Community Choices Among Options for the Development of the Moranbah Township

RESEARCH REPORT No 6.

John Rolfe and Galina Ivanova

IMPACTS OF THE COAL MINING EXPANSION ON MORANBAH AND ASSOCIATED COMMUNITY

May 2007

The report series titled **Impacts of the Coal Mining Expansion on Moranbah and Associated Community** *is published by the Centre for Environmental Management, Central Queensland University, Rockhampton.*

These reports represent the provisional findings of a project titled **Impacts of the Coal Mining Expansion on Moranbah and Associated Community.** *The project has been funded by the Queensland Department of Local Government, Planning, Sport and Recreation.*

The views and interpretations expressed in these reports are those of the author(s) and should not be attributed to the organisations associated with the project.

Any comments will be gratefully received and should be directed to Professor John Rolfe or to Associate Professor Stewart Lockie:

Professor John Rolfe
Centre for Environmental Management
Central Queensland University
Rockhampton, 4702
j.rolfe@cqu.edu.au
(07) 4923 2132 (ph)

Associate Professor Stewart Lockie
Faculty of Sciences, Engineering and Health
Central Queensland University
Rockhampton, 4702
s.lockie@cqu.edu.au
(07) 4930 9209 (fax)

Executive Summary

1. This report provides two key insights about how residents of Moranbah viewed options for the development of their township. Residents were asked about their preferences for development options for their community in two different ways in a survey format.
2. First, they were asked how worthwhile it would be to achieve some of the options if it came at a financial cost to them (the Choice Modelling experiment).
3. Second, they were asked how the different development options might influence their decision to stay or shift from the town in the future (the choice behaviour experiment).
4. The average number of years that respondents expected to stay in Moranbah was 8.5 years. When asked where they would move to, the most nominated area was Mackay (25%). Almost no respondents indicated that they would move to another mining town.
5. Both approaches generated the same priority for the attributes, with *Population in Workcamps* (the extent of workcamps in Moranbah) being the most significant explanator of choice, and the *Water Restriction* attribute being the least significant.
6. The Choice Modelling experiment only revealed slight differences in rankings between the *Housing and Rental Prices, Buffer for Mine Impacts Close to Town,* and *Water Restriction* attributes, whereas the contingent behaviour results ranked *Buffer for Mine Impacts Close to Town* as being more influential than *Housing and Rental Prices*.
7. There are also some differences in terms of the other attributes that were significant in the statistical models in terms of explaining choice. Gender was a significant factor in town development choices as well as household income, the number and age of children in a family and the age of respondents.
8. The implications of this study confirm the importance of the workcamp issue in terms of community perceptions about the 'liveability' of Moranbah. In both versions of the survey, offering a higher proportion of new population growth in workcamps made the options much less attractive.
9. The models indicated an average value to households of living in Moranbah with little workcamp development as compared to extensive workcamp development was $3,144 per year. Respondents indicated that they would reduce their length of stay in Moranbah by 2.6 years if workcamp development went from a low base to a high level of development.
10. It is not clear from this survey why workcamps are viewed so unfavourably in terms of town development, but it is possible that increased workcamps have been treated as a proxy for effects such as reduced community stability.
11. The value of much more attractive rental prices (a major fall) was identified at $559 per household per year, the value of improved water services at $415 per year, and the value of having a good buffer against mining impacts on the town was assessed at $494 per household per year.

Table of Contents

List of Tables

List of Figures

6.1. Introduction: Background and Objectives of the Study

Recent growth in the coal industry in the Bowen Basin is generating a number of impacts, both positive and negative, on communities in the region. This growth has put pressure on the supply of infrastructure, resources and skilled labour, and identified needs for better planning and integrated infrastructure development. There also have been changes in employment patterns within the coal industry over the past few years, with more emphasis on the use of contractors to perform some or most of the mining operations and an increased usage of variations on drive-in/drive-out (or fly-in/fly-out) operations. This had led to a workforce model where mine employees increasingly use temporary accommodation for the period of their shift, often supplied by third-party commercial operators, rather than traditional more permanent residences and community facilities supplied by the mining company.

For towns in the Bowen Basin such as Moranbah, the restructuring in the mining industry of the later 1990s, followed by the mining boom from 2003, has generated a number of key issues. Key ones can be summarised as follows:

- The decline in population and business activity followed by rapid growth from 2003 has not been constructive to stable growth,
- Demands for housing and services have outstripped supply, leading to bottlenecks and delays,
- The development of new mines and enterprises is not necessarily coupled with development in the town,
- There are large spending leakages to other areas as Moranbah residents make more purchases elsewhere and a higher number of employees make their residential base elsewhere,
- Short term development pressures means that additional labour in the region tends to be housed in workcamps rather than in permanent accommodation, and
- Social trends, demographic changes and increased wealth mean a higher proportion of people prefer to locate in coastal areas, urban centres and regional hubs.

The economic challenge for regional development in mining areas is to optimise the advantages of the booming resource industry, minimise any offsetting costs of impacts and to secure future development of the region. There are many options for the development of towns such as Moranbah (such as to choose between building more work camps or permanent houses) but there is limited knowledge about how to prioritise the options. Factors that are likely to influence the desirability of different development options include the costs involved, the wishes of the relevant community, predictions about demographic, economic and social trends, and the strategic planning and development priorities of the local and state governments.

Understanding what the community wants and how the community might prioritise different options is an important factor in helping to direct development in a town and region. This is because developments that meet with community approval are more likely to be accepted by residents, to generate subsequent multiplier effects, and to build social capital. In this report, research assessing the views that residents of Moranbah hold about the potential development of their community is detailed.

The report is part of a wider study conducted by Central Queensland University (CQU) into the economic and social impacts of mining on Moranbah and options for future growth. The CQU research team has conducted a similar study in the Bowen Basin where several social and economic assessment tools (such extended stakeholder analysis, Choice Modelling and experimental workshops) were used to elicit the views and opinions of local communities (Rolfe et al. 2005). This study is built on the previous research by using one of the assessment tools of Choice Modelling to identify how town residents view different community development options.

