to take their belongings with them on departure.
3. Sharing of rooms between two employees. A double lockable cupboard can be installed so that belongings can be stored. On changeover days where an employee needs to sleep after night shift, the employee is allocated another room from the pool for that period.