

**Assessing the Social and Economic Impacts of  
Coal Mining on Communities in the Bowen  
Basin: *Summary and Recommendations***

***RESEARCH REPORT No. 11***

**John Rolfe, Galina Ivanova and Stewart Lockie**

**SOCIO-ECONOMIC IMPACT ASSESSMENT AND  
COMMUNITY ENGAGEMENT TO REDUCE  
CONFLICT OVER MINE OPERATIONS  
RESEARCH REPORTS**

***March 2006***

**Socio-economic Impact Assessment and Community Engagement Reports are published by the Australian Coal Association Research Program.**

**These reports represent the provisional findings of the research project ‘Socio-economic Impact Assessment and Community Engagement to Reduce Conflict over Mine Operations’.**

**The project is funded by the Australian Coal Association Research Program (ACARP).**

**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. Because these reports present the results of work in progress, they should not be reproduced in part or whole without the written authorisation of the Project Leaders, Associate Professors John Rolfe and Stewart Lockie.**

**Any comments will be gratefully received and should be directed to Associate Professor John Rolfe:**

**Associate Professor John Rolfe  
Faculty of Business and Informatics  
Central Queensland University  
Rockhampton, 4702  
[j.rolfe@cqu.edu.au](mailto:j.rolfe@cqu.edu.au)  
(07) 4923 2132 (ph)**

**Associate Professor Stewart Lockie  
Centre for Social Science Research  
Central Queensland University  
Rockhampton, 4702  
[s.lockie@cqu.edu.au](mailto:s.lockie@cqu.edu.au)  
(07) 4930 9700 (fax)**

## Executive Summary

1. The Centre for Social Science Research at Central Queensland University has conducted a research project funded by the Australian Coal Association Research Program (ACARP) from March 2004 to March 2006.
2. The broad aim of this project was to assist coal mining companies develop effective processes for engaging with their communities and developing impact assessment and planning processes that can be agreed by their stakeholders. The focus of the project has been in three key areas:
  - (a) demonstrating that assessment of social and economic impacts can occur at any stage during the life of mine operations,
  - (b) developing new tools for the assessment of social and economic impacts, and
  - (c) comparing the impacts from mining between mining-focus and rural-focus towns.
3. Social and economic impact assessment is an important component of environmental planning and project approvals processes in Australia. While the EIS process remains important for the assessment of new projects, it does not cover all the economic and social impacts of mining on regional communities. Key deficiencies include the lack of assessment for:
  - (a) Economic and social impacts that occur after the approvals stage,
  - (b) The economic and social impacts of changes in the scale of operations, such as those influenced by commodity cycles,
  - (c) The cumulative impacts of multiple operations on communities, and
  - (d) The impacts of wind-down or closure of mines on communities.
4. Other issues with impact assessment relate to the potential lack of consistency between different studies, and the failure to follow-up and check many of the predictions that are made.
5. The development of sustainability indicators and annual reporting mechanisms that many companies are voluntarily adopting are welcome. However, there

are opportunities to better align these with more comprehensive assessments of economic and social impacts, and to use regular social and economic impact assessment procedures as inputs into sustainability reporting.

6. The traditional approaches to social and economic impact assessment are to use stakeholder analysis for the former and economic impact modelling (input output analysis) for the latter. Social impact assessment is enhanced with the involvement of communities in negotiation and decision making stages, but these stages are often not included. In a similar way, economic impact assessment rarely goes beyond a desktop analysis of impacts into a consideration of either net welfare effects or opportunities to increase economic development. The outcomes of most impact assessment exercises are separate assessments of social and economic impacts that are limited and not congruent.
7. Opportunities exist to develop new tools for assessing impacts and gaining involvement with communities. Two key mechanisms that have been identified are **choice modelling** and **experimental workshops**.
8. **Choice modelling** can be applied by giving community members sets of options for different development outcomes or mining impacts on their community, where there are typically some offsetting influences. Analysis of the choices that people make gives insights into both preferences for community development and tradeoffs between different social and economic impacts from mining.
9. **Experimental workshops** can be applied with small groups of community people where they might be asked to participate in small ‘games’ or experiments. These might be focused on different development options for communities or different mixes of social and economic impacts from mining. The analysis of choices that people make provides some indication of both preferences for community development and tradeoffs between different social and economic impacts from mining.
10. The **choice modelling** and **experimental workshop** tools share some elements of social impact assessment in that they involve participation from community members, focus on a number of demographic and social impacts,

and provide feedback about participants' preferences. They also share some elements of economic impact assessment in that they give more quantitative feedback about the strength of preferences and often evaluate them in monetary terms.

11. The **choice modelling** and **experimental workshop** tools do not replace the traditional impact assessment approaches of structured interviews and economic modelling. Instead, they are better viewed as complements to the existing set of tools.
12. The use of **choice modelling** has been demonstrated with an analysis of workforce mobility associated with residents of Blackwater. The results identify the contribution of different factors to choices about where people might locate to, and the salary premiums that might be involved in moving them to different locations.
13. The use of four different impact assessment tools has been demonstrated in two case study applications in this project. One case study has focused on assessing the impacts of mining on Blackwater, a predominantly mining service town. The other case study has focused on assessing the impacts of mining on the Bauhinia Shire, a predominantly agricultural shire where mining activities are just starting up. Each case study involved the application of stakeholder analysis, input output modelling, choice modelling and experimental workshop assessment tools.
14. There is a great deal of consistency in the results from the different techniques. For example, the positive impacts of mining on employment and economic growth was consistently identified, as was the importance of health services in future community development.
15. Each of the tested techniques provided different insights into the types of impacts on communities. As expected, stakeholder analysis provided a rich data set about the variety of impacts but little guidance about the priorities or strength of community preferences, while the economic modelling provided some understanding about the changes in economic activity without much understanding of community impacts.

16. There was a tendency with stakeholder analysis for negative impacts to be emphasised, while the economic modelling focused on net positive impacts. In contrast, the alternative assessment provided more guidance about prioritisation and how communities viewed tradeoffs for future development, but without the rich detail of the stakeholder analysis or the predictions of net economic impacts available from economic modelling.
17. The application of the choice modelling technique revealed some particular benefits not available with the other options. The use of a survey allowed data to be collected from a large (and random) sample of community members, gaining input from many more people. In many cases, the application of this technique was more inclusive. As well, it was possible in the survey format to collect data on a very wide range of issues in ways that allowed more quantitative analysis. This was particularly the case for the results of the choice modelling analysis, where the priority tradeoffs for key issues could be expressed in monetary terms.
18. The experimental workshops had particular value in understanding how group feedback might change priority setting, and allowing participants to get feedback about how their preferences or allocations to future community development might contribute to a pool of community preferences. The combination of a group workshop setting with experimental feedback loops made this technique more appropriate to work through potential options for community development and understanding how individual preferences may change with information feedback.
19. The analysis in the two case studies identified some significant differences between the two communities. While mining was generally viewed in positive terms because of the economic and demographic impacts, there were varying levels of concern about different economic and social impacts. The differences between the two communities indicates that dealing with impacts needs to be tailored to specific community characteristics and issues.

## Table of Contents

Executive Summary .....	3
8.1 Introduction.....	8
8.2 Background to the issues being considered .....	10
8.3 Approaches to the assessment of Social and Economic Impacts.....	13
8.4 The case study of interest.....	20
8.5 Input – Output Modelling .....	22
8.6 Stakeholder analysis.....	24
8.7 The Choice Modelling Survey .....	26
8.8 The Experimental Workshops.....	33
8.9 Discussion and Summary.....	35
8.10 References.....	38

### List of Tables

Table 1. Attributes and levels used in Choice Modelling experiment.....	29
Table 2. Results from Choice Modelling application, Part worth. ....	31

### List of Figures

Figure 1. Research plan for case studies.....	19
Figure 2. Perceptions about the community that people live in.....	26
Figure 3. Community perceptions of mines.....	27
Figure 4. Perceptions about mining and community impacts.....	27
Figure 5. What would encourage families to live in the area?.....	28

## **8.1 Introduction**

This report is a final report from a research project funded by the Australian Coal Association Research Program (ACARP). The funding allocated by the ACARP was \$272, 328, and the project ran from March 2004 to March 2006.

The broad aim of this project was to assist coal mining companies develop effective processes for engaging with their communities and developing impact assessment and planning processes that can be agreed by their stakeholders. The broad focus of the project has been in three key areas:

- (d) demonstrating that assessment of social and economic impacts can occur at any stage during the life of mine operations,
- (e) developing new tools for the assessment of social and economic impacts, and
- (f) comparing the impacts from mining between mining-focus and rural-focus towns.

The range of project outcomes have been summarised in a series of reports, as follows.

