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Better Planning for Coastal NSW

GUIDEBOOK ON SOCIAL IMPACT ASSESSMENT

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Guidebook Summary

In the planning and development process associated within urban and regional development there is an increasing requirement to go beyond an assessment of traditional environmental and ecological impacts and examine the social impacts of proposed developments and land use changes. Triggers for social impact assessments (SIAs) can be found in state planning legislation, and can be sourced to the decision making requirements of state agencies and departments or the demands of local communities faced with local development and land use changes.

While there is an identified need to undertake SIAs in many planning and development contexts, there is considerable uncertainty and confusion as to what constitutes a SIA. In Australia many 'so-called' SIAs, often undertaken as one component of an environmental impact assessment, are little more than descriptive profiles of communities based on the analysis of census or other secondary data. Good SIAs, like good environmental impact assessments, can be exceedingly useful in informing the planning process and realising negotiated outcomes which are acceptable to multiple stakeholder and interest groups.

A Comprehensive Coastal Assessment (CCA) process has been initiated by the NSW Government to address a wide range of planning objectives, based on the NSW Coastal Policy. The CCA process is aimed at providing decision support tools to improve strategic planning, land use, natural resource protection and socio-economic development along the NSW coast and it is within this context the Guidebook for Social Impact Assessment has been developed.

The primary objective of the Guidebook is to provide planners, policy makers and others involved in regional and urban planning with an initial conceptual and applied methodological framework for understanding and undertaking SIAs.

It is not the intention of this Guidebook to address all SIA methods and it does not include a discussion of the many important participatory and consultative techniques and processes that should be an integral part of most SIAs. The Guidebook describes a procedural framework for undertaking SIAs and four specific methods useful in a SIA context, which include:

- Human service provision thresholds,
- Demographic profiles and social indicators,
- Place meanings and environmental values and
- Network analysis.

1 Introduction

1.1 BACKGROUND AND OBJECTIVES

Throughout Australia the demand for social impact assessment (SIA) as an integral component of the planning and the development approval process, has grown considerably in recent years. However, there is limited understanding and knowledge of SIA and the use and application of specific SIA methods.

The primary objective of this project is to provide planners, policy makers and others involved in regional and urban planning with a conceptual and applied methodological framework for understanding and undertaking SIAs.

The information presented in this guidebook is not intended to address all methods of SIA and does not include a discussion of the many important participatory and consultative techniques and processes that should be an integral part of most SIAs. The report describes a conceptual framework for SIA based on the concepts of community resilience and vulnerability and four SIA methods which include:

- Human service provision thresholds,
- Demographic profiles and social indicators,
- Place meanings and environmental values and
- Network analysis.

1.2 THE DEVELOPMENT OF SOCIAL IMPACT ASSESSMENT

SIA is an applied interdisciplinary field that has emerged from within the social sciences. The term ‘social impact assessment’ was first used in the context of environmental impact analysis, stemming from the US National Environmental Policy Act (NEPA) in 1969, and was used to recognise and quantify the impacts on human populations resulting from significant environmental alteration.

It is an approach to understanding and assessing the impacts of change on individuals, families, communities and society. It draws on existing knowledge and methods used in a number of different social science disciplines including sociology, psychology, human geography, environmental studies, economics and political science. However SIA differs from many other types of social science analyses in that it is anticipatory, where the goal is

to assess the consequences of an action or event before the event has actually taken place (Burdge, 1995)

Although the US NEPA (1970) legislation is often cited as the primary driver for the development of social impact assessments, Burdge (2003) has indicated that "a search of the refereed literature turns up few case studies where SIA was conducted either as a stand alone assessment or within the context of a combined SIA-EIA…[and that]…a look at the 'grey' literature of EIAs and government documents reveals few separate SIA case studies" (p. 85)

Similarly, Chadwick (2002) in a review of social and economic assessments in the context of environmental impact statements in the United Kingdom notes that social impacts are seldom reported and that when SIAs were undertaken, they generally focused on objective and quantifiable impacts associated with population change, infrastructure needs or economic assessment.

SIA in Australia has been undertaken within the broader context of environmental impact assessment and also independently as a stand-alone assessment. There are two areas in which SIA has developed in Australia, including (i) natural resource management (NRM) and resource extraction and (ii) local and regional infrastructure and urban development.

In an NRM context several SIAs have been undertaken in relation to specific resource use activities including forestry, fisheries, water resources and mining. With the exception of those SIAs undertaken in relation to mining developments, many of the other resource based SIAs have been undertaken at a regional level and as part of a broader environmental planning and management process. In this context, one of the largest SIA programs in Australia was undertaken in relation to the development of Regional Forest Agreements between the Commonwealth and State Governments, with Comprehensive Regional Assessments being undertaken as part of this process. Included in these assessments were SIAs, which concurrently with other assessments, were undertaken for large regional areas including for instance, the State of Tasmania, Southern and Northern NSW and South East Queensland. SIA in a NRM context continues in Australia through the development of regional NRM plans under the extension to the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality, where several States require regional NRM bodies or catchment Management Authorities (CMAs) to assess the social and economic impacts of management actions in these plans.

Although often at a smaller scale to SIAs undertaken within a regional NRM context, SIAs in Australia also continue to be undertaken in the context of local and regional infrastructure planning and urban development (see for example the Northern Rivers Regional Organisation of Councils, 1999; Shantz, 2001). Local Government Authorities often undertake small scale stand alone SIAs for specific development proposals or planning initiatives and SIA, although often at a rudimentary level, is often included in broader impact assessments of regional infrastructure and development proposals (i.e., resort developments, high voltage transmission lines, waste disposal facilities etc)

However in both a national and international context SIA continues to be limited and constrained by a number of methodological and substantive problems (Becker and Vanclay, 2003). Several of these key issues are discussed below.

1.2.1 Use of Procedural Stages in the SIA

Although there are accepted procedural stages for undertaking SIAs, as described in Section 2, it is rare to find a SIA that conforms to these stages. The majority of SIAs focus on the preliminary stages of scoping and profiling (baseline assessments) as it is these stages for which information is often available and which can be readily obtained using existing methods and techniques. The prediction and evaluation of social impacts is more difficult to address and the field of SIA lacks rigorous methodological techniques and methods to address issues in these stages. For the most part the prediction and evaluation of social impacts is based on the 'expert judgement' of the SIA practitioner who will generally draw on information obtained from the community involvement process and primary and secondary data sources.

1.2.2 Quantification and SIA

Quantification, or the application of numeric and statistical techniques, along with the use of existing secondary data (such as ABS data sets) and an emphasis on 'desktop analysis' with little if any field research, is a common approach to undertaking SIAs. This approach to SIA has produced a number of SIAs which have tended to focus only on those issues amenable to quantification or for which secondary data is readily available. As a consequence SIA using this approach has often omitted issues of critical concern to communities, as these issues have not been identified as there has not been secondary data available to address them. For example, issues related to impacts on attachment to community or place; or the fairness and equity of decision making process; or the micro distributional impacts of developments and environmental change are difficult to quantify using exiting published data such as that found in ABS census statistics and are therefore generally omitted from many SIAs.

While resource issues are often cited as the reason for undertaking desktop quantitative analyses, an additional reason for undertaking this form of analysis is that the context in which the SIA is being undertaken is often highly politicised and conflictual and as a consequence there is often concern that field research by SIA practitioners may further exacerbate existing issues. In part this is essentially an institutional issue which needs to be resolved within the many organisations and Government agencies who are responsible for initiating or undertaking SIA in Australia.

While quantification is not necessarily inappropriate, there needs to be recognition that such an approach is only one of a number methods and interpretative approaches that may be used in SIA. The use of non-numeric, or qualitative approaches are widely used in human geography, anthropology and sociology and focus on discourse and meaning through such methods as group discussions, unstructured interviews, analysis of spoken and written materials and the use of case studies. Reflection on the methodology of previous SIAs

suggests that in many contexts there is a need to use multiple methods drawn from both quantitative and qualitative approaches if the core subject matter of SIA is to be adequately addressed.

1.2.3 Integration with other Environmental Assessments

SIA is often undertaken as one of a number of components of a broader environmental impact assessment process that may include concurrent biophysical and economic assessments. One of the difficulties when assessing social impacts in this context is that while the scientific community may recognise the disciplinary boundaries, community and stakeholders do not necessarily discuss social impacts within the same independent disciplinary compartments and boundaries. As a consequence, SIA may become relatively pervasive across the different assessments and disciplines, as is the case when local knowledge of biophysical processes or micro-economic flow-on impacts are identified and discussed as part of the SIA. Where there are multiple assessments occurring within a resource management or planning context the integration of SIA with other assessments often needs to be better identified and articulated.

1.2.4 Integration with Community Involvement

Burdge (2002) has indicated that in the United States the rise of community involvement and consultation in project development in the 1980's, while important, has had the effect of displacing SIA. The rationale for this being that if the community are involved and consulted in relation to project development, then social impacts will be considered. While community involvement is often a necessary requirement of project development, SIA provides a systematic and structured framework for the assessment and prediction of impacts which is not necessarily found within project based community involvement programs.

In environmental impact assessments in Australia, the community involvement process often occurs independently although concurrently with the SIA. Several difficulties have occurred in the past where the community involvement processes and the SIA have not been clearly integrated.

Firstly, the SIA process, if it is not to be a 'desktop' assessment, will itself undertake field assessments or community based research where there is interaction with key stakeholders and community groups, which may also occur in the community involvement process. Clearly if the SIA and community involvement processes are not integrated, communities may find both processes somewhat fragmented and lacking clear objectives.

Secondly, closer integration is often required between the SIA and community involvement process as the content and substance of the issues identified in the SIA and community involvement process are often closely related. Many of the issues that are identified and discussed in the substance of the community involvement processes are also core issues for the SIA. Similarly, many issues identified in the SIA process often have significant

implications in relation to the content and development of community involvement programs.

Thirdly, and of critical importance, is that meaningful community involvement with the assistance of the SIA may be used to better negotiate the introduction of change with the possibility of achieving greater acceptance of any changes that may occur. If integrated with the SIA, involving the community may assist in the mitigation of impacts that have been identified in the SIA. Furthermore, community involvement processes may be used to monitor social impacts that take place after the intervention of change has occurred.

As discussed above, there are significant opportunities for improving the value of SIA, particularly if the nature of the impact is clear and the impact assessment is integrated at an early stage with community involvement processes. However, integration has infrequently been a feature of past SIA and community involvement processes.

1.3 LEGISLATIVE REQUIREMENTS FOR SOCIAL IMPACT ASSESSMENT

In Australia there are no specific legislative requirements that directly and specifically stipulate formal SIAs within the context of environmental planning and management. Where SIAs are undertaken as a legislative requirement they are often undertaken on the basis of the statutory definition of environment as used within the legislation or on the basis that 'social matters' must be taken into account in relation to the development or activity.

While the legislative definition of environment is often sufficiently broad as to encompass the social environment alongside the biophysical, it is nearly always the case that when environmental assessments are undertaken as a direct consequence of legislation, there is considerably less emphasis placed on social assessments relative to biophysical assessments. It would generally be the case that most SIAs undertaken within Australia do not have a specific legislative trigger, but are conducted more as a consequence of community pressure or the institutional requirements of government or industry.

The legislative definition of the environment as a basis for requiring an assessment of social impacts is evident in both Australian Government and State legislation. For instance, under S528 of the *Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, the definition of environment includes "(a) ecosystems and their constituent parts, including people and communities; (b) natural and physical resources; (c) the qualities and characteristics of locations, places and areas; and (d) the social, economic and cultural aspects of a thing mentioned in paragraph (a), (b) or (c)."