The data was collected by surveying a random sample of households in Moranbah. The Choice Modelling survey involved asking town residents if some improved town development options were attractive enough for them to be prepared to incur higher costs to achieve them. Respondents were also asked in a similar set of tradeoffs if they would change the number of years they planned to stay in Moranbah when different town development options were presented. These contingent behavior questions were designed to supplement the choice modeling questions and help identify the importance of key attributes.

The rest of the paper is structured as follows. A relevant literature review is provided in the next section, and an overview of the methodology used for the survey conducted in Moranbah is presented in Section Three. Results of choice modeling and choice behaviour experiments are presented in Sections Four and Five respectively, with discussions and final conclusions following in Section Six.

6.2. Overview of the Relevant Literature

There is a range of literature in economics and other fields that is relevant to the prioritisation of options for town development. There are at least three broad themes relevant to the issues for this study:

1. Regional economics and regional development issues,
2. Impact assessment and community planning, and
3. Housing pricing analysis.

The regional development theme is well established in the social sciences, with regional economics being a key discipline focusing on explaining why and how particular communities and regions are more successful than others. Much of the economic focus on regional development has been about the larger picture items such as the macro-economic settings of the national economy, levels of government investment in infrastructure, and the setting of institutional frameworks which encourage independence and innovation in regions (Beer et al. 2003). While the economic vision for regions is to become dynamic areas of innovation and private sector development, there is not so much evidence at the local level about what are the key activities that regional communities can engage in to secure further development. Much of the focus has been on economic factors such as access to natural resources and transport links to explain growth patterns. In recent years there has been more extensive consideration of the roles played by non-economic factors such as social capital and collective knowledge building in regional development (BTRE 2003), and in the range of factors that attract and retain skilled labour to particular regions and communities (Miles et al. 2004).

The second theme of impact assessment is more focused at an individual case study level and identification of the different impacts that may be associated with particular development options. There are different forms of impact assessment, with Social Impact Assessment (SIA) largely focused on identification of impacts on the views and wellbeing of a community, and Economic Impact Assessment (EcIA) largely focused on predicting changes in income, expenditure and employment associated with new projects or other policy changes (Thomas 2001). While there are some benefits of community engagement associated with an impact assessment process, it does have limitations in not linking the community engagement process (part of the SIA) with the varying economic impacts (EcIA) (Rolfe et.al. 2005). This makes it difficult to use the outputs of an impact assessment exercise to identify how communities will prioritise different options for development that come with a range of different tradeoffs.

The third theme of housing analysis represents a more definitive assessment of the factors that people might take into account when purchasing homes. Hedonic pricing analysis is a statistical method of disaggregating property prices according to underlying attributes, hence providing insights into the factors perceived as important to home buyers. Typical factors that might affect housing prices can be property characteristics such as physical location, block size, type of the house, number of bedrooms, and closeness to services like shopping centres (Cheshire and Sheppard 1998). The effects of external environmental and social factors on housing prices have also been assessed with hedonic pricing studies. Examples of key factors include the effects of:

- air quality (Murdoch and Thayer 1988),
- water quality (Leggett and Bockstael 2000),
- distance from hazardous land risks (Dale et al. 1999, Kiel 1995),
- neighbourhood characteristics such as the type of housing, school quality, water amenities, education standards, and crime levels (Galster and Williams 1994, Dubin and Goodman 1982, and Haurin and Brasington 1996).

While hedonic pricing and other similar valuation techniques provide an analysis of the factors that drive private housing demand, they do not necessarily give a very accurate guide to the factors that deliver net community benefits. This is because the public benefits (or spillover effects) are unlikely to be represented in private investment decisions. A more desirable assessment technique would combine the predictive power of regional economic modeling with the community engagement processes of impact assessment and the more definitive attribute valuation of hedonic pricing.

Some steps towards such an integrated assessment of community development options have been developed by Rolfe et al. (2005) in the application of the Choice Modelling technique to community development options. Their previous work has assessed how two different communities in the Bowen Basin region of Central Queensland viewed different development options with varying levels of social and economic impacts from mining operations. One case study focused on assessing the impacts of mining on a predominantly mining service town, while the other focused on impacts in a predominantly agricultural shire. Each case study involved the application of the Choice Modelling technique to present different potential development options to the relevant communities. The results showed that while

mining was generally viewed in positive terms, there were varying levels of concern about different economic and social impacts.

6.3. Design and Performance of Surveys

6.4.1. Design of survey

Other stages in the identification and assessment of relevant impacts in the Moranbah community have been outlined in previous research reports for this project. The information about key issue from the literature review and extended stakeholders analysis were used to design a Choice Modelling survey for data collection. The survey needed to be broad enough to cater for key issues that might be important to different communities, and specific enough to provide useful feedback. The survey had to be simple and concise so that it was easy for respondents to complete, but still be capable of providing useful information.

A standardized introduction was designed specifically for the survey, followed by several options about the potential development of the Moranbah township. The inclusion of different options and the choice of collection techniques was driven by the Choice Modelling research design. It is not usually possible to undertake Choice modelling questions over the telephone. In this study, potential respondents were contacted by telephone and asked to participate in the research. They were then offered different ways of completing the survey questionnaire. The survey comprised of two parts: part A and part B. Respondents could choose to complete Part A of the survey over the telephone and have the Choice Modelling section (Part B) of the questionnaire mailed to their home address or emailed to them as a Microsoft Word attachment file, or they could have the whole questionnaire (Part A and Part B) sent to them via post or email.

Part A of the survey focused on questions related to

- the length of residence,
- occupation,
- structure of household,
- perceptions of the Moranbah community,
- spending patterns,
- views about current coal mining development,
- attitudes towards current high housing demands,
- factors that would encourage respondents to live in Moranbah,
- purchases outside Moranbah, and
- socio-demographic characteristics of respondents.

Part B of the survey focused on presentation of the Choice Modelling and choice behaviour questions. Three Choice Modelling and three choice behaviour sets were offered to respondents in eight different versions of the survey. There were also some follow up questions after the choice sets to explore reasons why different patterns of choice had been followed.

Care also had to be taken in the survey collection stage to ensure a representative sample of the community was approached. One of the reasons for adopting a multiple data collection strategy was to reduce non-response bias. The data collection period was also extended in order to capture those respondents who would have normally been absent during a shorter collection period.