- **Report 1.** Overview of Social and Economic Issues Associated with the Bowen Basin Coal Industry
- **Report 2.** A Review of Environmental Impact Assessments (EIA) for Coal Mine Developments and the use of Economic and Social Impact Assessment in the Bowen Basin - Tools and Trends
- **Report 3.** Accounting for Social and Economic Impacts in Annual Sustainability Reporting.
- **Report 4.** Regional Economic Impact Assessment: An Overview of the Input-Output Method
- **Report 5.** The Impact of Coal industry Development Projects on the Central Highlands, Fitzroy and Queensland Economies: An Application of Input-Output Method
- **Report 6.** Regional Economic Impact Assessment: Factors Influencing Workforce Mobility to Regional Mining Towns

- **Report 7.** Social and Economic Impacts Associated with Changes in the Coal Mining Industry in the Bowen Basin on the Township of Blackwater
- **Report 8.** Social and Economic Impacts Associated with Changes in the Coal Mining Industry in the Bowen Basin on the Bauhinia Shire (Springsure and Rolleston)
- **Report 9.** Results of the Extended Stakeholder Analysis (Blackwater)
- **Report 10.** Results of the Extended Stakeholder Analysis (the Bauhinia Shire)
- **Report 11.** Summary and Recommendations

This report includes a number of summary findings about the social and economic impacts of coal mining on the communities in the Bowen basin. The approaches used are outlined and briefly discussed. The findings from this research should be more widely applicable in other regions of Australia and overseas where there is a need to assess social and economic impacts of project, industry or policy on regions and communities. The focus of this report is to outline the number of issues that have been considered, and to give a summary of key findings. Further details on the project are available in the earlier reports that have been produced.

The rest of this report is structured as follows. The background of the issues is summarised in section 2. An overview of approaches to assess social and economic impacts is provided in section 3, while the coal mining industry in the Bowen Basin of central Queensland is described in section 4. The results of traditional assessment methodologies for the case study follow: economic impact assessment in section 5, and social impact assessment in section 6. Results of the two alternative mechanisms then follow: choice modelling in section 7 and experimental workshops in section 8. Final conclusions are drawn in section 9.

## **8.2 Background to the issues being considered**

The coal mining industry makes a key contribution to the Queensland and Australian economies, and is the underlying driver of employment and economic conditions in many local and regional communities. However, questions are sometimes raised about the limited economic impact on local areas where mining occurs, particularly when mines are serviced at a distance by fly-in/fly-out, or drive-in/drive-out operations. There is also debate about the potential social impacts that might be imposed on regional communities.

Currently, in Queensland the potential economic and social impacts are assessed for major projects prior to commencement through an Environmental Impact Assessment (EIS) process. This is focused on individual proposals, and typically involves Economic Impact Assessment and Social Impact Assessment procedures. While the EIS process remains important for the assessment of new projects, it does not cover all the economic and social impacts of mining on regional communities. Key deficiencies include the lack of assessment for:

- (e) Economic and social impacts after the approvals stage,
- (f) The economic and social impacts of changes in the scale of operations, such as those influenced by commodity cycles,
- (g) The cumulative impacts of multiple operations on communities, and
- (h) The impacts of wind-down or closure of mines on communities.

There is a number of reasons why economic and social impacts of mining should be assessed carefully through the life cycle of mining operations. First, an understanding of the positive impacts that exist can identify ways of enhancing these for local and regional communities. Second, there are many relationships that are symbiotic between mining operations and communities where improvements in economic and social relationships can make it easier for mining companies to source labour and access contract workers and professional services. Enhancement of these relationships can facilitate regional development.

The third broad reason is that the mining operations can sometimes be associated with negative consequences. Examples of these occur when there are impacts from new developments, flow-on effects from competition in factor markets (including labour),

and the consequences of downsizing and/or mine closure. A better understanding of these impacts can help to avoid or mitigate the worst effects.

Existing literature on natural resource planning and management now takes it as given that broad consultation and participation reduces conflict and improves the quality of decision-making. In relation to large resource development projects, public involvement is seen as something that should occur early in the life of a proposal in order to ensure that:

- impact assessment processes incorporate local knowledge about social conditions, processes and likely impacts;
- attitudes and perceptions towards proposed change can be identified;
- subjective and cultural impacts may be identified;
- appropriate mechanisms to involve different groups in the decision-making process may be identified;
- the views of the public may be incorporated at the stage of project design and used to maximise benefits rather than simply to compensate the losers following implementation;
- a range of alternative mitigation and development options may be identified and adequately assessed; and,
- conflict over projects may be minimised by ensuring that as many interests as possible are considered in decisions and appropriate mitigation strategies are put in place (Lockie, 2001:281).

It is not always clear, however, how communities of interest should best be involved. Current consultation strategies may often be little more than public relations exercises that are conducted at the beginning of major projects. Ideally, consultation with communities affected by any aspect of mine development, operation or closure should begin as early in the life of a mining project as possible, and then be ongoing. Adequately resourced closure plans should be maintained throughout the life of mining projects to ensure that planned outcomes are achieved. Community acceptance of the plans will then facilitate the acceptance of tenure surrender at the end of mine life. Mine closure issues will vary from site to site, as will appropriate consultative processes.

There is a growing interest in finding the methods of engaging with communities that result in increasing benefits for both communities and coal mining companies. A recent study addressing complex risks associated with a smelter in South Australia (Proctor 2005) indicated that there is also interest in community engagement methods in other industries, especially those concerning social and environmental issues. This will require the development of impact assessment tools that allow (a) community engagement and input, (b) structured or quantitative assessment, and (c) evaluation of different impacts and development options.

The focus of this report is to summarise the results of an impact assessment and engagement project in central Queensland and recommend some alternative mechanisms for the assessment of social and economic impacts in relation to a coal mining community. The alternative methods, choice modelling and experimental workshops, are compared to the traditional economic and social impact assessment procedures in two case studies. One is an established mining community undergoing some changes in the level of mining activities, and the other is an agricultural community experiencing mining activity beginning in their shire. Under the current regulatory framework, there is no requirement for industry or government to assess such impacts after initial approval for projects has been granted. This project provided a demonstration of how follow up assessment processes might be conducted.

### **8.3 Approaches to the assessment of Social and Economic Impacts**

Environmental impact assessment (EIA) is a decision tool employed to identify and evaluate potential social and economic impacts of certain proposed development actions in order to facilitate informed decision-making and sound environmental management. This “preliminary planning” model is typically used prior to the commencement of a project. Suggestions about how the impact assessment approach can be enhanced are outlined in report 2.

Economic and social sciences offer a range of tools to assess economic and social impacts (Rolfe, Lockie & Ivanova, 2005). According to Sadler (1996), there is no ‘one size fits all’, all-purpose methodology available for any aspect of impact assessment. Instead, the selection and use of appropriate EIA tools requires professional judgment in order to match methodologies with project characteristics, specific features of the social, economic and biophysical environments, and residual areas of uncertainty. The challenge is to find methods that best fit the purpose, can be understood, and are acceptable to intended audiences.

In terms of serving decision-makers, the dominant view is that, wherever possible, impact predictions should be quantified. The vague and imprecise predictions contained in many EIA reports are regarded by many as an important failing of EIA practice (Cashmore et al 2004). However, in Australia, there are relatively few prescriptions regarding the specific methodologies to be employed (Disano 2003).

Traditional Economic Impact Assessment (EcIA) generates an estimate of the economic consequences of a particular project on the designated region e.g. the local economy or larger area. The emphasis is typically on tracing the flow of spending associated with a project to identify changes in sales, income and jobs. The focus is on understanding the likely order of magnitude of impacts rather than specific amounts.

There are range of tools that can be used for the EcIA such as the use of simple spending multipliers, Input Output modelling, or general equilibrium modelling (Jensen & West, 2002, Rolfe, Lockie & Ivanova, 2005). Many of the EIS’s in Australia involve the use of input-output modelling as the core of the EcIA stage.

Input Output (IO) modelling provides a mechanist approach to estimate how economic impacts can ‘ripple’ through an economy. It is typically done by building a

model of a regional economy where the transactions between each industry sectors, the household sectors, and the economy outside of the region are summarised in a matrix. While a model can be developed from primary data, most IO models are based on national or state-level accounts provided by the Australian Bureau of Statistics.

An economic assessment process can also include Cost-Benefit Analysis (CBA). This provides some evaluation of the net welfare impacts of policy as distinct from the normal focus of an EcIA on the identification of income, spending and employment impacts. A cost-benefit analysis involves the assessment of the net benefits of a project to society as a whole, and should include the costs and benefits of social and environmental impacts alongside of financial, infrastructure and other consequences. It is often difficult to include all of these impacts in a cost-benefit assessment, which may explain why these are rarely included. However, the cost-benefit analysis framework is a more rigorous assessment process, while the EcIA approach simply identifies the impacts without any evaluation of whether they provide net benefits to society.