Similarly Section 5 of the *Queensland Environmental Protection Act (1994)* defines environment as including the "qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community, and the social, economic, aesthetic and cultural conditions that affect, or are affected by, such things."

In NSW the definition of environment under the *Environmental Planning and Assessment Act (1979)* includes "all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings." Furthermore in NSW the *Environmental Planning and Assessment Regulation (2000)* clause 228 requires that the following issues be considered when taking into account the likely impact of an activity on the environment, many of which would, either directly or indirectly, include a consideration of social impacts.

(a) any environmental impact on a community,
(b) any transformation of a locality,
(c) any environmental impact on the ecosystems of the locality,
(d) any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality,
(e) any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations,
(f) any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974),
(g) any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air,
(h) any long-term effects on the environment,
(i) any degradation of the quality of the environment,
(j) any risk to the safety of the environment,
(k) any reduction in the range of beneficial uses of the environment,
(l) any pollution of the environment,
(m) any environmental problems associated with the disposal of waste,
(n) any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply,
(o) any cumulative environmental effect with other existing or likely future activities.

The definitions of environment and the requirement to address social matters in Australian and State Government environmental planning and management legislation emphasise two important facets relating to the scope of SIA.

Firstly the assessment of social impacts includes an assessment of the potential impacts of any development or activity on people and communities and their qualities and characteristics. This is the most common interpretation of SIA where the focus is on an examination of changes in the demographic or objective characteristics of populations and communities, including for example changes in employment, migration, family characteristics and business and commercial activities.

A second, and sometimes more important focus when assessing social impacts, is to understand the extent to which development proposals may impact on the perceived environment or place meanings and values that are ascribed to the environment. This includes for example impacts on cultural values, including natural and aesthetic values;

impacts on community associations and attachments to place, impacts on sense of community and the aesthetic qualities of the environment.

An emphasis on this type of impact is identified in the NSW Environmental Planning and Assessment Regulation (2000) where it is stated that the assessment should examine "any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality" and "any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations" (Section 228).

While specific legislation may trigger an assessment of social impacts within the context of a broader environmental impact assessment process, there are no additional triggers for SIA in Australia. At the current time most SIAs in Australia, and in particular those undertaken outside of the context of a traditional environmental impact assessment process, are triggered by political processes and in particular community and stakeholder calls for the assessment of social impacts within a changing development or environmental management context.

There appears to be no reason why a SIA could not be triggered under existing State and Commonwealth legislation in a similar way as environmental impact assessments are also triggered. It is most likely the case that the prevailing institutional frameworks, traditions and values simply place an emphasis on a biophysical rather than social assessment in this legislative context.

In addition to legislative triggers, many SIAs in Australia are also 'triggered' through the demands of community and industry. SIAs undertaken as part of the Regional Forest Agreement processes were one of the largest programs of SIA undertaken in Australia and were initiated through the demands of forest industry groups (Coakes and Fenton, 2001). Similarly SIAs of dairy industry deregulation (Fenton, 1999d) and changes in fisheries management (Fenton, 2002) have been initiated by industry and community groups. It is probable that much of the demand for SIAs within the community may be related to developing opportunities through which community and key stakeholders can develop voice in the planning and management process. As such undertaking a SIA may have more to do with issues of fairness and community involvement in decision making than the identification and reporting of specific 'social impacts' within a traditional SIA framework.

1.4 DEFINING THE SCOPE OF SOCIAL IMPACT ASSESSMENT

The Interorganisational Committee on Guidelines and Principles for SIA (2003) defines SIA as including:

> "the consequences to human populations of any public or private actions- that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society. The term also includes cultural impacts involving changes to the norms, values and beliefs that guide and rationalize their cognition of themselves and their

society" (The Interorganisational Committee on Principles and Guidelines for Social Impact Assessment, 2003).

While this definition of SIA is useful, it nevertheless does little to define the scope of SIA - in other words, what constitutes the 'social' in 'social' impact assessment. While the scope of a SIA is dependent upon the type of changes that are likely and the broader environmental and social context in which these changes occur, several authors have attempted to define the core SIA variables (Juslen, 1995; Taylor, Goodrich and Bryan, 1995; Vanclay, 2002). A recent description of the type of social impacts that might be investigated within a SIA is given by the Interorganisational Committee on Guidelines and Principles for SIA (2003), which defines social impacts under five headings (bullet points provide illustrations of the impact variables that might be considered within each heading):

- **Population change**
  - population size, density and change
  - ethnic and racial composition and distribution
  - relocating people
  - presence of seasonal residents
- **Community and institutional structures**
  - Voluntary associations
  - Interest group activity
  - Size and structure of local government
  - Historical experience with change
  - Employment/income characteristics
  - Employment equity of disadvantaged groups
  - Local/regional/national linkages
  - Industrial/commercial diversity
  - Presence of planning and zoning
- **Political and social resources**
  - Distribution of power and authority
  - Conflict between newcomers and old-timers
  - Identification of stakeholders
  - Interested and affected parties
  - Leadership capability and characteristics
  - Interorganisational cooperation
- **Community and family changes**
  - Perceptions of risk, health and safety
  - Displacement/relocation concerns
  - Trust in political and social institutions
  - Residential stability
  - Density of acquaintanceships
  - Attitudes toward proposed action
  - Family and friendship networks
  - Concerns about social well-being
- **Community resources**

- Change in community infrastructure
- Indigenous populations
- Changing land use patterns
- Effects on cultural, historical, sacred and archaeological resources

Schooten, Vanclay and Slootweg (2003) in their recent categorisation of social impacts, preface their categorisation with the concept of change, so that each of the impacts identified in their categorisation reflect 'a change in…' The seven categories of social impacts include…a change in…

- **Health and social wellbeing**
  - Death of self or family member
  - Death in the community
  - Nutrition
  - Actual physical health and fertility
  - Perceived health
  - Mental health
  - Aspirations
  - Autonomy
  - Stigmatisation or deviance labelling
  - Feelings in relation to the project
- **Quality of the living environment (liveability)**
  - Quality of the living environment (actual and perceived)
  - Leisure and recreation opportunities and facilities
  - Environmental amenity value/aesthetic quality
  - Availability of housing facilities
  - Physical quality of housing (actual and perceived)
  - Social quality of housing
  - Adequacy of physical infrastructure
  - Adequacy and access to social infrastructure
  - Personal safety and hazard exposure (actual and perceived)
  - Crime an violence (actual and perceived)
- **Economic impacts and material wellbeing**
  - Workload
  - Standard of living
  - Economic prosperity and resilience
  - Income
  - Property values
  - Employment
  - Replacement cost of environmental functions
  - Economic dependency
  - Burden of national debt
- **Cultural impacts**
  - Change in cultural values
  - Cultural affrontage

- Cultural integrity
- Experience of being culturally marginalised
- Commercial exploitation of culture
- Loss of language or dialect
- Natural and cultural heritage

- **Family and community impacts**
  - Alterations in family structure
  - Obligations to living family members and ancestors
  - Family violence
  - Social networks
  - Community identification and connection
  - Community cohesion (actual and perceived)
  - Social differentiation and inequity
  - Social tension and violence
- **Institutional, legal, political and equity impacts**
  - Functioning of government agencies
  - Integrity of government and government agencies
  - Tenure or legal rights
  - Subsidiarity
  - Human rights
  - Participation in decision making
  - Access to legal procedures and advice
  - Impact equity
- **Gender relations**
  - Women's physical integrity
  - Personal autonomy of women
  - Gendered division of production-orientated labour
  - Gendered division of household labour
  - Gendered division of reproductive labour
  - Gender based control over, and access to resources
  - Political emancipation of women

It is most likely the case that as part of the process of defining SIA, lists of social impacts will continue to be developed in an attempt to define the scope of SIA. While it is also most likely the case that a definitive list of social impacts will be somewhat elusive, the lists of social impacts that have been developed at least provide an illustration of the scope of social impacts that may be investigated with a SIA.

An examination of the type of social impacts identified in these lists highlights a number of common dimensions which distinguishes amongst the different types of impacts:

- **Quantitative and qualitative.** Impacts are identifiable which are assessable though both quantitative (numeric) and qualitative assessment procedures (non-numeric).

- **Actual and perceived**. It is important to examine both actual and perceived impacts as both will play an important role in understanding human response to change.
- **Positive and negative**. While there is certainly an emphasis on the identification of negative impacts, as mitigation strategies and processes often need to be developed to address these impacts, this should not preclude an assessment of positive impacts.
- **Units of analysis** (i.e., individual, family, community, organisation). Impacts will be applicable at different 'units of analysis' or organisational levels, which has implications in relation to the development of the assessment methodology used in the SIA.
- **Anticipatory impacts**. Unlike environmental impact assessments many of the impacts identified in a SIA may be anticipatory. In other words, changes to individuals, families and communities will often occur as a direct consequence of people anticipating the impact of a specific event before the event actually occurs.
- **Direct and indirect.** While many social impacts occur as a direct consequence of some intervention or change, many social impacts are also the result of indirect or flow on effects. Social impacts are often embedded in a network of interdependent relationships within the social system in which the change originally occurs.

The social impacts investigated within any specific SIA will be grounded in the environmental and social context in which the change occurs. The scoping process, which is one of the early stages of SIA implementation, focuses upon identifying potential impacts and as part of this process, existing lists, such as those described in this section, may be usefully reviewed as checklists or markers for ensuring that the required range of potential social impacts are being assessed.

2 A Framework for SIA

Although the scope of SIA and the methodology that is used will be specific to the development or change that is to occur and the social and environmental context in which the change is embedded, it is also important when undertaking a SIA to use a framework which guides the identification, analysis and prediction of impacts. On the one hand, this requires a 'procedural' framework which provides guidance in terms of the methodology and procedures that might be used in the impact assessment. It also requires a 'conceptual' framework, which provides conceptual guidance in relation to the selection of impact variables and the possible interrelationships amongst these variables (Lawrence, 1997).

2.1 PROCEDURAL FRAMEWORK: TECHNICAL AND PARTICIPATORY

In relation to defining a procedural framework for SIA, a core dimension which forms a thread through SIA methodology is the technical-participatory dimension to impact assessment. Technical approaches to SIA are generally based on objective assessments, make use of quantifiable indicators and are based on 'expert' assessments often made by the social impact assessor. In a technical assessment there is little if any community participation in the assessment processes.

On the other hand, participatory approaches, place an emphasis on the identification and prediction of impacts through the use of local knowledge within communities and amongst those most likely to be affected by change. In large part, the SIA practitioner facilitates the process of sharing and acquiring knowledge about the identification, prediction and mitigation of impacts. Using this approach SIA is embedded within a process of community involvement and participation (see for example the discussion in Section 1.2.4).

Table 1 identifies common themes which distinguish both approaches. Of course in an applied SIA context there may well be some mixing of the two approaches and associated themes.