6.4.2. Design of the Choice Modelling Section

Choice Modelling involves asking respondents to a survey to make a series of choices about alternative scenarios or profiles. In this study each choice set involved three profiles describing the alternatives on offer. One of the profiles described the expected development outcome in five years time, and remained constant between the choice sets. The other profiles varied, so that respondents were being asked to make a series of similar, but different choices. An example of a choice set used in this experiment is given in Figure 1.

The design of a Choice Modelling application involves several stages:

- The first task is to select the set of attributes used to reflect key impacts of community development on people. This requires an extensive consultation phase with both the "experts", such as local government planners, and community members. This was undertaken through the extended stakeholder analysis.
- The second task is to identify the range over which each attribute will vary. This involves advice about the potential changes in attributes over the relevant time period.
- The third stage involves setting the framework and base scenarios. The main options are to firstly, identify the current situation and potential variations in future development outcomes, or secondly, identify the expected future outcome and options to improve it. To make the options easier for respondents to assess, a future base scenario and potential 'improvements' were chosen.
- The fourth step is to develop the questionnaire which includes the choice sets where the different options are presented. An additional task here to identify a sub sample of potential ways of combining the attributes and levels into the choice sets to be offered.

The profiles were made up of a number of attributes that describe the issue in question. These attributes were selected from stakeholder analysis interviews as the key factors of relevance to the development of the Moranbah community. The key attributes included in the choice sets were:

- Additional annual costs to the household.
- Prices of housing and rentals.
- Level of water restrictions.
- Buffer for mine impacts close to town.
- Population in workcamps (for growth in population of 5,000 people).

In this experiment, five attributes were used to describe each profile. To generate differences between profiles, these attributes were allowed to vary across different levels (e.g. $0, $250, $500 and $1,000 in *Additional annual costs to the household*).

These profiles then represent different options for respondents to consider. The levels in the constant 'opt-out' option remained set across the choice sets. The attributes and levels used in the profiles are shown in Table 1.

There are a large number of potential profiles that could be drawn and presented to respondents. As it was only possible to present a selection of profiles, an experimental design process was used to select the profiles, and then partition them into blocks for presentation to respondents in different versions of the survey.

Table 1. Attributes and levels for the choice sets.

Attributes	Levels
Additional annual costs to the household	$0 (base), $250, $500, $1,000
Prices of housing and rentals	• 25% increase • No change (base) • 25% decrease
Level of water restrictions	• None for households, town parks and gardens are drier than now • Some for households, town parks and gardens are drier than now (base) • None for households, town parks and gardens are greener than now
Buffer for mine impacts close to town	• Moderate impacts from noise, vibration and dust (base) • Slight impacts from noise, vibration and dust • No additional impacts
Population in workcamps	• No more housing, 5,000 in workcamps • 1,000 in housing, 4,000 in workcamps (base) • 4,000 in housing, 1,000 in workcamps

Figure 1. Example choice set used in survey

2	**Question 2:** Carefully consider each of the following three options. Suppose options A, B and C were the only options available, which would you choose?				
Additional annual costs to your household	**Housing and rental prices**	**Level of water restrictions**	**Buffer for mine impacts close to town**	**Growth in population of 5,000 people**	***I would choose***
	Potential Condition in 5 years time (Options A,B and **(Expected outcome under current policy pressures)**				
Option A					
$0	**No** change	**Some** for households, town parks and gardens are **drier** than now	**Moderate** impacts from noise, vibration and dust	1,000 in housing, 4,000 in workcamps	
Option B					
$250 ($21/month)	**No** change	**None** for households, town parks and gardens are **drier** than now	**Slight** impacts from noise, vibration and dust	4,000 in housing, 1,000 in workcamps	
Option C					
$1,000 ($83/month)	**25% increase**	**None** for households, town parks and gardens are **greener** than now	**Slight** impacts from noise, vibration and dust	1,000 in housing, 4,000 in workcamps	

A key stage in the application of the Choice Modelling exercise is to explain to respondents what the purpose of the exercise is and how it will be presented. To achieve this the following information was provided to respondents (Figure 2).

Figure 2. Information provided to respondents

In the next few questions, we ask you about some options for future development of Moranbah. In each question, we are going to give you two options on how the town could develop in the future; each option is different, but similar.

We've identified some of the most important issues from talking to a range of people in the community. To keep the questions simpler, we've focused on four key issues.

Each option involves a tradeoff, where we show that the positive development outcomes might involve some costs to Moranbah residents. We have summarised this as a **reduction in your disposable income**, which might occur because of a mixture of:
- extra support for local businesses and services although local prices are higher;
- increased charges by state and local government to provide better services; and
- reduced wages from coal mining companies so they can minimise impacts from new developments

There are **no current plans** for any of these extra charges – first we are trying to find out if residents think it is worth developing the town in specific ways.

If you would prefer town development to continue as it is now, you can choose the "Option A" option on each page.

There are no right or wrong answers – we are just interested in your opinions. There are three similar choice sets on the pages that follow.

6.3.2 Performance of the survey

The survey of residents conducted in Moranbah used combined phone and mail-out techniques. The survey was conducted by the Population Research Laboratory at Central Queensland University during November 2007. A general quota of 100 residents was targeted for the Choice Modelling part, and the selection method was applied consistently until this quota was met. Potential respondents were selected at random from current land based telephone numbers using a market pro database. To allow for diversity in respondent lifestyles, the timing of questionnaire distribution was varied and covered weekends and weekdays, mornings, afternoons and early evenings. The questionnaire was pilot-tested by trained interviewers on a number of randomly-selected households in the Moranbah. Interviewer comments (e.g. confusing wording, inadequate response categories, and question order effects) and pre-test frequency distributions were reviewed before modifications were made to the questionnaire.