Social Impact Assessment (SIA) is understood in different ways. However there is some agreement that all issues that affect people, directly or indirectly, as a result of a project or policy are pertinent to SIA (Burdge et al. 1995). According to Vanclay (2003, p.6):

*“Social Impact Assessment includes the process of analysing, monitoring, and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment.”*

SIA involves the consideration of changes in one or more of the following aspects

- People’s way of life, how they live, work, play and interact with one another on a day-to-day basis;
- Their culture – shared beliefs, customs and values
- Their community – its cohesion, stability, character, services and facility
- Their environment, the quality of air and water people use, the availability and quality of the food they eat, the level of dust and noise they are exposed to, the

adequacy of sanitation, their safety and fears about their security and their access to and control over resources (Burdge et al. 1995, Cox & Miers 1995 in Petts 1999 Vol 1 p 304).

The broad ambit of SIA – along with the wide variety of quantitative and qualitative techniques available to SIA practitioners – allows SIA studies to focus on those changes that are most important within a community rather than on those that are easiest to measure or with which researchers are familiar (Burdge et al. 1995; Lockie 2001). While there is some debate among SIA practitioners over the extent to which SIA should provide a forum for negotiation over the management of interventions, as opposed to the extent to which it should focus strictly on predicting the outcomes of those interventions (Craig 1990, Dale and Lane 1994), it is widely accepted that the conduct of SIA should be closely linked to processes of public participation.

Unfortunately, however, there are many examples of EIA studies (including social and economic impact assessment) in which this is not the case, and where a narrow focus on technical issues has led to inadequate consideration of social impacts, ineffective public participation, and lost opportunities to avoid negative social and economic consequences (Dale et al. 1997, Formby 1990).

Apart from some common reliance on demographic data to describe a community of interest, there is little integration or overlap of social and economic impact assessment techniques in Australia. The lack of integration and overlap may limit the usefulness of their application ( Ivanova, Rolfe and Lockie 2005). Economic impact assessment may be too divorced from the communities of interest, with little direct input from the stakeholders of interest and limited capacity to take the model predictions and use them to help community performance. Social impact assessment may identify many of the issues important to communities, but without much quantification of community preferences or any real assessment of how realistic tradeoffs should be made.

Two alternative assessment techniques have been identified that provide some potential integration of economic and social assessment techniques. Both involve community members in the assessment of potential impacts of new or changed developments, akin to traditional social impact assessment procedures. However, the outcomes of the assessments are quantitative, and involve some assessment in

monetary tradeoffs, akin to traditional economic impact assessment. Here the two techniques are outlined in more detail.

### *The Choice Modelling technique*

Choice Modelling is a stated preference technique that has been adapted from conjoint analysis roots in transport and marketing fields to estimate values in economic research. There have been a number of applications to recreation and environmental issues in recent years (eg Bennett and Blamey 2001). There has also been growing interest in using the technique to analyse the choices people make in production enterprises (Lusk and Hudson 2004, Windle and Rolfe 2005).

Of particular interest are efforts to adapt the technique to analysis of social issues. There have been some developing applications in this area. Rolfe and Windle (2003) used Choice Modelling to identify how both indigenous and non-indigenous groups valued the protection of Aboriginal cultural heritage sites in central Queensland, Australia. Bennett et al (2004) used the technique to assess community preferences for the preservation of country communities in Australia.

Choice Modelling involves asking respondents to a survey to make a series of choices about alternative scenarios. Each choice set involves a number of profiles describing the alternatives on offer. One of the profiles describes a current or future status quo option, and remains constant between the choice sets. This effectively gives respondents a default option where they can choose continuation of the current situation. The other alternatives typically offer some improvements on the current situation, but with some monetary cost implications. These alternatives are described by a set of attributes, where variations in the levels of each create differences in the choice sets on offer.

While the choice modelling technique has traditionally been employed to analyse tradeoffs in transport and environmental fields, there is also potential for it to be employed to analyse tradeoffs with social issues. Key advantages of the use of the technique for this purpose are that it involves assessment of the preferences of the community of interest, it focuses attention on the key issues or attributes of importance, and it provides some quantitative feedback about the relative importance of those issues and attributes.

### *Experimental workshops*

Experimental workshops are an application of experimental economics procedures in an applied workshop setting. Many experimental economics processes were developed by Vernon Smith, joint winner of the 2002 Nobel prize for economics. He developed procedures to test in laboratory settings how people responded to economic incentives. Participants would normally be asked to undertake voluntary trades where the incentives are set by the underlying trading and institutional rules. By comparing trading results under different institutional settings, researchers can identify how human behaviour and preferences are influenced by the environmental setting.

Experimental economics can be adapted to test different market mechanisms and resource allocation procedures, so that the most efficient process can be selected before its application in a 'real' setting. Although it is more common to conduct experiments in a laboratory environment, a workshop setting can be more appropriate when the participation of case study stakeholders is being sought (Rolfe *et al.* 2004). An experimental workshop is a form of synthesis between experimental economics and a field pilot without being easily classified into either group. It is like experimental economics in that it utilizes a simulated environment to test how people would form preferences, but is not as tightly controlled as a normal experimental procedure. It is also like a field pilot in that it is focused on a real world application with actual stakeholders, but does not go beyond hypothetical scenarios in a half-day workshop.

The use of experimental workshops has been reported by Rolfe *et al.* (2005), and Rolfe *et al.* (2006). The reported workshops involved landholders, where they were given 'dummy' farms similar to their own, but with only the most important attributes identified. Workshop participants were then asked to indicate the types of conservation activities that they would be prepared to engage in, and the level of incentives they would require. The workshop format allowed information to be collected about both the potential supply of activities and likely levels of engagement. This is a potential for the same type of workshop to be applied to community development options where members of the community can 'trade' in different options to identify which are generate the most support.

### *Research plan*

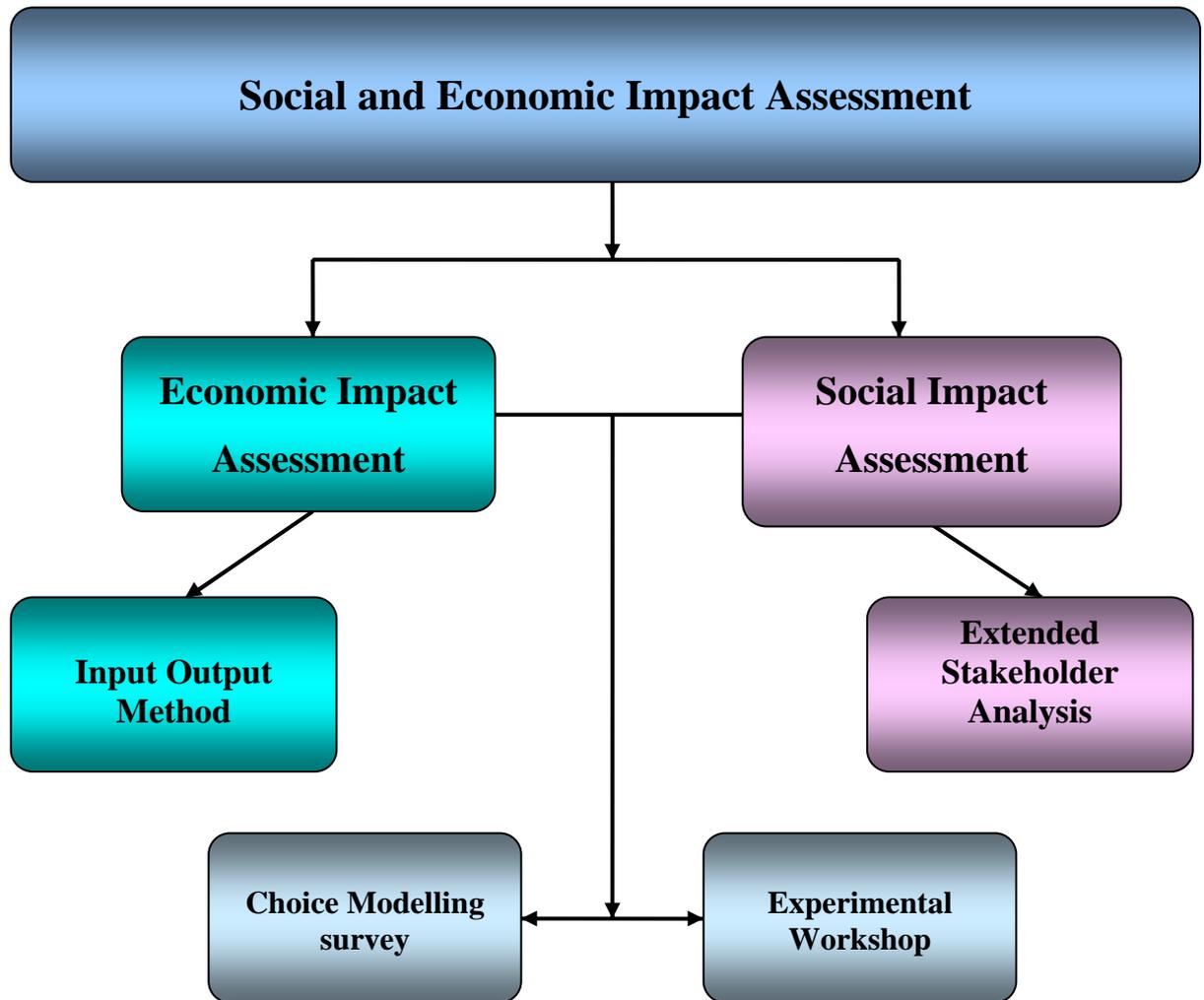
The focus of this project has been in several broad areas, as reflected in the design of the project and the research outputs. At a macro level, there has been some work on identifying trends in economic and social impacts in the Bowen Basin, and identifying what are the processes used to measure such impacts. These issues have been outlined in Report 1, but there has also been some discussion of regional scale issues in Report 2 (social impact assessment processes), Report 3 (sustainability reporting), Report 5 (economic impact assessment processes) and Report 6 (workforce mobility issues).