Table 1. A Comparison of Technical and Participatory Approaches to SIA

Technical Approach	Participatory Approach
State or agency centred	Community centred
Technical knowledge	Local community knowledge
Assessment of objective impacts	Assessment of perceived impacts
Quantitative/numeric/modelling approach	Qualitative/discourse analysis
Natural science emphasis	Social science emphasis
Planning solution based on science	Planning solutions based on negotiation
Planner/Scientist as expert	Planner/Scientists as facilitator
Recognises a 'public'	Recognition of multiple 'publics'
Informing and consulting	Involving and participating
No focus on language and communication	Focus on language and communication

Source: EBC (2004)

In most Australian and international contexts, SIAs have tended to be based on a technical assessment of impacts (Becker, Harris, Nielsen and McLaughlin, 2004). Given the scope of impacts included in SIA as described in Section 1, it is difficult to reconcile how many of the impacts that are identified would be amenable to a technical (objective, quantitative and numeric) assessment. It would appear more appropriate given the scope of impacts as described in Section 1 that a combination of both technical and participatory approaches would be required. Perhaps the reasons for the technical emphasis in SIA is (a) that SIA is often undertaken alongside environmental and economic impact assessments which do place significant emphasis on technical assessments and (b) that by adopting a technical 'desktop approach' to SIA, institutions and agencies responsible for the SIA are essentially 'playing safe' and retaining control over the process by not engaging the community in the impact assessment.

While this report describes several 'technical' approaches to the assessment of social impacts, it is most likely the case that in an applied context these approaches may need to be embedded in a participatory SIA framework if they are to provide a meaningful description of impacts and impact predictions.

2.2 PROCEDURAL FRAMEWORK: STAGES IN THE SIA

The process of undertaking a SIA is often described in relation to a number of core generic procedural stages, which typically include

- scoping,
- profiling,
- prediction,
- evaluation,
- mitigation and
- monitoring.

Depending on the context of the SIA, several of the steps may overlap or be undertaken concurrently and each stage may be accorded a different level of detail or significance.

The five core stages of a SIA that have been identified may be presented in a slightly different sequence by different SIA practitioners and authors. Furthermore, additional stages may be introduced into the procedural framework to supplement the five core stages. For instance, Figure 1 shows 10 stages for SIA as identified by the Interorganisational Committee on Guidelines and Principles for SIA (2003) and the eight stages of SIA as identified by the USA National Environmental Protection Agency.

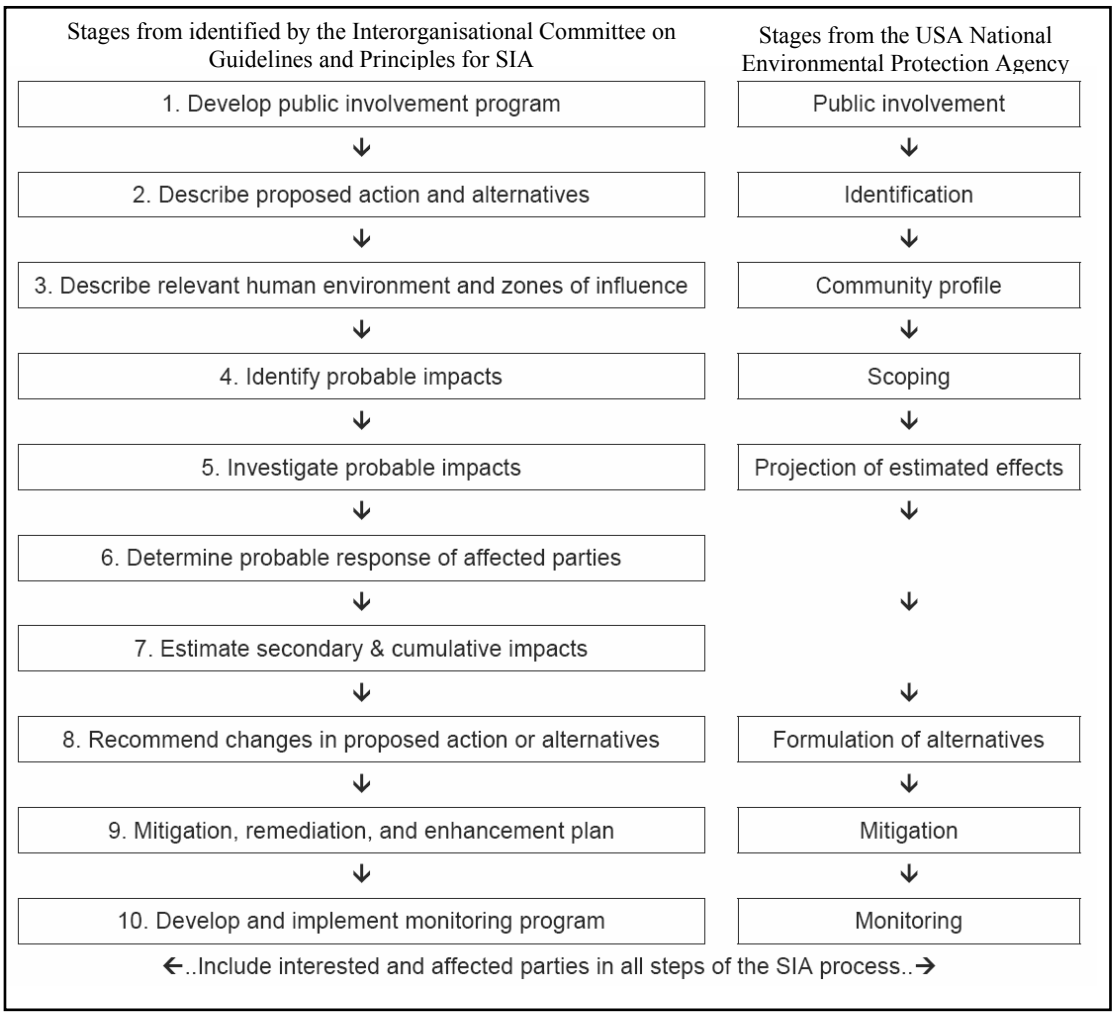


Figure 1. Generic stages in the SIA process

Scoping is usually the first and one of the most important stages in the SIA process and focuses on the identification of important issues to be addressed in the assessment. The scoping process may include a detailed description of the policy or development change which is likely to give rise to social impacts; a description and identification of appropriate techniques, methods or approaches to be used in the SIA and most importantly the identification of potential social impacts. Scoping is often undertaken through direct community involvement and engagement processes and through a review of existing and relevant documents, reports and other materials. As a consequence, the scoping phase of the SIA may also include the development of a community involvement program or the

integration of the SIA within an community involvement program that may already be established as part of the project development or EIA process (In Figure 1 scoping would also include steps 1, 2 and 4).

Profiling involves describing the existing social environment in which the change or impacts are likely to occur. It is sometimes described as a 'baseline social assessment' which is used to describe the past, current and future social environment that exists and is likely to exist if none of the proposed policy or development changes were to occur. As profiling provides a comparison against which social change can be understood, the description of the social environment should be meaningful and focussed in relation to the potential impacts identified in the scoping stage of the SIA. For instance, if there is likely to be a change in local employment, then profiling should include a detailed assessment of the baseline conditions in relation to local employment.

An additional issue addressed in the profiling phase of an SIA is the identification of other changes that have occurred or are occurring in communities and the extent to which these changes may influence the current impacts of interest (i.e., the existence of cumulative, additive and synergistic impacts). For example, while specific urban infrastructure developments impact on communities; these same communities may also be experiencing significant social change from other events occurring within the community including changes from the impacts of drought, low farm commodity prices, high unemployment rates, and other development and land use changes.

Profiling commonly makes use of Australian Bureau of Statistics (ABS) census and social indicator information which is used to describe the community and social trends that have occurred within the community over time. However there are several other primary and secondary data sources which can be used to assist in the development of community profiles including key informant interviews, survey research, and media and document reviews. As indicated previously, the profiling phase should not be encyclopaedic and attempt to present all available data and information, but should be focussed in relation to providing baseline information against which social change and impacts may be compared (In Figure 1 profiling would be included at step 3).

Prediction is undertaken after the completion of the scoping and profiling phases of the SIA and uses information on identified potential impacts and the description of the existing social environment to identify and describe the predicted social impacts. Predicted social impacts represent the difference between the future social environment with and without the proposed development or change taking place and may include predicted impacts associated with the planning, construction, operational and decommissioning phases of a project.

Prediction often addresses any cumulative impacts and flow-on impacts and describes the likelihood, magnitude and distribution of social impacts. There are few if any quantitative models which will enable predictions to be made about social impacts and it is generally the case, as is with environmental impact assessments, that prediction is based on:

(a) **'Expert judgements'**, with the 'experts' being the SIA practitioner or key informant participants in the community involvement process. The community involvement

process may itself include a number of structured techniques to identify and predict impacts including the use of scenarios.

(b) **Comparative methods**, where potential impacts are identified through a review of similar projects and case study documents and reports which describe impacts in a context similar to the one being investigated, and

(c) **Numeric projection and quantification** as occurs in simple numeric projections from baseline information, the use of population and employment multipliers, supply ratios (Section 3) and other statistical projections.

Prediction as a generic step in the SIA process would be included at steps 5, and 7 as shown in Figure 1

Evaluation is the process of determining community acceptability of the impacts identified in the prediction phase of the assessment. The process generally includes extensive community involvement and participation, as there are often significant differences amongst individuals and communities in how potential impacts are evaluated and the level at which impacts may become acceptable or unacceptable. In addition to the use of qualitative processes within the context of the community involvement process, survey research may also provide an assessment of how impacts are evaluated and the acceptability of impacts within the community (In Figure 1 evaluation would be included at step 7).

Mitigation focuses on addressing how any negative impacts that have been identified and which are above acceptable thresholds, may be ameliorated in order to minimise the level of social disruption and impact to those likely to be affected by the change. It is an important part of the SIA process. The identification of mitigation strategies and approaches should be based on extensive community involvement and participation (In Figure 1 mitigation would be included at steps 8 and 9).

Monitoring in the SIA process usually requires the establishment of a monitoring program in order to ensure that no unforseen impacts are occurring and that any mitigation strategies that have been developed and implemented are functioning and operating as intended (In Figure 1 monitoring would be included at step 10).

2.3 CONCEPTUAL FRAMEWORK: RESILIENCE AND VULNERABILITY

In addition to the need for a procedural framework to guide the SIA (Section 2.2), it is also important to have a conceptual framework, assists in the identification and organisation of SIA concepts. Such a framework may be useful in identifying the 'variables' to be examined in a SIA and how social systems may operate and respond to specific changes. As Rapaport (1985) has indicated "conceptual frameworks are neither models nor theories…models describe how things work, whereas theories explain phenomena. Conceptual frameworks do neither, rather they help us to think about phenomena, to order material, revealing patterns" (p.256).

Unlike the biophysical sciences, which operate on generally accepted laws associated with physical and biological processes, our understanding of social processes is relatively limited and based not on laws of behaviour or social organisation and function, but conceptual and theoretical frameworks. It is these frameworks that may be applied and used in understanding the underlying social processes operating within the context of SIA.

There are a number of theoretical and conceptual frameworks that may be useful in understanding the social processes operating within the context of SIA, including for example those of social capital (Bourdieu, 1986; Coleman, 1988; Putman, 1993), social wellbeing (McGregor, Morelli and Minerbi, 2003), structuration (Giddens, 1987), local knowledge (Baines, McClintock, Taylor and Buckingham, 2003) and social resilience (Adger, 2003; Holling 1973).

A brief description of the core concepts associated with social resilience is given below in order to illustrate the usefulness and importance of a substantive framework in SIA. The concept of social resilience may not be equally applicable in all SIA contexts and any number of other conceptual frameworks that have also been identified may be equally or more useful in understanding the social context in which the social change and impact is occurring.

The concept of social resilience is closely related to the concept of ecosystem resilience as first described by Holling (1973). In a social context, resilience is the potential for the social system to maintain its structure and function when faced with some disturbance, disruption or change and the ability of the social system to reorganise following the intervention and retain a functional state. There are two common definitions of resilience which are:

- The amount of change or disturbance that can be absorbed within the social system before there is a change in the state of the social system and
- The rate at which the social system recovers from a disturbance or change, which is often referred to as system stability.