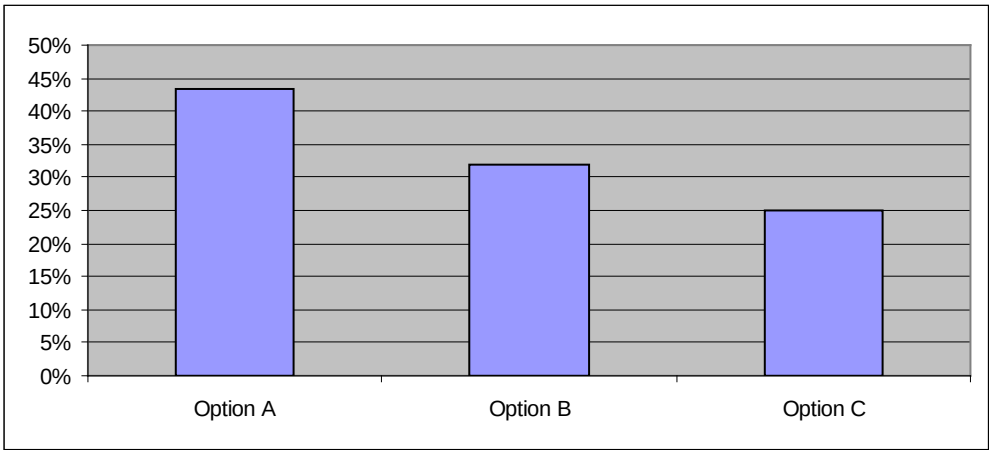
The target population designated for telephone interviewing was all persons 18 years of age or older who, at the time of the survey, were living in a dwelling unit in the town of Moranbah. The total random sample in Moranbah attempted by telephone interviewers was 1,034 households, with 320 successfully contacted. The survey response rate from contacted households was 41% and a total of 131 usable Choice Modelling questionnaires were collected.

6.4. Results of the Choice Modelling Experiment

6.4.1. Statistical models of the choice process

In the Choice Modelling experiment, participants were given three similar tradeoffs relating to their potential choices in town development, and asked to indicate their preferred choice in each. The number of choices made by respondents are summarised in the following figure. The dominant preference of respondents (57%) was for options B and C, implying they preferred to have some changes in community development pattern (Figure 3).

Figure 3. Support for different types of town development options



The choice information was analysed using a logistic regression (multinomial logit) model. The probability that a respondent would choose a particular town development can be related to the levels of each attribute making up the profile (and the alternative profiles on offer), the socio-economic characteristics of the respondent, and other factors. A summary description of the variables used in the statistical analysis and the original questions used in the survey is provided in Table 2.

Table 2. Variables used in the Choice Modelling analysis

Variable	Description/Original Question
ASC	Alternative Specific Constant (capturing the influence of other factors on choice)
Cost	Additional annual costs to your household
Housing and Rentals	Housing and rental prices
Water Restrictions	Level of water restrictions
Buffer for Mine Impacts	Buffer for mine impacts close to town
Population in Work Camps	Growth in population of 5,000 people
Female	Gender
Number of Children	How many children under the age of 18 years live in your household?
Income	Which broad income range is relevant for your household? (before-tax income for all household members)
Age	What was your age on your last birthday?
Length of residence	Q1: How long have you lived in Moranbah?
Enjoy living in Moranbah	Q6: Do you enjoy living in Moranbah?
Spending in Moranbah	Q9: Out of your TOTAL DISPOSABLE INCOME, what percent are you spending in Moranbah?
Improved services less travel	Part B Question 11: If shopping and services in Moranbah improved by 50%, how much less would you travel to Mackay?

A summary of the logistic regression model is presented in Table 3. The results show that model had high rho-square statistics, indicating an appropriate model fit.

Table 3. Multinomial Logit model for Moranbah Choice Modelling experiment

	Coefficient	Standard Error	Partworth, expected	Confidence intervals for Partworth (95%)	
				lower CI	Higher CI
Constant	-0.599	0.937	-$582	-$2,691	$1,300
Cost	-0.001***	0.000			
Housing and Rentals	0.284**	0.119	$276	$51	$601
Water Restrictions	0.218*	0.114	$212	-$6	$483
Buffer for Mine Impacts	0.248**	0.118	$241	$12	$541
Population in Work Camps	1.583**	0.144	$1,540	$1,048	$2,636
Female	1.243***	0.259			
Number of Children	0.261***	0.098			
Income	0.000**	0.000			
Age	0.037**	0.015			
Length of residence	-0.100*	0.053			
Enjoy living in Moranbah	0.212*	0.125			
Spending in Moranbah	-0.010**	0.005			
Improved services will reduce travel	0.025***	0.007			
Number of observations		420			
Log likelihood function		-316.4385			
R-sqrd		.31			

*** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.

For Moranbah residents, each of the Choice Modelling attributes was significant in explaining the choices between the options. Respondents were more likely to prefer the future scenarios that had higher levels of the attributes. As expected, they were less likely to choose scenarios that came at a higher cost. Gender was a significant factor in explaining choices as well as the number of children in a family, income and the age of respondent. Income and age had a weak effect on respondents' choices. There were four other attributes such as *Length of residency in Moranbah* that had a significant impact on respondent choices.

The *Length of residence* and *Spending in Moranbah* coefficients were negative, indicating that the longer respondents lived in Moranbah and the more of their budget was spent in Moranbah, the more likely they were to choose the status quo situation. In contrast, respondents who indicated that they did not enjoy living in Moranbah were more likely to choose the development improvement options.

The logistic regression function can be used to generate probabilities of choice, and estimates of economic value between different choice profiles. As well as these estimates of economic values, the models can also be used to generate estimates of marginal value changes for each attribute. Known as part-worths, implicit prices, or attribute values, these provide an indication of the annual value to respondents of each one unit change in the provision of an attribute (Rolfe, et al. 2000).

To compare results between models, part-worths were estimated for the attributes using the following equation:

Part-worth = -1 x Attribute coefficient/payment coefficient.

Summary results for the part-worths are also shown in Table 3. In each model, the part-worths show the value of a one-unit change in the attribute. For example, a change in the level of the Housing and Rental Prices attribute was valued at $276 per year by Moranbah respondents. The part-worths signal the value of changes within each attribute no matter whether the change is a loss or improvement for the residents.

The results provide some indication about the relative importance of the different attributes, with the *Population in Workcamps* attribute being relatively more significant than the other attributes. Of the other three attributes, the level of *Housing and Rentals*, and *Buffers for Mine Impacts* appeared to be slightly more important than *Water Restrictions* in determining choices[1].