A second key area has been to provide an adequate overview of traditional approaches to impact assessment. Social impact assessment tools have been reviewed in Report 2, and economic impact assessment tools in Report 4. Another key theme explored has been the need and opportunity to assess social and economic impacts at a community level through different stages in mining operations. The need for this has been highlighted in Report 1 and Report 2, but the opportunities to do so and the performances of the actual case studies are detailed in many of the other reports.

A fourth key focus has been the development of new assessment mechanisms that help to inform communities and decision makers about the social and economic impacts associated with mining operations. The choice modelling technique is introduced and demonstrated in Report 6, and both choice modelling and experimental workshop applications to the case studies are reviewed in Reports 7 and 8.

A fifth key focus has been to explore how economic and social impacts vary between different types of communities. This has been achieved by the selection of two different case studies. The results of these applications are included in Reports 7, 8, 9, and 10. A broad overview of the research plan for case studies is provided in Figure 1.

Figure 1. Research plan for case studies



## **8.4 The case study of interest**

The Bowen Basin is a large coal mining region in central Queensland, Australia. The basin produced \$2.76 billion of coal in 1999/2000 or 34% of Queensland's total mineral production (Department of Local Government and Planning 2002). By the end of the 1990s coal mining firms directly employed approximately 16,400 people, and paid them almost \$1000 million in salaries (ACIL Consulting 2002). A further 15 – 20% of jobs and salary payments would have been sourced through payments to contractors, and a further \$2,200 million paid to firms that provided goods and services to the mining industry (ACIL Consulting 2002). It was estimated that there were up to 60,000 full-time and part-time jobs involved in the provision of goods and services to the mining industry in 1999/2000.

Mining activities tend to be carried out by larger scale firms. There were 45 coal mines operating in Queensland during 2003–04. Of these, 34 were open-cut mines and 11 were underground (NRM 2005). Since that period, a sharp increase in coal prices and international demands has stimulated substantial development in the basin. This includes the development of new mines as well as increases in production from many existing ones. The mining industry in the region is serviced by a number of smaller towns close to the mine sites, and some regional cities along the coastline.

The two inland shires this research is focused on are very different. The Duaringa shire is a shire with an established coal mining industry, and the Bauhinia shire is a predominantly agricultural shire with coal mines being developed.

Blackwater is a mining service town in the Duaringa Shire of approximately 7,000 people that hosts a number of permanent mine workers as well as temporary workers and contractors. The town is approximately 200 km inland from Rockhampton, a regional city located close to the coast, while Emerald, a regional hub of about 13,000 people, is located 80 km to the west. While Blackwater does service some agricultural and transport industry, the dominant economic driver is servicing several coal mines in close proximity.

As a mining town, the development of Blackwater has been dependent on mine developments over the past thirty years. New mines have brought more people to the town, while mine closures have meant population declines. Changes in employment relations, restructuring of shift patterns and greater use of contractors saw a

contraction of the town population and economy from 1999 to 2003. This was reversed in 2004 and 2005, when increases in production and several construction projects saw sharp increases in population, the number of contractors, and a booming housing market.

The Bauhinia Shire is located around 350 km (4 hours drive) south west of Rockhampton. The shire covers an area of 23,641 square km and is home to 2,262 people. The town of Springsure is the population and administrative centre, while Rolleston is a smaller centre located approximately from 70 km east of Springsure. The Shire contains substantial reserves of coal and several new mines are currently in varying stages of development (CHDC 2005). The Rolleston and Minerva mines have been established in the shire in 2004 and 2005, and the predominantly rural towns of Springsure and Rolleston are beginning to cater for a range of mining and contracting activities.

In this case study, the economic and social impacts on Blackwater and Springsure of this upswing in the coal industry has been assessed with the four different techniques outlined above.

## **8.5 Input – Output Modelling**

Input – output modelling was used to predict the impacts of the increased mining activities at the local and regional level. This involved the construction of a representative model for each of the economies of interest, where the interrelationships between each business sector, households and the external world (i.e. outside of the region of interest) is summarised by a series of multipliers. Changes in activity in the coal sector can then be fed into the model as an input, and the consequential (multiplied) changes in each of the other sectors can then be read from the model as an output, usually in terms of changes in employment, expenditure and incomes.

While the results of input-output models are very useful, it is often very difficult to estimate them with great levels of accuracy, for a number of reasons (Ivanova & Rolfe, 2005; Jensen & West, 1986; West, 2004). In many cases, input-output models are estimated by adjusting national or state models to regional or local circumstances. The source models are often several years old and the relationships between sectors may not translate well across time and to regional or local situations. The models are based on ex-poste data, which may not be strong predictions of future activity.

Although the input output technique can be used to model economic activity in a region of any size, accurate results will depend on a high quality data about the level of economic activity and interrelationships between economic sectors. However, the smaller the region, the fewer official statistics are available. The best approximation is normally to use the Australian Bureau of Statistics (ABS) data on employment and adjust the input output table for a region according to local employment figures.

The sub-regional model that was developed predicted that an increase in \$1 of output of the coal mining sector in the Central Highlands would increase household income in the coal mining sector within the region by \$0.141. The direct and indirect impacts of a \$1 increase in output will result in a total income effect of \$2.10 across coal mining and all other supporting industries in the Central Highlands. Each dollar of additional output from coal mining in the Central Highlands will also have a consumption induced effect of \$0.022.

A 25% (\$209m) expansion in coal mining development in the Central Highlands was modeled to provide indicative analysis of impacts on the community of interest.

Under the 25% expansion scenario, the total (direct, indirect and induced) impacts of expansion of mining industry in the Central Highlands region on industry output, household income and employment in an average year is expected to be \$180m, \$37m and about 806 jobs respectively. The expected impacts on the town of Blackwater will be a subset of the predicted effects.

The results for the Bauhinia Shire model showed that an increase in \$1 of output of the coal mining industry could be expected to increase household income by \$0.20. Inputting a projected coal mining expansion of \$724m in the Bauhinia Shire led to predicted increases of the total output of the shire by \$926m, an increase in households' income by \$143m and an additional employment of 1,812 persons given the assumptions listed. However, the model is unrealistic the extent that most employees are expected to live in the shire, and much of the flow-on expenditure is expected to remain locally. Instead, the projections are more relevant at the regional level.

In summary it can be said that the IO results provide some guide as to the size of distribution of impacts from the current coal mining expansion and the potential impacts at the local level. However, the IO analysis performed was a desktop study that involved limited adjustment to the local economy. While more detailed models can be built with better information about local business spending, the preliminary modelling performed in this case study was typical of the economic impact assessment reported in EIS studies.

## **8.6 Stakeholder analysis**

The stakeholder analysis involved a number of semi-structured interviews with community leaders and other residents of the local community in Blackwater and the Bauhinia Shire. About 15 semi-structured interviews were conducted in each case study.

The results showed that stakeholders held strong views about the negative and positive impacts of mining on their community. Some of the negative impacts on Blackwater identified were physical ones, such as vibrations from detonations, coal dust, and noise from the trains. Some respondents from the Bauhinia Shire also mentioned the environmental impacts from mines. Indirect negative impacts of the mines on local businesses were also identified for both Blackwater and the Bauhinia Shire. Businesses are currently struggling for staff because most people work or want to work in the mines (because of higher wages). Another impact is that there is an extreme shortage of housing, which is also very expensive.

There were a number of concerns regarding contractors and shiftworkers in Blackwater but not so much in the Bauhinia Shire, perhaps because workcamps in the Bauhinia Shire were not located in the towns. There are several work camps in Blackwater, which are largely inhabited by single males, and the perceptions were that residents of the camps were more likely to make noise, cause disturbances and be involved in anti-social behaviour. Stakeholders in Blackwater also noted that shift work is unhealthy for the workers themselves: shifts involve only work and sleep, and no recreation. A strong concern was that miners work in Blackwater but live elsewhere: during their days off they leave Blackwater. They reside their family on the coast, live in camp when working and commute home on days off. One consequence is that they don't spend their money in Blackwater, except for essential shopping. Many smaller businesses have shut down or are struggling for patronage. There are also perceived to be increased risks of vehicle accidents because of workers commuting after shifts when fatigued.