Figure 2 shows how both concepts of resilience may operate. In the diagram on the left, the social system is operating within a functional range and at point X there is some intervention or change to the system. Adaptation to this change occurs and at some point in time the social system establishes the same or another equally appropriate level of system functioning. The difference between the two levels of system functioning is represented by the resilience of the system. An intervention may result in some social systems which are not resilient to change, experiencing significant change in they way they function. On the other hand, social systems that are resilient may experience only minor changes and adaptation to the new intervention. Of course the direction of adaptation by the social system may be either positive or negative.

In the diagram on the right (Figure 2) resilience is defined in relation to the time required for the social system to adapt to change or recover from the change that might be introduced. Again the social system may recover to the same level of function as was evident before the change was introduced or it may establish another equally appropriate functional level on which to operate.

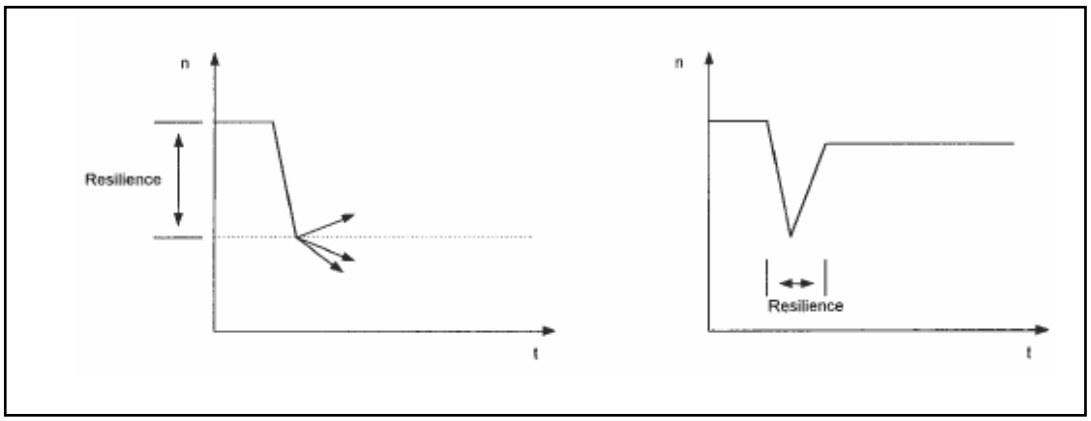


Figure 2. The resilience of social systems

Given the discussion of the resilience of social systems a core question that emerges is how reliance is to be operationalised or measured. If the concept of social resilience is used as a conceptual framework within SIA, it then provides a basis for the selection of social attributes or indicators to be used in the baseline assessments of scoping and profiling, and of course can be used in framing the approach to the prediction of social impacts (Section 2.2).

For instance, from the study of ecological systems there is evidence to suggest that the diversity inherent within the system plays a significant role in maintaining the integrity of ecosystems (Callicott and Mumford, 1997). Systems which have significant bio 'diversity' may well be more resilient to change than similar systems with far less bio 'diversity'. In a similar way, human and organisational diversity within a social system may well be associated with more robust and resilient social systems, while a social system with little diversity in their economic, human or organisation structures may well be less resilient to change.

While diversity is only one of a number of different attributes of the concept of social resilience, it should be apparent that given such a framework, there is a better basis to structure the substantive content of the SIA, including the identification of variables and indicators and their analysis.

3 Methods: Human Services

This section illustrates four SIA methods that may be used in the profiling and prediction phase of the SIA. Depending on the context of the SIA there are of course many other social science methods that may be equally if not more appropriate. It needs to be also remembered that most SIAs will embed or 'envelope' methods described in Sections 3 to 6 in broader community involvement or participatory programs. The four methods which are illustrated and discussed include:

- Human service provision thresholds
- Demographic profiles and social indicators
- Place meanings and environmental values
- Network analysis.

3.1 HUMAN SERVICE PROVISION

Changes in the size of populations may well have implications in relation to access to human services, which includes for example access to health and educational facilities. This may include the number of services available and the accessibility of the population to these services. Problems associated with the availability and accessibility to services is generally referred to as an issue of spatial accessibility.

Assessments and measures of spatial accessibility to services have focussed on two areas. This includes the use of 'supply ratios' or 'provider-to-population ratios' and the use of gravity models. Of the two measures of spatial accessibility, supply ratios are perhaps the most common as they are intuitively appealing, the data required is often readily available and unlike gravity models they can be developed with little computational complexity.

Supply ratios are most useful when developed for well defined and discrete geographic areas such as specific towns, regions or census areas. The supply ratio itself is often defined by the service providers themselves and may be readily available from State and Australian Government agencies and departments responsible for the provision of those services.

In defining a supply ratio for a specific service, the numerator of the ratio is usually some measure of service capacity, which may be the number of schools, the number of hospital beds or the area of parkland within a community. The denominator of the service ratio is the population size for the geographic area of interest and is usually derived directly from census data.

It is generally the case that service providers adopt a 'preferred' or optimum supply ratio, which indicates the preferred number of service units to a specific population size. For instance, the South Australian Urban Land Trust (1994) states that one local community health centre is required for every 30,000 people (1:30,000) and that a primary school is required for every 25,000 people (1:25,000).

When undertaking a SIA, a baseline assessment should be undertaken (wherever possible/desirable) to identify the existing and 'actual' supply ratios for services provided within the geographic area of interest. For example in a population of 5,500 people there may currently be one community health centre. In-migration to the area as a consequence of development or changes in land use planning may result in the population increasing to 7,000. If the preferred supply ratio for a community health centre is 1:3,000 this would therefore suggest the need for at least one additional community health centre in the community.

While the example above illustrates the use of supply ratios in relation to population growth, it may well also be the case that changes occurring within the geographic area of interest may result in lower populations and that there is less need for services to be provided.

Supply ratios may be useful in identifying gross trends in relation to population change and service delivery; however they must nevertheless be used with some caution. Some limitations of supply ratios are:

- Where the geographic area is not a discrete and bounded area, as found in many urban areas, supply ratios in these cases will not account for service use in adjacent geographic areas,
- They do not address issues related to travel distance and accessibility within the geographic area and
- They do not take into account the demographic characteristics of the population of interest, including the age, ethnicity or gender characteristics of the population.

When using supply ratios two additional assessments should be undertaken concurrently with the development of actual and preferred supply ratios.

Firstly demographic profiles should be developed for the existing population and for the predicted population at the time or after the change has occurred. These profiles at a minium should identify population change in relation to age and gender as these are the two key population characteristics most likely to influence the use of human services.

Existing population profiles can generally be obtained from current census data or surveys of the existing community. Predictions about the likely population size and composition are generally based on population multipliers, which can be derived from available information or the likely future workforce or immigration size. Sometimes survey research of similar workforces or populations likely to be migrating to an area of interest can also be undertaken.

Secondly, consultations should occur directly with existing local service providers in order to establish their capacity to provide services in the future, given changes in population size and composition. These consultations should focus on existing service use capacity (including the existence and size of any waiting lists for service use), the current capacity of the service provider to deliver services with existing human and physical infrastructure and any anticipated changes in service delivery which may impact on service provision in the future (i.e., expansion plans, future funding etc). It is usually the case that such consultations are an integral part of the community participation program in which the more technical SIA components are embedded.

Table 2 provides several examples of 'preferred' supply ratios for human services as documented by the South Australian Land Trust (1994). As indicated previously service providers within each State from both the private and public sectors will generally be able to provide supply ratios for specific services.

Table 2. Examples of Preferred Supply Ratios for Selected Human Services

Service	Supply Ratios (people)	
Primary Schools (Government)	1st primary school:	5,000 – 10,000
	2nd primary school:	10,000 – 20,000
	3rd primary school:	20,000 – 30,000
	High school:	10,000 – 20,000
Preschools	1st preschool:	30 four year olds
	2nd preschool:	Number of 4 year olds exceeds 120
Metropolitan hospital	4.8 beds	1,000
Community health centres	1 Regional community health centre	100,000
	1 District community health centre	30,000
	1 Neighbourhood community health centre	10,000
	1 Local community health centre	3,000
Nursing homes	40 beds	1,000 people over 70 years
Public library	1 central facility	5,000-10,000
	1 additional branch facility	70,000-80,000
Churches (Anglican)	Parish ministry	0-1,000
	Worship centre	20,000-30,000

Source: Adapted from South Australian Land Trust (1994)

4 Methods: Profiles and Indicators

Social indicators are most commonly used to monitor social change across time. Such indicators may include: crime rates, unemployment data, labour force participation rates and poverty measures. Social indicators have particular relevance in assessing social change processes. They can be particularly useful in aiding decision making and policy formation and contributing to our understanding of how communities are operating and functioning.

There are a number of different types of social indicators. Carlisle (1972) discusses four main types of social indicator, with the addition of a fifth type as proposed by Edwards (1975). These include:

- **Informative indicators.**
  These indicators are used to describe the social system and the changes taking place within a system.
- **Predictive indicators.**
  These indicators are informative indicators which fit into explicit predictive models of social systems. For example indicators such as unemployment and industrial diversity may be used in a model attempting to describe and predict the social resilience of a community.
- **Problem-oriented indicators.**
  These are indicators that address specific policy situations and actions on specific social problems
- **Programme evaluation indicators.**
  These indicators are used to monitor the progress and effectiveness of particular policies and programs.
- **Target delineation indicators.**
  Indicators which describe the demographic, environmental, pathological or service provision characteristics of populations (i.e., the use of supply ratios as discussed in Section 3)

Demographic profiles and social indicators may be developed from a number of different sources, including for example taxation data, information from Local Government Authorities, human service providers and social surveys. One of the most common sources of information in developing these profiles and indicators is census data.

The analysis of census data is very common in the profiling phase of an SIA. It is important as it provides a very reliable description of the population within an area or community based on information drawn from the entire population. However, given the abundance of census information available from the ABS population and housing census, careful consideration needs to be given to the type of census information that is reported. This

includes some consideration of the type of change that is proposed, the likely potential impacts as identified in the scoping process, data requirements for predicting impacts and the conceptual framework in which the SIA is being undertaken.

Census data can be obtained for different spatial units from census collector districts, urban centres (townships), a Shire or Council (Local Government areas) to larger statistical units such as statistical divisions. One of the advantages with data obtained at the collector district level is that each of the collector districts can be aggregated to define a specific region which approximates the area of interest for the SIA. Census information is available for the following geographic units.

- Collection Districts (CD)
- Statistical Local Areas (SLA)
- Statistical Subdivisions (SSD)
- Statistical Divisions (SD)
- States and Territories (S/T)
- Local Government Areas (LGA)
- Postal Areas (POA)
- State Suburbs (SSC)
- Urban Centres (UC)
- State Electoral Divisions (SED)
- Commonwealth Electoral Divisions (CED).

While census information is often drawn from the most recent census, in this case the 2001 census, it may also be useful to examine trends in relation to specific census variables across time. For instance, it may be useful to know what changes have occurred across different industry sectors during the past 20 years, as this may indicate a community's resilience or vulnerability to change. As the census is undertaken every five years this would require an examination of census data as reported in the 2001, 1996, 1991, 1986 and 1981 census periods. Certainly communities that have shown a continuous decline in key social indicators based on industry diversity, employment, educational attainment and home ownership over a number of years would perhaps be less resilient to change than communities where this decline has occurred only over recent years.