6.4.2. Identifying Differences in Values within Attributes

Many of the attributes used in the Choice Modelling were categorical and ordinal rather than being metric. To determine if values were associated with particular categories of each attribute, the analysis had to be extended. Separate models were developed for each attribute in turn to compare choices a) between levels one and two; b) between levels two and three and c) between levels one and three. The results of these different models are shown in the Appendix, with summaries provided in Tables 4 and 5.

For each attribute, there was a significant and positive value in moving from the lowest level to the highest level (Table 5). For the *Housing and Rental Price* attribute, positive values were associated with decreasing the price of housing and rentals. For example,

[1] One of the levels in the *Water Restrictions* attribute may have been misinterpreted, leading to lower significance of this attribute.

respondents valued the change from the "No more housing, 5,000 in workcamps" development option to the "4,000 in housing, 1,000 in workcamps" development option at $3,154 per household per year. For some attributes, there were also values associated with intermediate changes. For example, a move from level 2 in the Work Camp attribute (1,000 in housing, 4,000 in workcamps) to level 1 (5,000 in workcamps) was associated with a reduction in value of $1,720 per household per year.

Table 4. Part Worths associated with changes in attribute levels

	Level 2 to Level 1		Level 3 to Level 2		Level 1 to Level 3	
	Coeff.	Part-worth	Coeff.	Part-worth	Coeff.	Part-worth
Housing and Rental Prices	-0.336	-$327	-0.238	-$232	0.574**	$559
Water Restrictions	-0.488**	-$475	0.062	$60	0.426*	$415
Buffer for Mine Impacts	-0.343	-$334	-0.164	-$160	0.508**	$494
Population in Work Camps	-1.767***	-$1,720	-1.474***	-$1,434	3.241***	$3,154

*** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.

Table 5. Part Worths for lowest to highest changes in attribute levels

Attribute	Lower level	Upper level	Value of change
Housing and Rental prices	25% increase	25% decrease	$559
Water Restrictions	None for households, town parks and gardens are drier than now	None for households, town parks and gardens are greener than now	$415
Buffer for Mine Impacts	Moderate impacts from noise, dust (base)	No additional impacts	$494
Population in Work Camps	No more housing, 5,000 in workcamps	4,000 in housing, 1,000 in workcamps	$3,154

*** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.

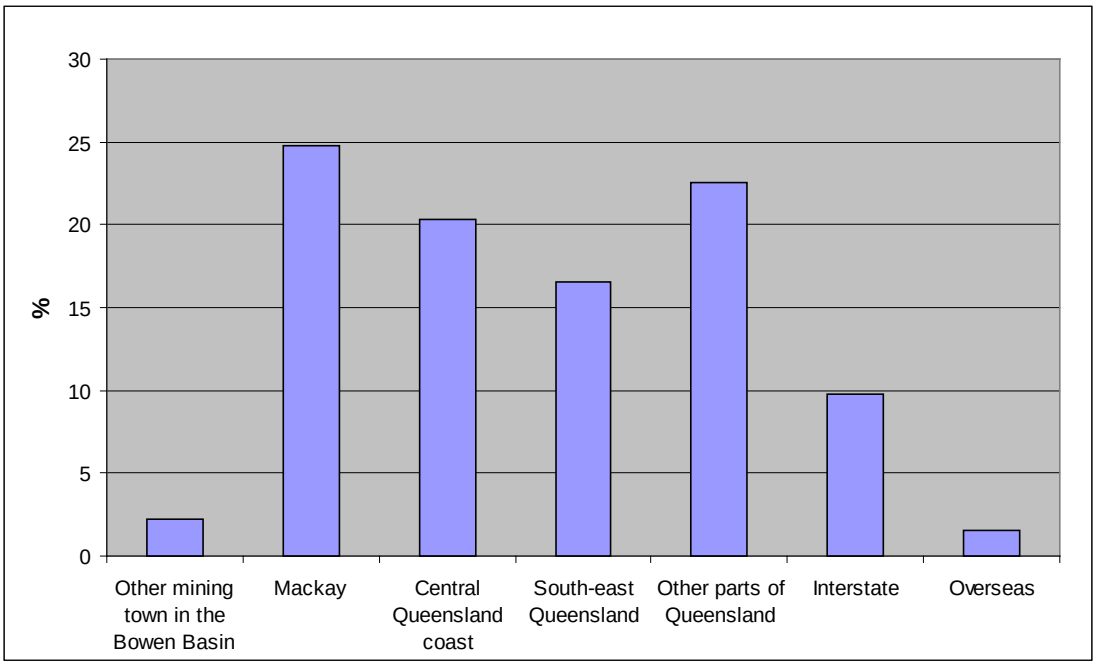
6.5. Results of the Choice Behavior Experiment

A critical issue in town development, especially when a region is facing a labour shortage, is to attract and retain population. While some methods (e.g. hedonic pricing analysis, choice modelling) identify tradeoffs among options, they do not necessarily provide insights into how the behaviour of respondents might change if they are to face different town development options. Choice behaviour analysis can fill this gap by identifying drivers of relocation options.

In this survey residents of Moranbah were asked about their intentions to remain living in the town when different development options were presented. A sample of the same profiles used in the Choice Modelling experiment was chosen for the choice behaviour questions. A total of 123 responses to the Choice Behaviour questions were obtained from the same survey collection.

To provide a reference point for analysis of the contingent behaviour data, respondents were first asked about their intentions to stay in Moranbah, and where they would go to if they did leave. Responses about where respondents would move from Moranbah are summarised below (Figure 4). About 25% of respondents would move to Mackay, with other parts of Queensland, the Central Queensland Coast and South East Queensland also receiving strong support. Only about 10% of respondents would move interstate while less than 2.3% of respondents would move to other mining towns in the Bowen Basin area.