Many stakeholders from Blackwater expressed fears that the more transient population base would mean that the residents of Blackwater could lose their sense of community, reducing involvement in sports and other activities. A lower population base can have a negative effect on community services such as schools, ambulances

and police. Respondents from the Bauhinia Shire were less concerned about losing community identity but expressed concerns that fewer people in the Shire could affect the number of teachers and doctors.

The positive impacts of mining that was stated by respondents were also similar to other mining towns: the mines are the main source of income in Blackwater and the providers of jobs in the Bauhinia Shire. There are a lot of direct work opportunities in coal mines and there are indirect work opportunities. In Blackwater, local businesses have gained the opportunity to grow and there is potential for developing new businesses. There were a number of other issues identified in each community, and these are provided in more detail in Reports 9 and 10.

The extended stakeholder analysis helped to identify major issues and values of each community. While this approach is valuable in identifying major issues in communities, it does not provide an idea of the community ranking of these issues in terms of importance. While social sciences have a range of techniques to evaluate importance of issues and estimate tradeoffs, the stakeholder analysis technique does not estimate the communities' preferred development options for the local region. The results of the extended stakeholder analysis therefore can be limited. Alternative mechanisms for reporting and assessing community views are reported in the following sections.

## 8.7 The Choice Modelling Survey

A survey approach was trialled as a mechanism for capturing community views about the impacts of mining and development options. In each community, the survey allowed responses to be collected on a number of issues:

- Community perceptions of the town’s community to live in,
- Community perceptions of mines and town’s development,
- What would encourage families to live in town, and
- Support of different ways of engaging with community.

While in both communities, people indicated that they were generally happy to live in, the Bauhinia shire community tend to have more positive responses compared with Blackwater community. In both communities, mines were perceived as supporting local businesses but having little understanding of the communities’ needs. Some of the most important attributes for each community were the standard of medical services and jobs opportunities for partners and children. In both communities people indicated that they would like to have a say in how community is developing. The detailed results of the survey can be found in Reports 7 and 8.

Summary results from the two communities are show in the following figures.

**Figure 2. Perceptions about the community that people live in.**

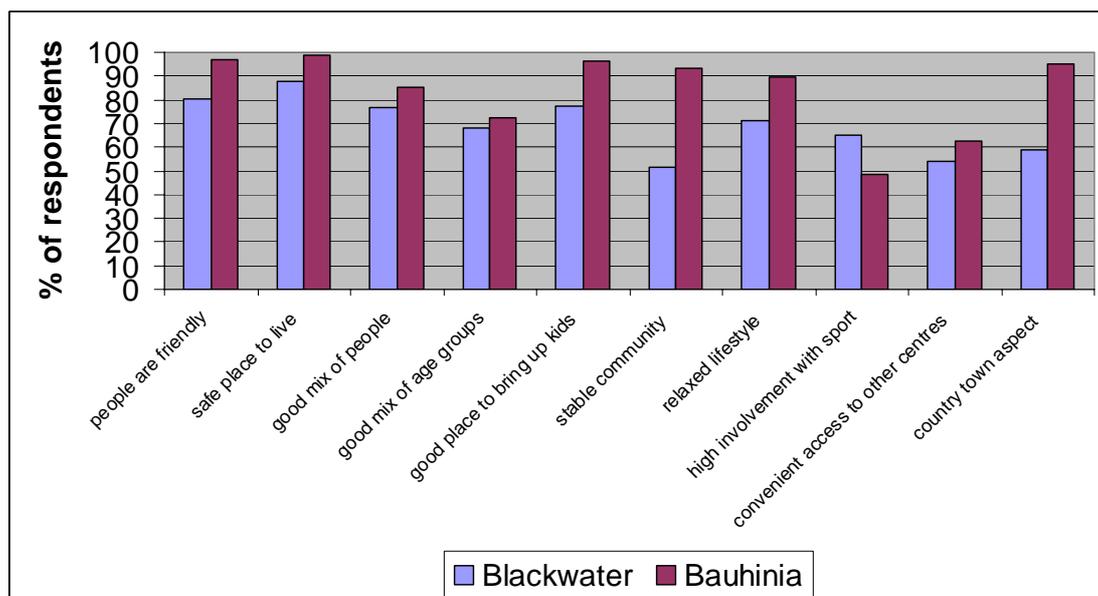
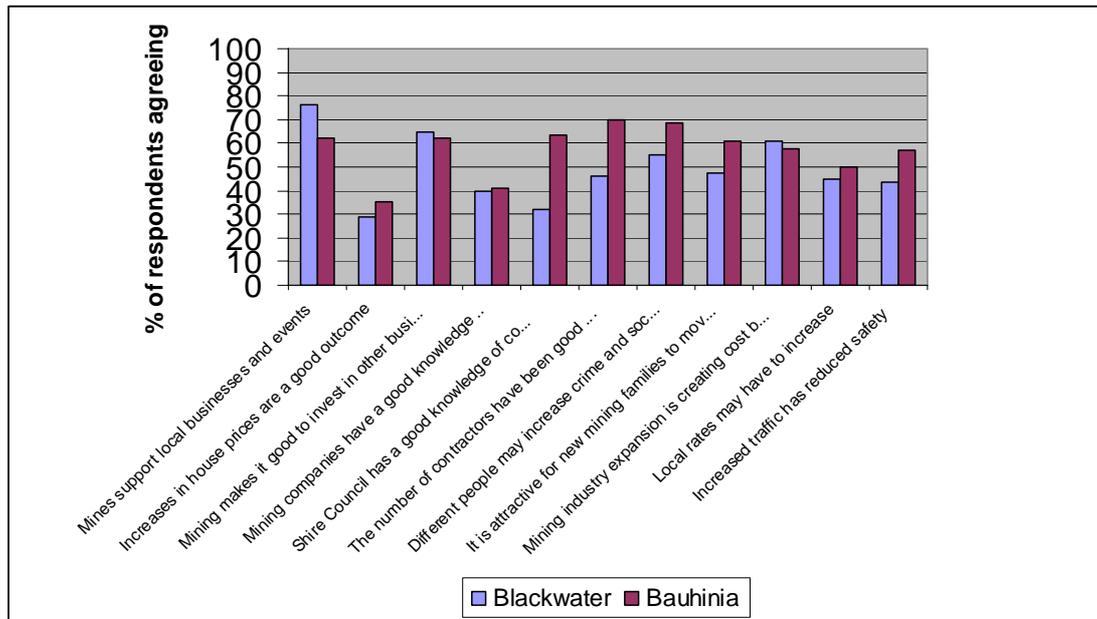
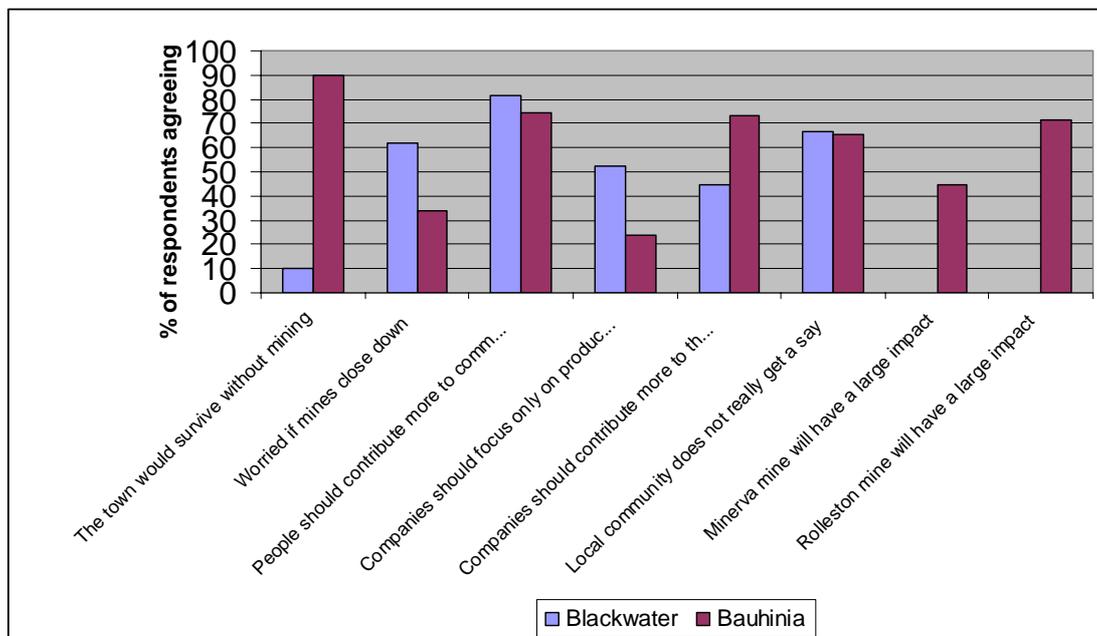


Figure 2 shows the percent of respondents who ‘very much’ or ‘mostly’ agree with statements about living in their community, while Figure 3 and Figure 4 shows the proportion of respondents who agreed with different statements about impacts from the mining industry.