In examining historical trends in census data some caution is required as (a) the census boundaries and geographic units may have changed from one census period to another and (b) the definition of census variables may also have changed. In order to ensure that the same geographic boundaries and units are being used across all census years in which comparisons are being made, concordance tables[1] should be reviewed to determine if there has been any change in the boundaries of census collector districts. Census dictionaries should also be

[1] Concordance tables are available from the Australian Bureau of Statistics (www.abs.gov.au) and indicate whether between census periods a census collector district (CCD) has (a) been split into two or more CCDs; (b) been amalgamated with other CCDs to create a new CCD or (c) had its boundary modified.

used to determine if there has been any change in the definition of specific census variables across census periods.

4.1 COMPOSITE SOCIAL INDICATORS

Composite social indicators are indicators which are based on the aggregation of a number of similar census variables. In Australia, the Australian Bureau of Statistics has developed a suite of socio-economic indexes for areas, commonly referred to as the SEIFA indexes (ABS, 2001a; 2001b). Each index summarizes a different aspect of the socio-economic conditions in an area, by deriving a composite indicator from a number of underlying census variables. In the 2001 census there were four indices which include:

- Index of relative socio-economic disadvantage
- Index of relative socio-economic advantage/disadvantage
- Index of economic resources
- Index of education and occupation

Index of Relative Socio-Economic Disadvantage
The index of relative socio-economic disadvantage is derived from census variables which include low income, low educational attainment, high unemployment and people with jobs in relatively unskilled occupations. High scores on the index of relative socio-economic disadvantage occur when the area has few families on low incomes and few people with limited training and in unskilled occupations. Low scores on the index occur when the area has many low income families and people with little training and in unskilled occupations. High scores on this index reflect a lack of disadvantage rather than high advantage.

Index of Relative Socio-Economic Advantage/Disadvantage
A high score on this index indicates that an area has a relatively high proportion of people with high incomes or a skilled workforce. It also means an area has a low proportion of people with low incomes and relatively few unskilled people in the workforce. Conversely, a low score on this index indicates that an area has a higher proportion of individuals with low incomes and more employees in unskilled occupations.

Index of Economic Resources
This index reflects the economic resources of families within an area. Census variables included in this index reflect the income and expenditure of families, including income and rent. Census variables which reflect wealth, such as dwelling size, are also included. A higher score on this index indicates that the area has a higher proportion of families on high income, a lower proportion of low income families, and more households living in large houses. A low score indicates the area has a relatively high proportion of households on low incomes and living in small dwellings.

Index of Education and Occupation
The index of education and occupation reflects the educational and occupational structure of

communities. An area with a high score on this index would have a high concentration of people with higher education qualifications or undergoing further education, with a high percentage of people employed in more skilled occupations. A low score indicates an area with concentrations of either people with low educational attainment, people employed in unskilled occupations, or the unemployed.

Although SEIFA indices are not comparable to similar indices derived in previous census years, they are available for a number of geographic areas and as such they can best be interpreted by comparing the values on the index for the area of interest to national, state or comparative values from other areas.

Figure 3 illustrates the use of the index of socio-economic advantages/disadvantage in identifying those suburbs of Sydney with high advantage. The index values in this case are presented at the postcode level relative to Australian values for the index.

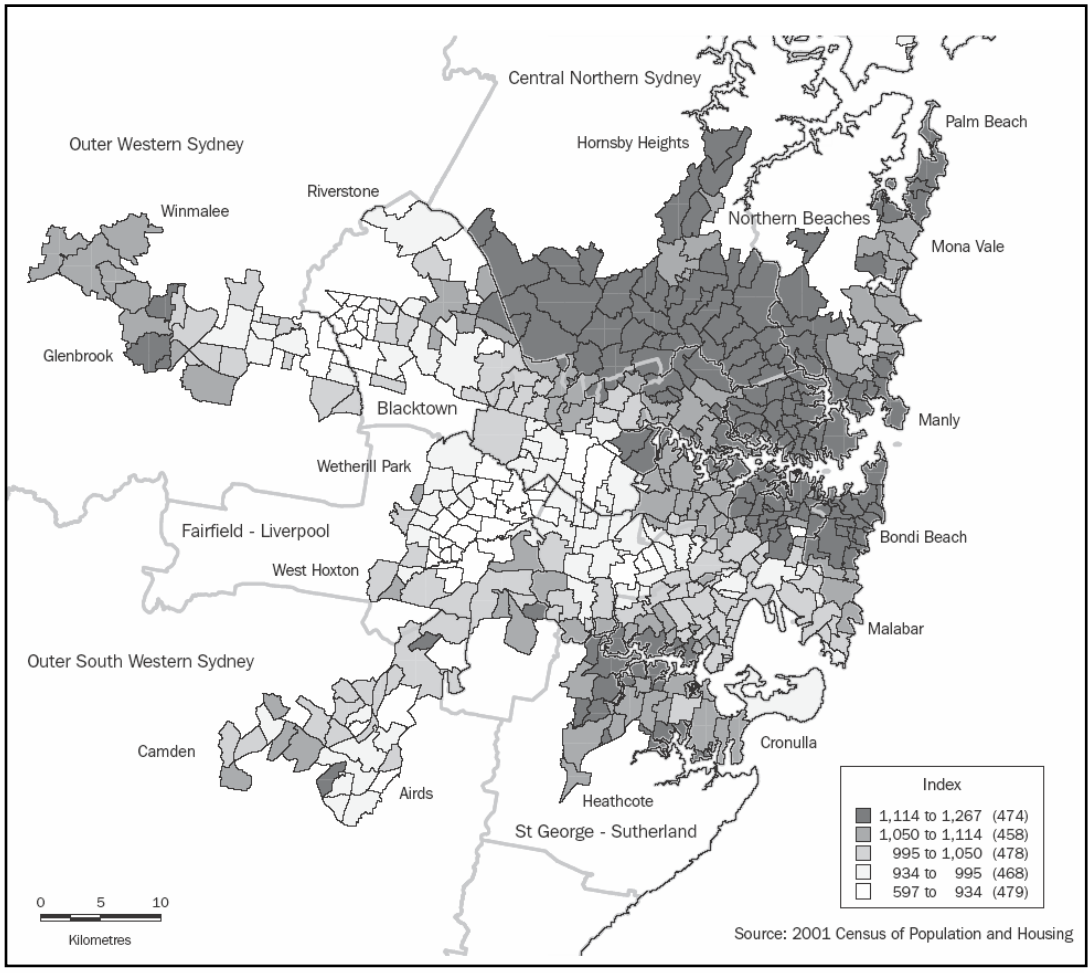


Figure 3. Spatial distribution of the index of socio-economic advantage/disadvantage

While the SEIFA indices are useful in profiling communities and may be used to indicate the resilience of communities and areas to change (Section 2.3), the SEIFA indices of advantage and disadvantage are not specific in relation to the type of advantage and disadvantage that might be experienced in the community

In order to address this issue, indices of community sensitivity to change (Fenton,1998a; 1988b; 1998c) have been developed from ABS census data to better identify communities that may be more less or more resilient to change. Analysis of census data, using similar techniques to that used in the development of the SEIFA indices, have identified four composite indices of community sensitivity to change (CSI) which included:

(i) unemployment and income,
(ii) education and occupation,
(iii) family and housing and
(iv) age dependency.

Table 3 identifies the four CSI indices and shows the specific census variables which comprise each index. As is evident in Table 3, the CSI provides a more specific assessment of community vulnerability or sensitivity to change than the more generalised SEIFA index.

Table 3. Four Community Sensitivity Indices

Index	
Unemployment and Income	**Family and Housing**
Unemployment rate	Percent dwellings rented
Unemployment rates (25-44 years)	Percent families with no vehicle
Weekly family income <$299	Percent separated and divorced
Education and Occupation	Percent of one parent families
Left school before 15 Years	**Age Dependency**
Percent over 15 years with no qualifications	Percent aged 14 years or less
Percent labourer or related workers	Percent aged 65 years or greater
	Dependency ratio

Source: EBC (2004).

For instance census areas may be described as having resilience or vulnerability in relation to unemployment and income; education and occupation; family and housing or the age characteristics of the population (populations with a high proportion of children or elderly). Each of the four indices are also reasonably independent, meaning for example that some communities may be identified as vulnerable or one index but relatively robust on the remaining three indices.

Figure 4 illustrates one application of the CSI in examining the relative resilience of a number of regions in North East NSW (Fenton, 1988b). The CSI index of unemployment and income, which is a z-score index, is plotted for a number of communities with the mean or average being rural NSW. Nimbin, Inverell and Dorrigo score above 2.5 standard deviations on this index, indicating that these regions are relatively sensitive to change on this dimension having relatively high unemployment rates and low family incomes.

Figure 4 also shows what percentage of the workforce within each region is employed in forest industries (derived from census information). The region of Dorrigo not only has a relatively high percentage of the workforce in forest industries, but is also relatively sensitive to change on the CSI index of unemployment and income. In this case Dorrigo may be significantly impacted by any change in forest policy in the North East of NSW which reduces the size of the forest industry workforce in Dorrigo.

The example presented in Figure 4 illustrates how composite social indicators, such as the CSI, may be used in not only providing profiles of communities in a SIA, but also in making predictions about potential impacts. It also shows the importance of developing a good procedural and conceptual framework when undertaking a SIA.

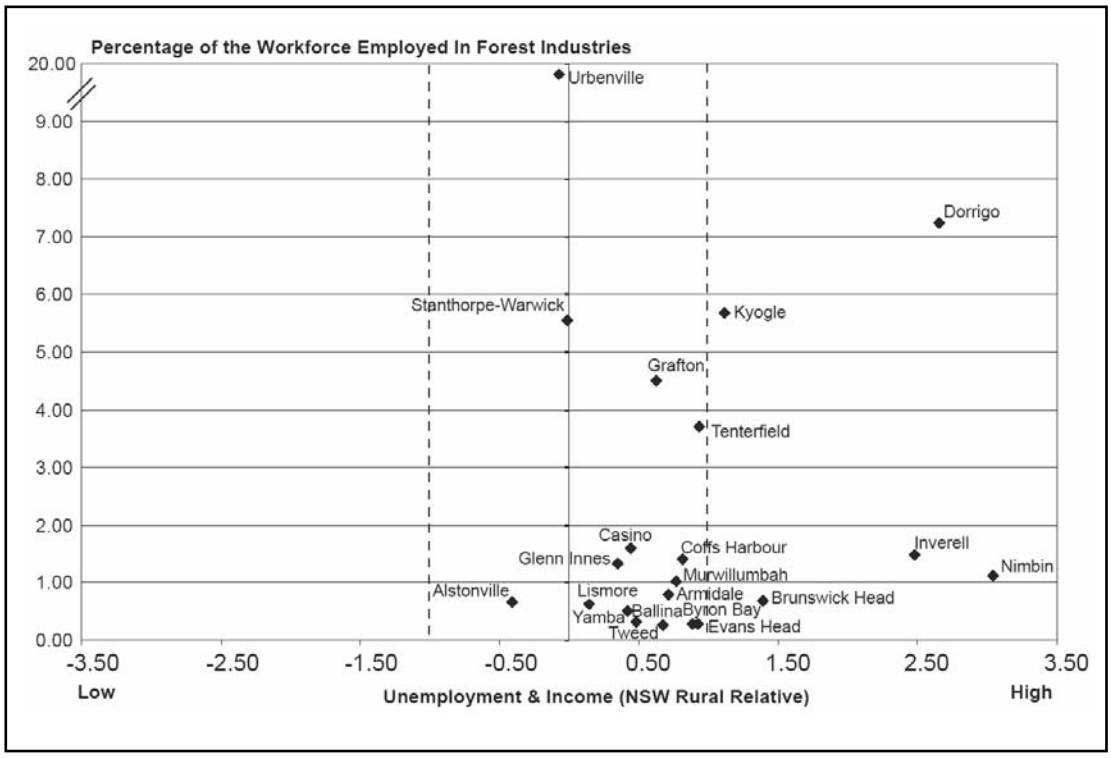


Figure 4. An application of the CSI index in assessing the impacts of forest policy

4.2 CENSUS DEMOGRAPHIC PROFILES

Not all variables with the census of population and housing need to be examined and there will often be a core subset of census variables which will be important to meet the specific objectives of the social impact study being undertaken. The selection of specific census variables and indicators will be dependent upon the social and geographic context of the SIA, the type of change that is being investigated and the conceptual framework that is being used to underpin the SIA.