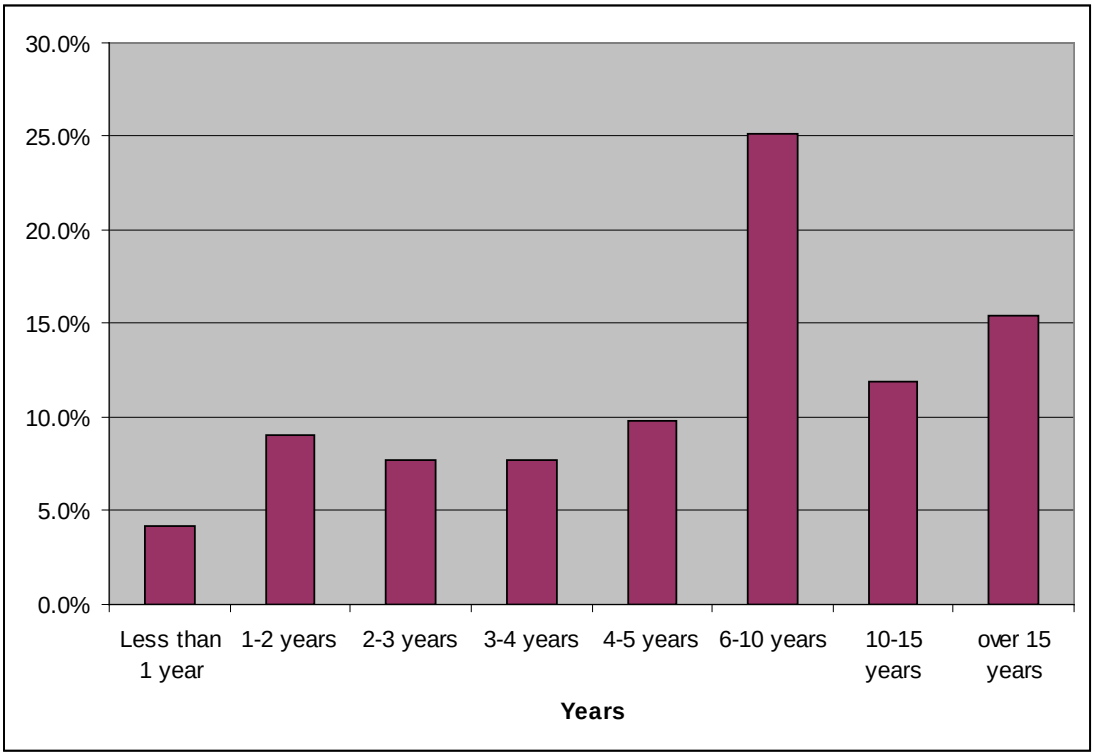
Figure 4. If you did move from Moranbah one day, where would you move to?



When respondents were asked "*At this stage, how many years do you think you and your family are likely to live in Moranbah?*" the mean number of years respondents stated they planned to live in Moranbah was 8.4 years. The results are summarised in Figure 5. More than 52% of respondents indicated that they would likely to live in Moranbah for more

than 6 years and only more than 4% of respondents thought that they would stay in Moranbah for less than a year.

Figure 5. At this stage, how many years do you think that you and your family are likely to live in Moranbah?



In the contingent behaviour model, the impacts of different development options were reflected in changes in the predicted length of stay in town. For the statistical analysis, the dependant variable was calculated as a difference between the number of years respondents stated originally and the number of years respondents stated after considering different profiles of town development. The same variables as in the Choice Modelling were used in scenarios presented to respondents:

- Housing and rental prices
- Level of water restrictions
- Buffer for mine impacts close to town
- Population in workcamps

An example of a choice profile offered in the contingent behaviour section is shown in Figure 6.

Figure 6. Choice profile.

Question 5. If the scenario below summarised the key changes in Moranbah in the next five years, would it change how long you think you would live in Moranbah?

Option 1	
• **Housing and rental prices**	*No change*
• **Level of water restrictions**	*Some for households, town parks and gardens are drier*
• **Buffer for mine impacts close to town**	*Slight impacts from noise, vibration and dust*
• **Population in workcamps**	*4,000 in housing, 1,000 in workcamps*

Please circle how many years from now you think you will live in Moranbah if this is how it develops (Remember your answer in Question 1)

less than one year	*1*
1 - 2 years	*2*
2 - 3 years	*3*
3 - 4 years	*4*
4 - 5 years	*5*
6 - 10 years	*6*
10 - 15 years	*7*
over 15 years	*8*
unsure	*9*

Linear regression models (Table 6) were significant in relating the dependant variable to the attributes of the development options and the characteristics of respondents. The results showed that *Population in Workcamps* is a highly significant predictor of a change in the number of years respondents would choose to live in Moranbah. Options with more housing development rather than workcamps increased the willingness of people to stay longer in Moranbah. The results from model 2 suggest that a change in one level of the *Population in Workcamps* attribute would reduce their planned stay in Moranbah by 1.34 years.

Another significant predictor was *Impacts from Coal Mines Close to Town*. The higher the impact from mines close to town the less the number of years that respondents indicated they would like to live in Moranbah. A change in one level of the attribute would reduce the length of planned stay on average by 0.7 of a year. The non-significance of coefficients for the *Housing and Rental Prices* and *Water Restriction* attributes indicates that these are less influential in determining the expected length of residence.

Females tended to state higher willingness to stay in Moranbah than males (significant at the 10% level). Families who have children in secondary school were less likely to state higher willingness to stay in Moranbah. The latter result indicates that even if more attractive development options are created for Moranbah, there will be still some population turnover for reasons such as education.

Table 6. Model for Choice of the Length of Living in Moranbah.

	Model 1		Model 2	
	Unstandardized coefficient	Standard error	Unstandardized coefficient	Standard error
Constant	5.845***	1.250	10.451***	2.820
CB Housing and Rentals	-0.294	0.300	-0.644	0.417
CB Water Restrictions	0.123	0.308	0.029	0.420
CB Buffer for Mine Impacts	-0.501*	0.302	-0.701*	0.403
CB Population in workcamps	-1.198***	0.309	-1.335***	0.405
Female			-1.268*	0.721
Younger than Primary School kids			-0.293	0.266
Primary school kids			-0.365	0.337
Secondary school kids			0.481*	0.289
Age			-0.048	0.049
Degree of freedom	347		216	
R Square	0.055795		0.109032	
Adjusted R Square	0.044784		0.070294	

6.6. Summary

This report provides two key insights about how residents of the Moranbah viewed options for the development of their township. After four key factors were identified to describe differences in future development paths, residents were asked about their preferences for the options in two different ways. First, they were asked how worthwhile it would be to achieve some of the options if it came at a financial cost to them (the Choice Modelling experiment). Second, they were asked how the different development options might influence their decision to stay or shift from the town in the future (the choice behaviour experiment).