**Figure 3. Community perceptions of mines.**



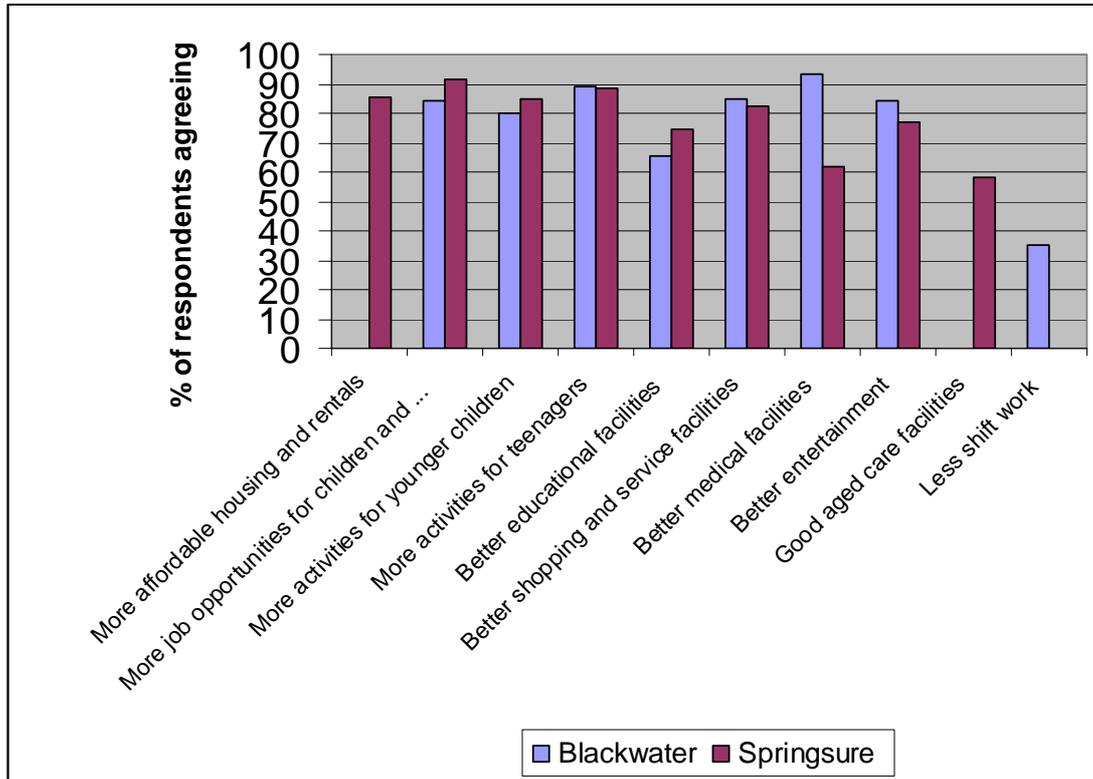
**Figure 4. Perceptions about mining and community impacts.**



The results demonstrate that there are some different perceptions about mining between communities, and even about different mines within a community. However,

when respondents were asked about what would encourage them and others to live in their area (Figure 5), there were more similarities than differences. Better medical facilities were the most important issue to Blackwater residents, while shift work patterns did not emerge for them as a major issue.

**Figure 5. What would encourage families to live in area?**



The surveys also contained some more specific options for community development with applications of the choice modelling technique. The application of the technique is described in more detail in Bennett and Blamey (2000) and Report 6, and the application in these particular case studies is outlined in Reports 7 and 8. Here, a brief summary is provided of the design, application and analysis stages employed in this project.

Key tasks in the design stage are to identify the relevant attributes of interest and the way of framing the tradeoffs in a choice experiment. The consultation stage was used to design both the choice modelling survey and the experimental workshop sessions. Focus groups were held in the Blackwater community to explore the issues of interest to the community.

As well, discussions were held with the local shire council and representatives of local mining companies to identify their perceptions about the key issues for community development. Due to the limitations of the survey and workshop techniques, only some of the most important issues were used to represent major tradeoffs. Therefore, some issues that arose from the consultation stage were not listed.

From the design work, six key attributes were identified as being indicative of some of the tradeoffs that influenced community development. These are described in Table 1. To frame the choice task, it was decided to offer respondents alternatives where improvements in the attributes were balanced against costs to them, expressed as decreases in their disposable income. For two of the attributes where it was unclear if people wanted increases or declines (*Population Change*, and *Shopping in Nearby Centres*), there were both increases and decreases shown in the levels.

**Table 1. Attributes and levels used in Choice Modelling experiment.**

<b>Attribute</b>	<b>Levels</b>
Change in population	<ul style="list-style-type: none"> <li>• +25%,</li> <li>• +10%,</li> <li>• -10%,</li> <li>• -25%</li> </ul>
Jobs for Partners/ Children	<ul style="list-style-type: none"> <li>• Very rare,</li> <li>• Difficult to find,</li> <li>• Moderately available,</li> <li>• Easily available</li> </ul>
Entertainment	<ul style="list-style-type: none"> <li>• Few restaurants or social events,</li> <li>• Good choice of restaurants, but few social events,</li> <li>• Few restaurants, but variety of social events available each weekend,</li> <li>• Good choice of restaurants and variety of social events available each weekend</li> </ul>
Standard of medical facilities	<ul style="list-style-type: none"> <li>• Improves by 10%,</li> <li>• Improves by 20%,</li> <li>• Improves by 50%,</li> <li>• Improves by 100%</li> </ul>
Shopping and services in Emerald and Rockhampton	- 10%, - 5%, + 20%, + 50%
% of jobs held by people who don't live in Blackwater	+ 10%, + 20%, + 50%, + 100%
Reduction in disposable income	\$20, \$50, \$100, \$150, \$250, \$500, \$1,000, \$2,000

The choice sets were structured in terms of two alternative scenarios that depicted different development options for the case study community (Appendix 1). Respondents could choose a development option (which came at some cost to them), or choose a 'status quo' or 'unsure' option. An experimental design was used to allocate levels to choice sets and select a fractional factorial of 64 sets to be collected. As four choice sets were offered per survey to minimise fatigue issues, 16 different versions of the survey had to be collected.

The use of a payment vehicle to represent costs can help to ensure that the choice sets involve tradeoffs, and also allow the subsequent model outputs to be expressed in terms of monetary values. It was difficult in this case study to choose a specific payment vehicle that would apply to all potential respondents, so a more general form was adopted. The choice scenarios and the payment mechanism were framed in the survey in the following way (for the Blackwater case study):

*In the next four questions, we ask you about some options for the future development of Blackwater. In each question, we are going to give you two options for how the town could develop in the future, where each option is described in different, but similar ways.*

*Each option involves a tradeoff, where we show that the positive development outcomes might involve some costs to Blackwater 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,  
reduced wages from coal mining companies so they can put more money into communities.*

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

The surveys were collected by a mixture of telephone & mailout, and drop-off & collect techniques in November and December, 2005. A total of 304 usable responses in Blackwater and 190 usable responses in the Bauhinia Shire were collected.

Respondents who indicated the 'unsure' option in the choice sets were coded as preferring the 'status quo' option. This represented the current situation for Blackwater and the Bauhinia Shire (the base level for each attribute) without any payment requirements. The choice data was analysed with the LIMDEP software package.

The results show that the models for both communities were significant (chi-square test), and had acceptable explanatory power (Rho-square statistic) (Appendix 2). In Blackwater, all of the attributes in the choice sets were highly significant, apart from the *Population change* variable. This suggests that the level of population was not important to most respondents.

In the Bauhinia Shire, all of the attributes in the choice sets were highly significant, apart from the *Entertainment and Social Events* variable. Only one demographic variable was significant in both communities, being *Household Income*. The positive coefficient indicates that people with higher levels of income were more likely to choose the alternatives for town development rather than a ‘status quo’ option.

The other attributes were signed as expected. The positive coefficients for *Jobs*, *Entertainment*, *Medical* and *Shopping* attributes indicates that respondents preferred choice sets with increasing levels of these attributes. The negative coefficients for *Outside Jobs* and *Reduction in Income* indicate that people wanted lower levels of these attributes. The significance of the constant value in Blackwater suggest there are other factors which drive choices, while the negative value may indicate some preference for the status quo situation. The constant was not significant in the Bauhinia Shire, indicating that the model captures most of the major factors which drive choices.

The results can be identified more clearly with the estimation of part-worth values (Table 2). This represents a negative of the ratio of each non-monetary attribute coefficient to the monetary coefficient.