Table 4 provides an illustration of census demographic profiles developed for a community which may be impacted by the development of a new road infrastructure corridor. In addition to basic descriptive information about the community (i.e., population size, age profiles), census variables are included which may indicate how resilient the community is to change (housing tenure, unemployment, income and family structure), how many in the community access educational facilities (as the road may impact on access to these services) and important information for the development of a community involvement program (including population size, percentage English speaking, the percentage of Aboriginal and Torres Strait Islanders and use of the internet).

A relative comparison to the Local Government Authority (LGA) in which the community at Alpha Road is found is also presented. Furthermore not only does the profile report percentages, but absolute numbers are also reported as these may be used later to predict the magnitude of potential impacts (i.e., the number of primary school children impacted by the road reducing access to primary school facilities in the area)

Table 4. An example of a Community Profile for Alpha Road Residents

Profile Characteristic	Alpha Road	LGA
Number of occupied private dwellings	124	34,688
Resident population	315	94,739
Occupancy rate	2.5	2.7
Percent rental housing	25.0 (31)	38.0
Percent fully owned	35.5 (44)	31.2
Percent mortgaged	30.6 (38)	23.2
Speaks only English	93.3 (292)	87.5
Percent different address 3 years ago(a)	9.4 (29)	25.4
Percent different address 5 years ago(b)	21.5 (62)	52.7
Pre-school (0-4yrs)	6.7 (21)	6.2
Primary school (5-12 years)	11.1 (35)	10.4
High school (13-17 years)	8.9 (28)	6.7
Young singles/couples (18-24 years)	8.9 (28)	13.2
Young middle families (25-39 years)	20.6 (65)	23.2
Mature families (40-49 years)	21.3 (67)	13.9
Pre-retirement (50-64 years)	11.1 (35)	15.0
Elderly (over 65 years	11.4 (36)	11.2
Unemployment rate	17.0	8.8
Unemployment rate (15 to 24 years of age)	23.1	15.6
Median weekly rent	$125	$125
Median individual income	$450	$350
Median weekly household income	$900	$750
Percent separated or divorced	18.1 (47)	11.9
Percent aged ≥15 years with no qualifications	63.4 (161)	54.9
Percent one-parent families (persons)	24.3 (60)	15.3
Percent ‘white collar’ workers	54.7 (76)	66.5
Percent ‘blue collar’ workers	45.3 (63)	33.5
Percent attending pre-schools	0.0 (0)	1.3
Percent attending primary schools	9.8 (31)	8.5
Percent attending secondary schools	7.6 (24)	5.7
Percent Aboriginal and Torres Strait Islander	3.2 (10)	4.8
Uses the internet (Percent over 15 years of age) 40.2 (103)	46.0	
Percent household with one motor vehicle	39.3 (48)	40.7
Percent households with two or more motor vehicles	52.5 (64)	42.0
Industry Employment		
Manufacturing	13.9 (21)	7.7
Construction	7.3 (11)	6.8
Retail and wholesale trade	19.9 (30)	18.7
Government administration and defence	8.6 (13)	12.4

Data Source: Australian Bureau of Statistics (1996, 2001)

4.3 THE ANALYSIS OF SOCIAL INDICATORS

In many instances it may not be sufficient to simply know the value of a specific census variable. An unemployment rate of 15.3% for a specific community may be a useful indicator of employment within the community, but it is only when it is compared to some normative value, such as a regional or national unemployment rate that a broader understanding and interpretation of the index is possible.

Of course the question arises as to what specific normative values are to be used as the comparison. Do we compare the value for the area of interest to norms derived for the region, state or to some national average? None of these comparisons will necessarily be incorrect and each type of comparison can be used to provide useful comparative information for specific census variables of interest. Table 4 for example compares census values from the local community to those obtained from the Local Government Authority in which the community is located and Figure 4 provides relative comparisons of the CSI index to the average for rural NSW.

There are numerous measures which can be used to describe how specific sub populations or geographic regions depart from a specific norm, including for instance the location quotient and Z-scores.

The location quotient is one of the most commonly used measures and is given as:

$$Q_j = X_j/k$$

Where: X_j is the percentage of variable X occurring within a sub population or area
K is the (constant) percentage *of variable X* in the sub population or area

A location quotient of 1.0 indicates the variable is represented in the area or sub population in exactly the same proportion as it is represented in the comparative sub population base or area. Values less than 1.0 indicate the variable to be less than the norm, while values greater than one indicates values higher than the norm. The location quotient may be usefully applied to all collector districts or urban centres and localities within a geographic area of interest, with the geographic area of interest itself used as the relative comparison.

Table 5 provides an example of location quotients for specific age profiles for three localities within the Shire of Sutherland. In this case location quotients are calculated separately for the 1996 and 2001 census periods.

Table 5. An Example of Location Quotients for Age (1996 and 2001)

Age Profiles	Kurnell		Woolooware		Cronulla	
	1996	2001	1996	2001	1996	2001
0-4 Pre-school children	1.33	1.20	0.96	1.05	0.65	0.61
5-12 Primary school children	1.10	1.13	0.92	0.94	0.51	0.57
13-17 High school children	0.87	1.01	0.88	0.93	0.53	0.61
18-24 Young singles/couples	0.87	0.81	0.89	1.02	1.39	1.22
25-39 Young middle families	1.16	1.15	1.02	0.96	1.33	1.41
40-49 Mature families	1.00	0.99	0.94	1.07	0.77	0.86
50-64 Pre-retirement	0.88	0.96	0.94	0.91	0.84	0.85
65 + Elderly	0.72	0.74	1.39	1.15	1.48	1.29
Dependency ratio	0.99	0.96	1.14	1.06	0.85	0.78

Note: *An index that has a value of 1.0 indicates the same concentration as the Sutherland Shire in either 1996 or 2001. Indexes greater than 1.0 and less than 1.0 respectively, indicate concentrations higher and lower than the Shire of Sutherland for the specific census period*

Data Source: *Australian Bureau of Statistics (1996, 2001).*

While the location quotient is a commonly used comparative measure, the use of z-score transformations are often a more suitable comparative measure as they take into account the spread or dispersion of scores around the mean or average. In addition z-score transformations can often be used when composite indices have to be derived which may be based on a number of very different variables using different measurement scales (i.e., participation rates, percentages, dollar values etc)

As an example of the calculation of a z-score, if the unemployment rate is determined for all census collector districts within a region and the mean and standard deviation derived across all census collector districts, a z-score transformation of the unemployment rate for each collector district can be derived using the following formula:

$$Z = (X_i - X_{mean})/X_{SD}$$

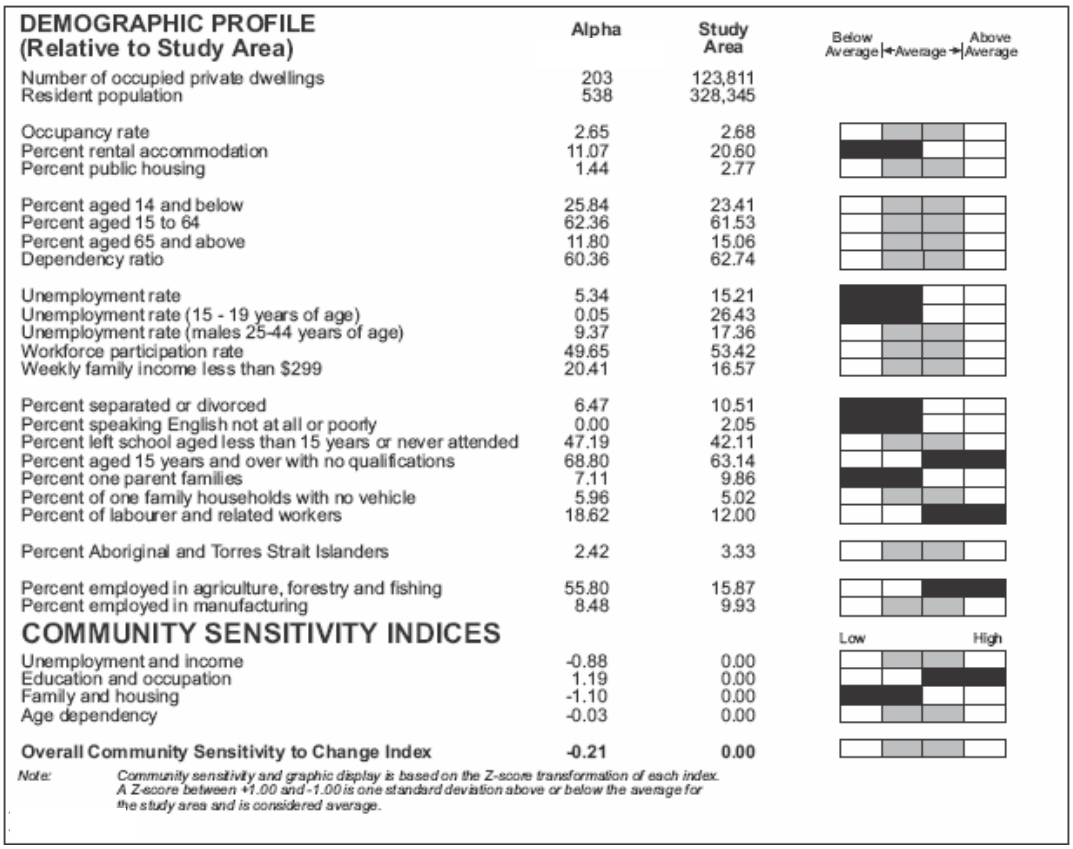
Where: X_i is the raw score for variable X for the sub population or area
X_{mean} is the mean of all scores on variable X
X_{SD} is the standard deviation of all scores on variable X

The z-score will have a mean of zero and a standard deviation of 1.0. This means that collector districts in our example that have a z-score within plus or minus 1.0 will comprise 68% of all collector districts. As such Z-scores below –1.0 or above +1.0 maybe considered above or below average when compared to the norm.

Figure 5 shows an example of a census based demographic profile developed for a community identified as Alpha, which is located within a larger study area. The first column of values in the table shows the raw census values and percentages for specific census variables. For instance the resident population of Alpha is 538; 25.8% of the population is below 14 years of age and the unemployment rate is 5.3%.

The same census values are also provided for the entire study area in which the community of Alpha is located. The question that now arises is whether the census values for the community of Alpha are 'significantly' different to those of the study area.

Using the study area values as the mean and calculating the standard deviation based on all other communities within the study area, it is possible to calculate the z-scores for each census variable. Although the z-scores themselves are not reported in Figure 5, the graphic in Figure 5 indicates whether the z-score for Alpha is within plus or minus one standard deviation of the study area mean (grey tint) or is located above or below one standard deviation of the mean (black tint). As an example, the percent of people in rental accommodation and the unemployment rate is 'significantly' lower in Alpha when compared to other communities in the region.