The statistical analysis of the survey results identifies a number of similarities in the responses, as well as some key differences. While all four attributes used to describe the town profiles were significant predictors of choices in the Choice Modelling experiment, the *Water Restriction* and *Housing and Rental Prices* attributes were not significant in the choice behaviour experiment. In both approaches, the same priority for the attributes was revealed, with *Population in Workcamps* (the extent of workcamps in Moranbah) being the most significant explanator of choice, and the *Water Restriction* attribute being the least significant[2].

However, there were some differences in rankings for the other attributes across the two approaches. The results of the Choice Modelling experiment only revealed slight differences in rankings between the *Housing and Rental Prices, Buffer for Mine Impacts Close to Town,* and *Water Restriction* attributes, whereas the contingent behaviour results ranked *Buffer for Mine Impacts Close to Town* as being more influential than *Housing and Rental Prices.*

There are also some differences in terms of the other attributes that were significant in the statistical models in terms of explaining choice. Gender was a significant factor in town development choices as well as household income, the number and age of children in a family and the age of respondents.

The implications of this study confirm the importance of the workcamp issue in terms of community perceptions about the 'liveability' of Moranbah. In both versions of the survey, offering a higher proportion of new population growth in workcamps made the options much less attractive. It is not clear from this survey why workcamps are viewed so unfavourably in terms of town development, but it is possible that increased workcamps have been treated as a proxy for effects such as reduced community stability and lower levels of services and shopping. This would help to explain why respondents indicated that they would live for a shorter number of years in Moranbah if most of the population increase is housed in workcamps.

[2] It is possible this result is because of some potential ambiguity in the way that respondents interpreted the levels for this attribute.

6.7. References

Beer, A., Maude, A. and Pritchard, B. 2003 *Developing Australia's Regions: Theory and Practice*, University of New South Wales Press, Sydney.

Bureau of Transport and Regional Economics (BTRE) (2003) *Government interventions in pursuit of regional development: Learning from experience*, Working Paper No. 55, BTRE: Canberra.

Cheshire, P. and Sheppard, S. 1998 "Estimating the Demand for Housing, Land, and Neighbourhood Characteristics," *Oxford Bulletin of Economics and Statistics*, Department of Economics, University of Oxford, vol. 60(3), pages 357-82,

Dale, L., Murdoch, J., Thayer, M. and Waddell, P. 1999 "Do Property Values Rebound from Environmental Stigmas? Evidence from Dallas", Land Economics, 75(2), 311–26.

Dubin, R. and Goodman, A. 1982 "Valuation of Education and Crime Neighborhood Characteristics Through Hedonic Housing Prices", *Population and Environment*, 5(3):166–181.

Galster, G. and Y. Williams, 1994 "Dwellings for the Severely Mentally Disabled and Neighborhood Property Values: The Details Matter", *Land Economics*, 70(4):466–77.

Haurin, D. and Brasington, D. 1996 "School Quality and Real House Prices: Inter- and Intrametropolitan Effects", *Journal of Housing Economics*, 5:351–68.

Kiel, K. 1995 "Measuring the Impact of the Discovery and Cleaning of Identified Hazardous Waste Sites on House Values", *Land Economics*, 71(4):428–35.

Leggett, C. and Bockstael, N. 2000 "Evidence of the Effects of Water Quality on Residential Land Prices", *Journal of Environmental Economics and Management*, 2000, 39:2, 121–44.

Miles, B., Marshall, C., Rolfe, J. and Noonan, S. 2004 *"The attraction and retention of professionals in regional and remote areas of Queensland"*, Institute for Sustainable Regional Development, Central Queensland University, Rockhampton.

Murdoch, J. and Thayer, M. 1988 "Hedonic Price Estimation of Variable Urban Air Quality", *Journal of Environmental Economics and Management*", 15(2): 143–46.

Rolfe, J.C., Bennett, J. W. and Louviere, J. J 2000, "Choice Modelling and its Potential Application to Tropical Rainforest Preservation", *Ecological Economics*, Vol. 35, pp. 289-302.

Rolfe, J., Ivanova G. and Lockie S. 2005 *Assessing the Social and Economic Impacts of Coal Mining on Communities in the Bowen Basin: Summary and Recommendation*, Research Report 11, Socio-economic impact assessment and community engagement to reduce conflict over mine operations research reports, Centre for Social Sciences Research, Central Queensland University, Rockhampton.

Thomas, I. 2001 *Environment Impact Assessment: Theory and Practice*, Federation Press, Sydney.

6.8. Appendixes

Table 6A.1 Moranbah MNL Model

	Coeff.	Std.Err.	t-ratio	P-value
Alternative specific constant	-0.599	0.937	-0.639	0.523
Cost of options	-0.001	0.000	-4.332	0.000
Housing and rental prices	0.284	0.119	2.393	0.017
Water restrictions	0.218	0.114	1.917	0.055
Buffer against mining impacts	0.248	0.118	2.093	0.036
	1.583	0.144	10.962	0.000
Female	1.243	0.259	4.794	0.000
Children	0.261	0.098	2.681	0.007
Income	0.000	0.000	-2.050	0.040
Age	0.037	0.015	2.507	0.012
Length of residence	-0.100	0.053	-1.883	0.060
Enjoy living in Moranbah	0.212	0.125	1.694	0.090
Spending in Moranbah	-0.010	0.005	-2.070	0.038
Improved services will reduce travel	0.025	0.007	3.654	0.000
Number of observations				420
Log likelihood function				-316.43
R-sqrd				.31