**Table 2. Results from Choice Modelling application, Part worth.**

	Blackwater	The Bauhinia Shire
Constant	- \$7,212.07	-\$4,275.57
Population change	Not signif.	\$21.48
Jobs for partners/children	\$938.37	\$676.53
Entertainment and social events	\$592.70	Not signif.
Standard of medical facilities	\$28.47	\$10.72
Shopping and services in nearby centres	\$17.57	\$16.41
Increase in proportion of jobs held by people who don't live in town	- \$41.88	-\$19.06

The part-worths indicate the value of a one unit change for each attribute. For example, in Blackwater, an improvement in *Jobs for Partners/Children* is valued at \$938, while an improvement in *Entertainment and Social Events* is worth \$593.

In the Bauhinia Shire, an improvement in *Jobs for Partners/Children* is valued less than in Blackwater at \$677, while an improvement in *Entertainment and Social Events* is insignificant.

In Blackwater, each 1% improvement in *Health Services* is worth \$28.47, while each 1% improvement in *Shopping in Nearby Centres* is worth \$17.57. The responses from the Bauhinia Shire indicated that an improvement in these services is valued less: \$10.72 and \$16.41 respectively. Respondents from the Bauhinia Shire value each 1% increase in *Population* at \$21.48 compared with insignificant results for Blackwater for the same variable.

In both case studies there was a strong value attached to having jobs filled by people who lived in the town. Each 1% increase in the Proportion of Jobs held by *People who don't live in the Town* created a decrease in value of \$41.88 for Blackwater residents, and a decrease of \$19.06 for residents of the Bauhinia Shire. This is likely to reflect an opinion that unless workers and families live in the town on a full-time basis, additional services and shopping are unlikely to develop. However, the results for Blackwater are a little inconsistent with the non-significance of the coefficient for the *Population* attribute.

The choice modelling survey identified the attributes that are significant and how trade off between those attributes can be evaluated. However, caution should be taken when interpreting the results. Since only several key attributes were included in the choice models, the results should be put in the context of the wider issues that arose from the stakeholder analysis. These two techniques should be used in ways that compliment each other.

## **8.8 The Experimental Workshops**

Three experimental workshops were each conducted in Blackwater and the Bauhinia Shire, involving a total of 23 and 35 participants respectively from each community. The workshops were focused on the same key attributes used in the choice modelling study, and many of the preliminary design and focus group stages of the choice modelling survey also helped in the design of the experimental workshops.

A series of budget allocation exercises were used in the experimental workshops to identify the key priorities for government expenditure. Participants were initially asked to rank the six key attributes (as shown in Appendix 3) in order of importance. Then they were asked to apportion an identified budget amount between each of the six areas, assuming that an additional budget became available. The same budget level was used for each respondent, with a draft allocation task shown in Appendix 4. There were 5 rounds of the exercise, where the level of budget was changed in each round. There was a discussion section in the workshops where participants could review what they thought were the priorities. Finally, participants were asked to repeat the ranking of the six key attributes in order of importance to estimate whether the participation in budget allocation exercise and in discussion changed their perceptions of important of these attributes.

The results of the simple ranking exercise in both communities showed that *Medical* was viewed as most important, with an average ranking close to 5 (most important). *Shopping and Services in Nearby Centres*, and *Proportion of Jobs held by People who don't live in Town* were the lowest ranked factors. In both communities, after the budget allocation exercise and discussion, *Shopping* was seen as less important after the workshop, but the *Proportion of Jobs held by People who don't live in Town* became a more important issue.

The results of the budget ranking exercises are summarised in reports 7 and 8. The results demonstrate the importance of *Health* to workshop participants in both communities, with approximately 40% of any additional budget being allocated to this category. The allocation was higher for smaller budget levels, indicating the high marginal value that community members placed on improvements in this area.

While the general ranking exercise and the budget ranking exercises identified the same priority issues of *Health* and *Jobs for Partners/Children* as most important, and

*Shopping and Services in Other Centres* as least important, other issues were not ranked consistently across experimental workshop and choice modelling techniques. This result was consistent for Blackwater and the Bauhinia Shire.

The slight differences in results may be a consequence of the formats involved. The survey approach allowed more framing of the issues by asking respondents a variety of different background questions before the choice modelling sets were introduced. However, the experimental workshops involved a verbal briefing of the issues and purpose of the exercises at the beginning of the workshop. Variation in outcomes may be a consequence of the different approaches to the context setting, or the different formats used to elicit responses.

The variation in responses may also be because the experimental workshops allowed more group interaction and feedback than did the other mechanisms. The responses given in the workshops may represent better information than responses given in the interviews or the surveys, hence explaining potential differences.

## **8.9 Discussion and Summary**

The results showed that practitioners of impact assessment have a range of tools to choose from to make an assessment and negotiation process informative and acceptable for decision makers and communities.

Traditional tools of social impact assessment and economic impact assessment have many advantages but also some weaknesses. Social impact assessment has strengths in terms of tapping into different community groups and discovering how they could be affected. Normally the social impact is assessed only during the assessment stage, without using the range of available techniques for mitigating negative impacts and negotiating trade-offs with impacted communities. However it is hard to identify tradeoffs in quantitative manner. In comparison economic impact assessment has strengths in quantifying impacts but is typically only applied to a very narrow set of issues, and with limited interaction with communities. An outcome is that both approaches have weaknesses, and the limited overlap makes it difficult to reconcile differences in predictions.

In this project, two alternative assessment techniques were tested, namely the choice modelling survey and experimental workshop approaches. While the social impact assessment technique (Extended Stakeholder Analysis) was used to identify a range of social and economic impacts, the alternative socio-economic techniques assisted in exploring ways of assessing particular community views in a structured setting. Furthermore, the experimental workshop technique was used to allow for group discussion and feedback.

The comparison of traditional impact assessment tools with these alternative approaches has generated a number of insights.

First, there is a great deal of consistency in the results from the different techniques. For example, the positive impacts of mining on employment and economic growth was consistently identified, as was the importance of health services in future community development. Some of the consistency may be attributable to the use of the stakeholder analysis as a prior design stage for the choice modelling and experimental workshop applications, and to the selection of a generic set of attributes for both of those latter techniques. However, the broad consistency of results is a general indicator of the acceptability of these different approaches.

Second, each of the tested techniques provided some different insights into the types of impacts on communities. These insights varied across techniques. As expected, stakeholder analysis provided a rich data set about the variety of impacts but little guidance about the priorities or strength of community preferences, while the economic modelling provided some understanding about the changes in economic activity without much understanding of community impacts. As well, there was a tendency with stakeholder analysis for negative impacts to be emphasised, while the economic modelling focused on net positive impacts. In contrast, the alternative assessment provided more guidance about prioritisation and how communities viewed tradeoffs for future development, but without the rich detail of the stakeholder analysis or the predictions of net economic impacts available from economic modelling. These alternative techniques are better viewed as complement rather than substitutes to the traditional impact assessment tools.

Third, the application of the choice modelling technique revealed some particular benefits not available with the other options. The use of a survey allowed data to be collected from a large (and random) sample of community members, gaining input from many more people. In many cases, the application of this technique was more inclusive. As well, it was possible in the survey format to collect data on a very wide range of issues in ways that allowed more quantitative analysis. This was particularly the case for the results of the choice modelling analysis, where the priority tradeoffs for key issues could be expressed in monetary terms.

Fourth, the experimental workshops had particular value in understanding how group feedback might change priority setting, and allowing participants to get feedback about how their preferences or allocations to future community development might contribute to a pool of community preferences. The combination of a group workshop setting with experimental feedback loops made this technique more appropriate to work through potential options for community development and understanding how individual preferences may change with information feedback.

These different assessment mechanisms do appear to offer key insights into community preferences about dealing with impacts that are not available from stakeholder analysis and economic modelling approaches.

There is a value in adding choice modelling and experimental workshops to the toolkit of economic and social impact assessment. While survey and workshop mechanisms

give different insights into community preferences, they are better viewed as complements rather than replacements for more traditional types of social and economic impact assessment. Further work to develop these tools and include them in impact assessment processes appear warranted.