DEMOGRAPHIC PROFILE (Relative to Study Area)	Alpha	Study Area
Number of occupied private dwellings	203	123,811
Resident population	538	328,345
Occupancy rate	2.65	2.68
Percent rental accommodation	11.07	20.60
Percent public housing	1.44	2.77
Percent aged 14 and below	25.84	23.41
Percent aged 15 to 64	62.36	61.53
Percent aged 65 and above	11.80	15.06
Dependency ratio	60.36	62.74
Unemployment rate	5.34	15.21
Unemployment rate (15 - 19 years of age)	0.05	26.43
Unemployment rate (males 25-44 years of age)	9.37	17.36
Workforce participation rate	49.65	53.42
Weekly family income less than $299	20.41	16.57
Percent separated or divorced	6.47	10.51
Percent speaking English not at all or poorly	0.00	2.05
Percent left school aged less than 15 years or never attended	47.19	42.11
Percent aged 15 years and over with no qualifications	68.80	63.14
Percent one parent families	7.11	9.86
Percent of one family households with no vehicle	5.96	5.02
Percent of labourer and related workers	18.62	12.00
Percent Aboriginal and Torres Strait Islanders	2.42	3.33
Percent employed in agriculture, forestry and fishing	55.80	15.87
Percent employed in manufacturing	8.48	9.93
COMMUNITY SENSITIVITY INDICES		
Unemployment and income	-0.88	0.00
Education and occupation	1.19	0.00
Family and housing	-1.10	0.00
Age dependency	-0.03	0.00
Overall Community Sensitivity to Change Index	**-0.21**	**0.00**

Note: Community sensitivity and graphic display is based on the Z-score transformation of each index. A Z-score between +1.00 and -1.00 is one standard deviation above or below the average for the study area and is considered average.

Figure 5. An example of the use of z-scores in interpreting census profiles and indicators

5 Values and Place Meanings

This chapter focuses on values and place meanings in SIA. Any discussion of values in this context has to recognise that there are different disciplinary definitions and uses of the term value. As noted by More, Averill and Stevens (1996), the term value also has to contend with "a haze of closely related concepts – how does a value differ from a preference, a motive, a goal, a policy, a want, a desire, or an inspiration?" (p.399).

From the perspective of SIA, Brown's (1984) early discussion of the term value is particularly important. Brown (1984) distinguishes between two forms of value which include 'held values' and 'assigned values'. Held values are the "modes of conduct, end states or qualities which could possibly be desirable" (Brown, 1984, p. 232).

Held values include those enduring beliefs about preferable end states which guide choices and actions and are linked directly to individual beliefs about environmental quality and sustainability. Many of the environmental disputes that have emerged in Australia are often centred on beliefs about development and land use changes which are incongruent with the values held by individuals in relation to preferable end states for the environment.

In addition to 'held values', Brown (1984) also describes 'assigned values' or those values that are assigned to environmental events, objects and contexts such that one, because of its assigned value, may take precedence or preference over another. Much of the research in economic valuation focuses specifically on assigned values, through the application of such methods as contingent valuation, benefit-cost analysis and cost effectiveness analysis.

This chapter provides a discussion of environmental values or 'held values' and also provides an introduction to several non-economic methods for exploring and identifying those values and meanings that are assigned to place.

5.1 ENVIRONMENTAL VALUES

There have been several conceptual models which have been developed to explain the different values people hold and how these values may direct behaviours and attitudes towards environmental issues (Stern, Dietz, Guagnano and Kalof, 1999; Dunlap and Van Liere, 1978).

Bengston (1994) has provided several reasons why a better understanding of environmental values would benefit natural resource managers and those involved in the development of environmental policies. These include (a) that natural resource management goals can be established which incorporate not only the economic value of the resource but the intrinsic and amenity values, (b) that by understanding the values of the community, resource managers will be better able to determine community reactions to new management regimes

and policies and (c) that an understanding of the environmental values within a community will better enable resource managers to understand the conflicts that occur between different stakeholder groups.

An assessment of the environmental values within communities is most often based on survey research where values are identified through the use of appropriately designed questionnaires. While survey research is the most common method for identifying community values, other methods such as stakeholder analysis, media reviews and individual interviews can also be used in identifying values.

Environmental values may be understood at a purely descriptive level or may be used in a predictive model to explain community responses to land use and development changes and in SIA context may be used in the scoping or prediction phase of the assessment. For instance, Satterfield and Gregory (1998) undertook a descriptive analysis of environmental values in order to identify the different values held by the general public and those households dependent upon the timber industry.

Table 6 identifies the questions used to identify the different environmental value orientations, with survey respondents using a four point agree-disagree scale in responding to each of the questions. A value orientation associated with environmental support is typical of the values more broadly held within the community, while values associated with deep ecology typically represent a less common value orientation.

Table 6. Environmental Value Questions (Satterfield and Gregory, 1998)

Environmental Support

- I think environmental problems are extremely important
- When I see or hear a story about an environmental issue, I pay particular attention to that story
- It bothers me that the world's natural environment is changing so quickly

Deep Ecological Environmental Support

- All species, including humans, have an equal right to coexist on the planet
- I am attracted to the spiritual qualities in the natural worlds
- I would be willing to sacrifice much of my current standard of living in order to help ensure that nature is not harmed
- Technological development is destroying nature

As shown in the environmental value scales (Table 6) used by Satterfield and Gregory (1998), a common approach in much descriptive assessment of environmental values is to distinguish between extrinsic (or instrumental and utilitarian values) and intrinsic value orientations. The extrinsic value orientation consists of beliefs about the value of the natural environment in relation to its use, production or economic value. In other words, this value orientation is concerned about the value of the natural environment purely in terms of its value to humans (defining the natural environment in terms of a `resource' exemplifies this common value orientation). On the other hand, the intrinsic value orientation consists of beliefs that focus on the inherent value of nature and that the natural environment has value for its own sake independent of human use. In some instances, individuals will hold one

value orientation at the exclusion of the other, although, it has also been found that many individuals hold both value orientations concurrently and express considerable value conflict in their beliefs about the management of natural resources (Fenton, 1998f).

A similar study to that undertaken by Satterfield and Gregory (1998) was also undertaken by Fenton (1998f). A community survey was undertaken of over 2,000 households in South East Queensland in order to identify specific environmental value orientations in relation to the management of Queensland forests. Table 7 shows the specific belief statements used to identify the value orientations, with survey respondents responding to each belief statement using a four point agree-disagree scale.

A factor analysis of the rectangular matrix of 14 belief statements by 2,000 respondents was undertaken in order to identify factors or groupings of similar belief statements. Table 7 shows that four factors were identified, which included an intrinsic and extrinsic value orientation.

Table 7. Factor Structure of 14 Environmental Belief Statements

Statements	Factor 1 Environmental Concern	Factor 2 Intrinsic Value	Factor 3 Industry Dependency	Factor 4 Extrinsic Value
Factor 1: Environmental Concern				
I am concerned about the management and use of native forests in Queensland	*0.72876*	0.18164	-0.02375	0.14150
I am confident that native forests are being well managed in Queensland[1]	*-0.68640*	0.20398	0.20320	0.12241
Better laws are needed to regulate the use of native forests in Queensland	*0.55495*	0.23887	0.13592	-0.06058
The balance of the forest ecosystem is fragile	*0.51768*	*0.45954*	-0.20598	0.09713
Laws to protect native forests do not affect me[1]	*-0.41211*	-0.18024	0.00126	0.09716
Factor 2: Intrinsic Value				
Forests are important for their own sake	0.21980	*0.63606*	-0.22462	0.05471
I appreciate the natural beauty of the forest	0.30163	*0.57875*	-0.23593	0.14145
The conservation and protection of native forests in Queensland will benefit the economy	0.27100	*0.55968*	0.04884	-0.19619
Forest industries should be more involved in the management of forests	-0.16145	*0.53963*	0.15248	0.28163
Factor 3: Forest Industry Dependency				
If the forest and timber industries didn't exist in this area I would have to live somewhere else	0.04222	-0.16642	*0.78230*	0.00273
The area in which I live is very dependent on the timber and logging industry	-0.07090	-0.03476	*0.77629*	0.16587
Factor 4: Extrinsic Values				
I sometimes feel torn between the need for jobs and the need to protect native forests in Queensland	0.11603	0.12675	-0.03489	*0.73913*
Protecting native forests will threaten jobs	-0.11933	-0.48653	0.14602	*0.59205*
The timber industry is important to the Queensland economy	-0.21661	0.16859	0.34652	*0.53451*

Note: [1]*These belief statements are negatively correlated with the associated factor. Values in italics are the significant factor loadings*

Source: EBC (1998f).

In a SIA, information about the value orientations of communities and residents forms an important component of the profiling phase of the assessment. While it is often the case that

demographic information is used in the profiling phase of the SIA, information about the value orientations of the population is often critically important as it is the value orientations which will often underpin community attitudes and actions in relation to development proposals and land use changes.

For instance, Figure 6 using the information presented in Table 7 shows the spatial distribution of intrinsic values in the population of SE Queensland. Populations with higher intrinsic value scores are found in the metropolitan and urban areas of Brisbane and the Sunshine Coast, while those populations with lower intrinsic value scores are found in the more rural and agricultural areas of SE Queensland.

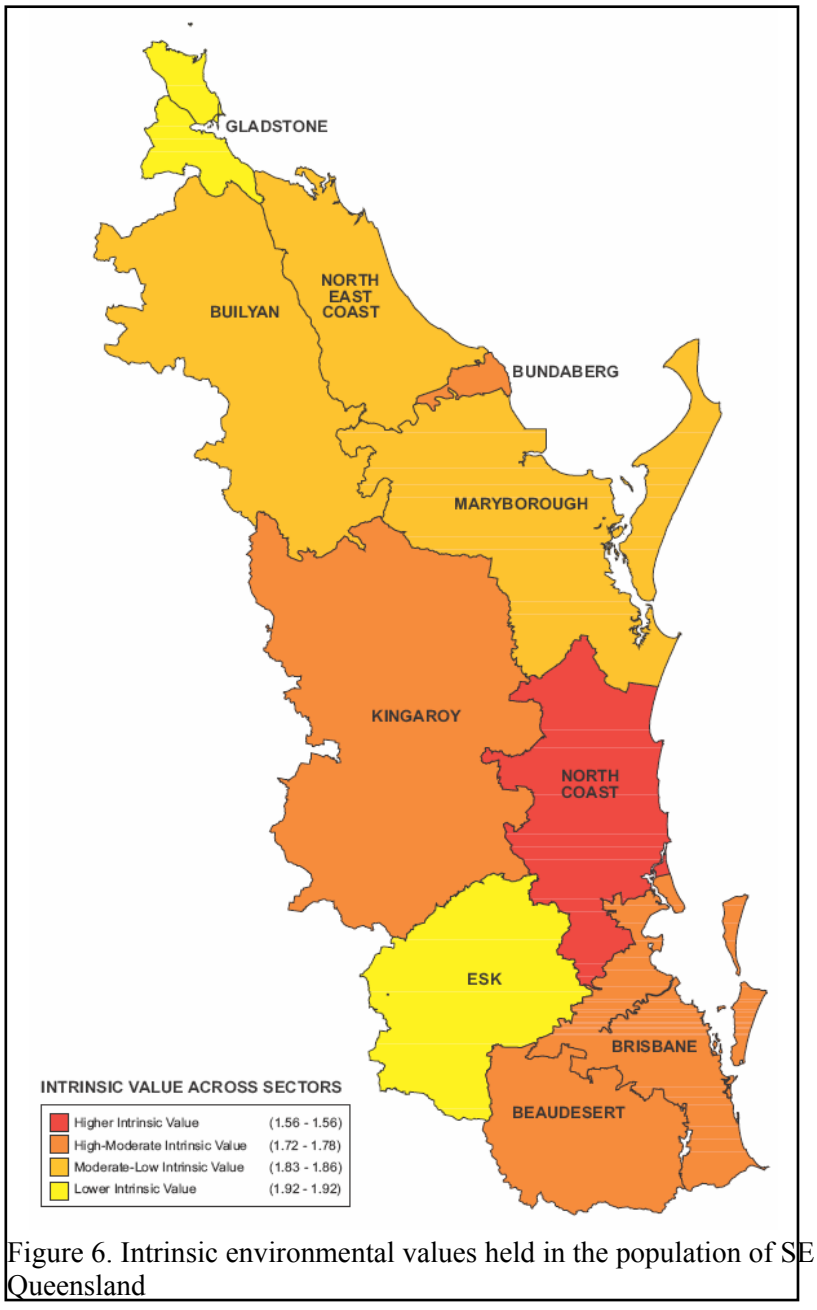


Figure 6. Intrinsic environmental values held in the population of SE Queensland

5.2 PLACE MEANINGS

The previous discussion, to use the terminology of Brown (1984), has focused on the values that are 'held' within the population, rather than the values that are 'assigned' or 'ascribed' to the environment and places within the environment.