Table 6A.2. Change in levels for Housing and Rental Prices

Base = Level 2	**Coefficient**	**Standard Error**
Constant	-0.636	0.951
Cost	-0.001***	0.000
Housing and Rentals Level 1	-0.336	0.250
Housing and Rentals Level 3	0.238	0.230
Water Restrictions	0.218*	0.114
Buffer for Mine Impacts	0.240*	0.123
Population in Work Camps	1.584***	0.144
Female	1.245***	0.260
Number of Kids	0.261***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.101*	0.053
Enjoy Moranbah	0.211*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Base = Level 1	**Coefficient**	**Standard Error**
Constant	-0.636	0.951
Cost	-0.001***	0.000
Housing and Rentals Level 2	0.336	0.250
Housing and Rentals Level 3	0.574**	0.239
Water Restrictions	0.218*	0.114
Buffer for Mine Impacts	0.240*	0.123
Population in Work Camps	1.584***	0.144
Female	1.245***	0.260
Number of Kids	0.261***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.101*	0.053
Enjoy Moranbah	0.211*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Base = Level 3	**Coefficient**	**Standard Error**
Constant	-0.636	0.951
Cost	-0.001***	0.000
Housing and Rentals Level 2	-0.238	0.230
Housing and Rentals Level 1	-0.574**	0.239
Water Restrictions	0.218*	0.114
Buffer for Mine Impacts	0.240*	0.123
Population in Work Camps	1.584***	0.144
Female	1.245***	0.260
Number of Kids	0.261***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.101*	0.053
Enjoy Moranbah	0.211*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Number of observations	420	
Log likelihood function	-316.41	
R-sqrd	0.31	

*** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.

Table 6A.3. Change in levels for Water Restrictions

Base = Level 2	**Coefficient**	**Standard Error**
Constant	-0.819	0.948
Cost	-0.001***	0.000
Housing and Rentals	0.300**	0.119
Water Restrictions Level 1	-0.488**	0.228
Water Restrictions Level 3	-0.062	0.233
Buffer for Mine Impacts	0.251**	0.119
Population in Work Camps	1.589***	0.144
Female	1.242***	0.260
Number of Kids	0.270***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.098*	0.053
Enjoy Moranbah	0.213*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Base = Level 1	**Coefficient**	**Standard Error**
Constant	-0.819	0.948
Cost	-0.001***	0.000
Housing and Rentals	0.300**	0.119
Water Restrictions Level 2	0.488**	0.228
Water Restrictions Level 3	0.426*	0.230
Buffer for Mine Impacts	0.251**	0.119
Population in Work Camps	1.589***	0.144
Female	1.242***	0.260
Number of Kids	0.270***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.098*	0.053
Enjoy Moranbah	0.213*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Base = Level 3	**Coefficient**	**Standard Error**
Constant	-0.819	0.948
Cost	-0.001***	0.000
Housing and Rentals	0.300**	0.119
Water Restrictions Level 2	0.062	0.233
Water Restrictions Level 1	-0.426*	0.230
Buffer for Mine Impacts	0.251**	0.119
Population in Work Camps	1.589***	0.144
Female	1.242***	0.260
Number of Kids	0.270***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.098*	0.053
Enjoy Moranbah	0.213*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Number of observations	420	
Log likelihood function	-315.49	
R-sqrd	0.31	

*** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.

Table 6A.4. Change in levels for Buffer for Mines Impacts

Base = Level 2	**Coefficient**	**Standard Error**
Constant	-0.571	0.939
Cost	-0.001***	0.000
Housing and Rentals	0.281**	0.119
Water Restrictions	0.224*	0.115
Buffer for Mine Impacts Level 3	0.164	0.225
Buffer for Mine Impacts Level 1	-0.343	0.251
Population in Work Camps	1.576***	0.145
Female	1.242***	0.259
Number of Kids	0.264***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.100*	0.053
Enjoy Moranbah	0.212*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Base = Level 1	**Coefficient**	**Standard Error**
Constant	-0.571	0.939
Cost	-0.001***	0.000
Housing and Rentals	0.281**	0.119
Water Restrictions	0.224*	0.115
Buffer for Mine Impacts Level 3	0.508**	0.240
Buffer for Mine Impacts Level 2	0.343	0.251
Population in Work Camps	1.576***	0.145
Female	1.242***	0.259
Number of Kids	0.264***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.100*	0.053
Enjoy Moranbah	0.212*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Base = Level 3	**Coefficient**	**Standard Error**
Constant	-0.571	0.939
Cost	-0.001***	0.000
Housing and Rentals	0.281**	0.119
Water Restrictions	0.224*	0.115
Buffer for Mine Impacts Level 2	-0.164	0.225
Buffer for Mine Impacts Level 1	-0.508**	0.240
Population in Work Camps	1.576***	0.145
Female	1.242***	0.259
Number of Kids	0.264***	0.098
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.100*	0.053
Enjoy Moranbah	0.212*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Number of observations	420	
Log likelihood function	-316.34	
R-sqrd	0.31	

*** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.

Table 6A.5. Change in levels for Population Growth Options

Base = Level 2	**Coefficient**	**Standard Error**
Constant	-0.716	0.952
Cost	-0.001***	0.000
Housing and Rentals	0.278**	0.119
Water Restrictions	0.219*	0.113
Buffer for Mine Impacts	0.242**	0.119
Population in Work Camps Level 3	1.474***	0.214
Population in Work Camps Level 1	-1.767***	0.309
Female	1.232**	0.259
Number of Kids	0.261***	0.097
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.100*	0.053
Enjoy Moranbah	0.213*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Base = Level 1	**Coefficient**	**Standard Error**
Constant	-0.716	0.952
Cost	-0.001***	0.000
Housing and Rentals	0.278**	0.119
Water Restrictions	0.219*	0.113
Buffer for Mine Impacts	0.242**	0.119
Population in Work Camps Level 3	3.241***	0.316
Population in Work Camps Level 2	1.767***	0.309
Female	1.232***	0.259
Number of Kids	0.261***	0.097
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.100*	0.053
Enjoy Moranbah	0.213*	0.125
Spending in Moranbah	-0.010**	0.005
Improved services less travel	0.025***	0.007
Base = Level 3	**Coefficient**	**Standard Error**
Constant	-0.716	0.952
Cost	-0.001***	0.000
Housing and Rentals	0.278**	0.119
Water Restrictions	0.219*	0.113
Buffer for Mine Impacts	0.242**	0.119
Population in Work Camps Level 1	-3.241***	0.316
Population in Work Camps Level 2	-1.474***	0.214
Female	1.232***	0.259
Number of Kids	0.261***	0.097
Income	0.000**	0.000
Age	0.037**	0.015
Length of residence	-0.100*	0.053
Enjoy Moranbah	0.213*	0.125
Spending in Moranbah	-0.010*	0.005
Improved services less travel	0.025***	0.007
Number of observations	420	
Log likelihood function	-316.20	
R-sqrd	0.31	

**** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.*