## 8.10 References

- ACIL Consulting 2002, Pacific coal: adding value to the community and the economy, unpublished report prepared for Pacific coal.
- Adamowicz, W., P. Boxall, M. Williams and J. Louviere (1998), 'Stated preference approaches for measuring passive use values: choice experiments and contingent valuation', *American Journal of Agricultural Economics*, **80**, 64–75.
- Bennett, J., and R. Blamey (2001), *The Choice Modelling Approach to Environmental Valuation*, Edward Elgar, Cheltenham, U.K.
- Bennett, J., van Bueren, M. and Whitten, S. 2004 "Estimating society's willingness to pay to maintain viable rural communities", *Australian Journal of Agricultural and Resource Economics*, 48(3):487 - 512.
- Blamey, R., J. Bennett, J. Louviere, M. Morrison and J. Rolfe (2000), 'The use of policy labels in environmental choice modelling studies', *Ecological Economics*, **32**, 269–86.
- Burdge R, P Fricke, K Finsterbusch, W Freudenberg, R Gramling, A Holden, L Llewellyn, J Petterson, J Thompson and G Williams (1995), "Guidelines and principles for social impact assessment", *Environmental Impact Assessment Review*, 15, pages 11-43.
- Cashmore, M, Gwilliam R, Morgan R, Cobb, D & Bond A 2004, The interminable issue of effectiveness: substantive purposes, outcomes and research challenges in the advancement of environmental impact assessment theory, *Impact Assessment and Project Appraisal*, December 2004, vol. 22 no. 4, pp. 295-310.
- CHDC 2005 "Central Highlands Regional Profile", *Central Highlands Development Corporation, Emerald*, p. 23.  
[www.cgris.com.au/.../sites/default/resources/documents/files/Central\\_Highlands\\_Regional\\_Profile\\_CHDC.pdf](http://www.cgris.com.au/.../sites/default/resources/documents/files/Central_Highlands_Regional_Profile_CHDC.pdf)
- Department of Local Government and Planning, 2002, *WHAM 2015 Regional Plan (Draft) Whitsunday Hinterland and Mackay*, May 2002, Queensland.
- Ivanova, G. & Rolfe, J. 2005, *An overview of the Input Output method. Socio-economic impact assessment and community engagement to reduce conflict over mine operations research reports, Research Report 3*, Centre for Social Sciences Research, Central Queensland University: Rockhampton.
- Ivanova, G., Rolfe, J., and Lockie, S. 2005, *Social and economic issues associated with the Bowen Basin coal industry: Community Engagement to Reduce Conflict Over Mine Operations*, Paper presented on the ANZSEE conference, Massey University, New Zealand.
- Jensen, R. & West, G. 1986, *Input-Output for Practitioners*, Office of Local Government. Department of Local Government and Administrative Sciences, Canberra.
- Jensen, R. C. & West, G. 2002, *Community Economic Analysis*, Queensland Government. Department of Primary Industries, Brisbane.

- Lockie, S. (2001) 'Social Impact Assessment in Review: Setting the Agenda for Impact Assessment in the Twenty-First Century', *Impact Assessment and Project Appraisal*, 19(4), 277–287.
- Lusk, J.L. and Hudson, D. (2004). Willingness-to-pay estimates and their relevance to agribusiness decision making, *Review of Agricultural Economics* 26(2), 152–169.
- Morrison, M. and J. Bennett (2000), 'Choice modelling, non-use values and benefit transfer', *Economic Analysis and Policy*, **30** (1), 13–32.
- NRM 2005 “*Queensland coal facts 2003-04*”, Queensland Government, Natural Resources and Mines.
- Petts, J (ed) 1999, *Handbook of environmental impact assessment* vol. 1: *Environmental Impact Assessment: process, methods and potential*, Blackwell Science, Osney Mead, Oxford
- Proctor, W. 2005, 'Addressing Complex Risks Using Deliberative Multi-criteria Evaluation', paper presented to Australia New Zealand Society for Ecological Economics 2005 Conference, New Zealand.
- Rolfe, J., Lockie, S. & Ivanova, G. 2005, *Overview of social and economic issues associated with the Bowen Basin coal industry. Research Report 1*, Centre for Social Sciences Research, Central Queensland University: Rockhampton.
- Rolfe, J.C., McCosker, J.C., Windle, J., and Whitten, S. (2004). *Designing Experiments to Test Auction Procedures*, Establishing East-West Corridors in the Southern Desert Uplands Research Report No.2, Environmental Protection Agency and Central Queensland University, Emerald.
- Rolfe, J. and Windle, J. 2003 “Valuing the protection of aboriginal cultural heritage sites”, *The Economic Record*, 79: (Special issue) s85 – s95. Vanclay, F 2003, “International principles for social impact assessment”, *Impact assessment and project appraisal*, vol. 21, no. 1, March 2003, pp. 5 – 11.
- Sadler, B 1996 International study of the effectiveness of Environmental assessment – Final Report – *Environmental assessment in a changing world: Evaluation practice to improve performance* June 1996, Canadian Environmental Assessment Agency and the International association for Impact Assessment.
- West, G. 2004, 'Simple Input-Output Model and Impact. Analysis Unpublished course notes.' School of Economics, the University of Queensland, Brisbane.
- Windle, J., and Rolfe, J. 2005 “Diversification Choices in Agriculture: A Choice Modelling Case Study of Sugarcane Growers”, *Australian Journal of Agricultural and Resource Economics* 49(1):63-74.

## Appendix 1- Sample Choice Modelling question

This is the 1<sup>st</sup> out of 4 questions

Please treat each set of choices independently of others, i.e. do not change your answers

<b>Option 1</b>
• Population grows by 5%
• Jobs for partners/children very rare
• Good choice of restaurants but few social events available
• Standard of medical services improves by 10%
• Shopping and services in Emerald and Rockhampton increases by 20%
• Proportion of jobs in Blackwater holding by people living elsewhere increases by 20%
• You have to spend an extra \$200/year (\$17/month) of your disposable income

<b>Option 2</b>
• Population grows by 10%
• Jobs for partners/children easily available
• Few restaurants but variety of social events available each weekend
• Standard of medical services improves by 50%
• Shopping and services in Emerald and Rockhampton increases by 50%
• Proportion of jobs in Blackwater holding by people living elsewhere increases by 60%
• You have to spend an extra \$1,000/year (\$85/month) of your disposable income

Please indicate your preference: (Tick one)	
<input type="checkbox"/>	<b>Option 1</b>
<input type="checkbox"/>	<b>Option 2</b>
<input type="checkbox"/>	Option 3 ( <i>I would not support either option</i> )
<input type="checkbox"/>	<b>Option 4 (Unsure)</b>

## Appendix 2- Sample Choice Modelling results

### Blackwater

	Coefficient	Standard Error	Part worth
Constant	- 2.140***	0.257	- \$7,212.07
Population change	0.002	0.004	Not signif.
Jobs for partners/children	0.278***	0.047	\$938.37
Entertainment and social events	0.176***	0.047	\$592.70
Standard of medical facilities	0.008***	0.001	\$28.47
Shopping and services in nearby centres	0.005**	0.002	\$17.57
Increase in proportion of jobs held by people who don't live in town	- 0.012***	0.002	- \$41.88
Reduction in disposable income	- 0.000***	0.000	
Household income	0.000**	0.000	
Number of observations		1166	
Log Likelihood		-1089.04	
Adjusted Rho-square		0.14801	
Chi-Square statistic (9 D. of F.)		169	

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

### Bauhinia Shire

	Coefficient	Standard Error	Part worth
Constant	-1.621	0.285	-4,275.57
Population change	0.008*	0.004	21.48
Jobs for partners/children	0.256***	0.059	676.54
Entertainment and social events	0.073	0.058	Not signif.
Standard of medical facilities	0.004**	0.002	10.72
Shopping and services in nearby centres	0.006**	0.003	16.41
Increase in proportion of jobs held by people	-0.007***	0.002	-19.06
Reduction in disposable income	- 0.000***	0	
Household income	0.000*	0	
Number of observations		736	
Log Likelihood		-704.0787	
Adjusted Rho-square		0.12388	
Chi-Square statistic ( D. of F.)			

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

### Appendix 3 – A Rating Survey Experimental Workshop question

Please rate each of the following options in relation to the future development of Blackwater from most (1) to least (5) important.

	<b>Very important</b>	<b>Important</b>	<b>A bit important</b>	<b>Not very important</b>	<b>Not important at all</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Increased population growth					
Jobs for partners/children					
Entertainment					
Standard of medical facilities					
Shopping and services in Emerald and Rockhampton					
Proportion of jobs held by people who don't live in Blackwater					

## Appendix 4 – Sample Experimental Workshop question

Attribute	Levels	Cost	Your Choice
<b>Change in permanent population</b>	0%	\$0m	You can pick one of these three options or write a different amount
	10%	\$1.5m	
	25%	\$3m	
<b>Jobs for Partners/Children</b>	Difficult to find	\$0m	You can pick one of these three options or write a different amount
	Moderately available	\$3m	
	Easily available	\$6m	
<b>Entertainment</b>	Few restaurants or social events	\$0m	You can pick one of these three options or write a different amount
	Few restaurants, but variety of social events available each weekend	\$0.75m	
	Good choice of restaurants and variety of social events available each weekend	\$1.5m	
<b>Standard of medical facilities</b>	Improves by 10%	\$0m	You can pick one of these three options or write a different amount
	Improves by 20%	\$3m	
	Improves by 50%	\$6m	
<b>Shopping and services in Emerald and Rockhampton</b>	No change	\$0m	You can pick one of these three options or write a different amount
	Improves by 20%	\$0.75m	
	Improves by 50%	\$1.5m	
<b>% of new jobs held by people who move to live in Blackwater</b>	Increases by 10%	\$0m	You can pick one of these three options or write a different amount
	Increases by 20%	\$0.75m	
	Increases by 50%	\$1.5m	

\$9m

*Your Total should add up to \$9m*