Rather than focussing specifically on identifying and describing assigned values[2], a broader description is warranted. This section describes methods and techniques for understanding the meaning (including assigned values) which people ascribe to places, objects and events in the environment.

Identifying place meanings, or the meanings that are ascribed to the environment, is an important component of the profiling phase of the SIA and provides information on significance places and locations within the environment. This type of information is also valuable when decisions are made about the appropriateness of different alternative locations for infrastructure and land use developments. As such they may also be used as a predictive tool in site location and land use suitability.

Place meanings include not only descriptions of the environment but also the emotive qualities of the land and places within the environment. There are often several important dimensions underpinning the meanings people ascribe to places, and these may be embedded in individuals' historical associations with the land, where people describe the land as home, as part of their livelihood, or as partly defining who they are as 'land'-holders or farmers. Through place meanings, individuals may also ascribe important values to the land including important intrinsic or natural values or extrinsic use values.

Although there are several techniques and methods which may be used to assess place meanings, and while it is often a critical issue in many SIAs associated with environmental planning and management, there are very few SIAs that have addressed the issue of place meanings in this context.

Place meanings may be identified through qualitative techniques based on interviews with key informants or small group discussions and workshops. They may be identified in these contexts through relatively unstructured interview processes or through interviews which are structured using specific interviewer prompts and questions. The data, usually represented as the text of the interview conversation, can then be used to illustrate and describe the place meanings that are reported by individuals.

The following three quotations represent data from two unstructured interviews which illustrate the importance of place meanings within a planning and development context. As an aside, these quotations also emphasise the richness of qualitative data and that in some instance a preoccupation and reliance on highly numeric quantitative data, with its characteristic qualities of reliability and generalisability, may not always be valid in identifying and describing the key issues of local importance.

[2] This is also discussed in the NSW Comprehensive Coastal Assessment Guidebook on Data and Methodology (NSW Government, 2004)

In the first quotation a landholder is describing the potential impact of a proposal to develop a high voltage transmission line on his property and how this proposal is incongruent with the meanings and associations his family has developed with the land over the past 57 years.

> "These properties were acquired by my family over the years from 1945, the year of my birth 57 years ago. This land was all virgin scrub which we cleared and turned into good cultivation land. We farmed this land well, cared for it and have been proud to own this freehold county. This proposal of a high voltage transmission line through my family's properties would be totally devastating" (Fenton, 2003, p. 44)

In the next two quotations, place meanings may also represent local knowledge about ecosystems and their attributes. Within the context of SIA and particularly in relation to proposals related to new developments and land use changes, local knowledge forms an important part of both profiling and the prediction of impacts.

> "They don't really listen...they talked about damming the Wild River. They come over to our place and said how high does the river get?…I said it gets right up to the top…it's actually broken the banks. They said it only happens every 100 years…I said it's happened three times in my lifetime. You just get treated like a complete idiot because they've got a little piece of paper that says they've done a uni degree...and you're a country hick that knows nothing…they're not listening."

> "I am 61 years old…I've lived here all my bloody life and they put a floodgate on the creek and they never even asked myself or my neighbour across the creek what we thought the water levels were…I was furious at the time. I've been here all my life… and yet somehow or other the message doesn't get through that we know something!" (Fenton, 2004a, p. 67)

In addition to identifying place meanings through qualitative interview techniques, a somewhat more structured and quantitative approach known as Repertory Grid methodology can be used. This methodology is based on the early theoretical work of Kelly (1955) and has been used since the early 1970's to identify and describe the meanings people use to describe places and environments (Harrison and Sarre, 1971; Honikman, 1976; Fenton and Syme, 1989; Coakes, Fenton and Gabriel, 1999).

As the name would suggest the method is centred on the completion of a grid representing the data derived from a single person. The columns of the grid are referred to as 'elements', with each element in the grid belonging to a specific *set* of elements. For example, the elements may be towns in a region, specific spatially defined areas of the environment or different options or alternatives associated with a development or land use. The number of elements that form the grid is restricted only by the amount of time required to complete the grid.

The rows of the grid are referred to as ‘constructs’ and represent the specific meanings people use to describe the elements of the gird. Constructs are elicited from the individual through either a paired comparison method or a triad method.

In a paired comparison, two elements are presented to an individual, and s/he is asked to describe one important way in which one element differs from the other. A description will be provided representing a construct which has an emergent and implicit pole. For example, in describing the difference between two towns, one town may be described as ‘wealthy’ (the emergent pole) and the other town as ‘poor’ (the implicit pole).

It is this construct which forms the first row of the grid, with the emergent pole description usually written on the right row of the grid and the implicit pole written on the left row of the grid.

Pairs of elements are then repeatedly drawn from the pool of elements that are available and the individual asked to describe new differences between each pair of elements. When it is clear that no new constructs are able to be elicited the process of eliciting constructs is complete.

The paired comparison method is relatively easy to apply, however there is a tendency for the constructs that are elicited to be relatively simple and concrete. An alterative to the paired comparison method for eliciting constructs is the triad method. In this method three elements are selected randomly or systematically and the individual is asked to describe in what way two elements are similar but different to a third. As with the paired comparison method this method is again continued and constructs recorded until no new additional constructs are elicited.

At this stage the grid will consist of elements in the columns and any number of constructs recorded in the rows. Each element in the grid is now rated or scored in relation to each construct. In most cases, given the time required to score each element on each construct, this is usually undertaken using a simple binary rating scale, with a score of 1 applied when the construct is applicable to the element and a score of 0 when the construct is not applicable to the element.

Figure 7 shows an example of a repertory grid completed by a single respondent. In this grid there are 17 elements representing 17 different areas of the coast and 12 constructs that have been elicited (only the emergent pole of the construct is shown). The applicability of each construct to each element has also been scored using a binary scale. In addition to a series of elicited constructs, the grid also includes four constructs which have been ‘supplied’ and each of the 17 elements are also scored on the four ‘supplied constructs’.

The repertory grid example shown in Figure 7 is of course from a single individual and it is nearly always the case that a number of grids are collected from a sample of individuals. If they are to be analysed as a group then it is important to ensure that all grids have the same elements and as such may be stacked to form a larger matrix with a common set of elements in the columns and all constructs in the rows.

The analysis of repertory grids is usually based on the application of data reduction techniques such as factor analysis or cluster analysis. These techniques can be used to identify groups or clusters of elements which are similar in terms of the constructs that have been used to describe them or they can be used to identify groups or clusters of constructs. If there are a number of different stakeholder groups or other groups of interest in the population these techniques can also be used to identify the different meanings ascribed to the environment across different groups in the population.

Repertory girds can be completed through face-to-face interviews or in a workshop context with a group of individuals (Coakes, Fenton and Gabriel, 1999), as a self completion questionnaire (Fenton and Syme, 1989) or through telephone interviews (Fenton, 2004b).

	EMERGENT POLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	*Hard to get to*	✓		✓	✓	✓	✓		✓			✓	✓	✓	✓	✓		
2	*Good surfing*	✓	✓	✓	✓	✓	✓	✓			✓	✓				✓	✓	✓
3	*Good for boat launching*			✓			✓			✓			✓			✓		✓
4					✓													
5	*Lots of people*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
6	*Rough water*						✓		✓	✓								
7	*Crowded*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
8	*Never been there*				✓				✓		✓		✓	✓	✓	✓		
9										✓								
10				✓	✓			✓	✓		✓				✓	✓	✓	
11	*Protected beach*											✓						
12													✓					
13														✓				
14	*Open to the ocean*												✓	✓	✓	✓	✓	✓
15	*Boring*		✓	✓						✓			✓			✓		
16	*Pristine environment*										✓	✓	✓	✓			✓	✓
17	*Family area*					✓	✓			✓	✓	✓	✓					✓
A	Which places along the Tweed coast have high conservation values and should be protected from future development?								✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
B	Which areas along the Tweed coast that would be suitable for future urban expansion to accommodate any increase in population?		✓	✓		✓	✓		✓	✓								
C	Which areas of the coast would you say you are most familiar with?	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓				
D	Which areas of the coast would you visit most frequently throughout a typical year?		✓		✓			✓		✓		✓		✓				

Figure 7. Example of a Repertory Grid

6 Network Analysis

Network analysis attempts to systematically identify, through sequential cause and effect relationships, a series of flow-on or progressive impacts that may be triggered by initial project activities. In environmental impact assessment the use of network analyses is rare, as this form of analysis requires considerable data and conceptual knowledge about project impacts and how ecological and environmental systems function.

Given the rarity of network analysis in an EIA context, the application of network analysis in SIA is even more uncommon and only two applications of network analysis could be identified in the national and international SIA literature. Both of these applications attempt to trace the network of social impacts in a spatial context.

6.1 THE CONNECTIVITY NETWORK: A REAPPLICATION OF THE SORENSEN NETWORK

Sorenson networks (Sorenson 1971) are nearly always cited in the EIA literature as the primary example of a network approach. The network utilises a matrix format to identify potential causes of environmental change associated with proposed development actions. The development action and its alternatives are examined through networks that relate the action to causal factors (project activities), to first order condition changes, to second-and higher order condition changes, and finally, to environmental impacts and effects.

For example, the development of new residential areas on the coast may involve the construction of high-density apartments, play areas and parking areas, which are referred to as project activities. These activities will involve the removal of trees, excavation, and the construction of new sewerage systems. These are the causal factors. Tree removal will cause increased surface run-off which is one initial condition which may lead to a subsequent condition of flooding, which in turn may lead to erosion.

The Sorenson network does not provide guidance in terms of the measurement of impacts or the scoring of impacts in terms of magnitude and significance. The utility of the Sorenson network is limited to a descriptive analysis of the pathways between project activities and specific impacts.

The original Sorensen network has been adapted and applied in a SIA context to describe the ‘linkage’ between changes in the use of natural resources, social impacts and the resilience of communities. While Figure 8 illustrates the use of the connectivity matrix in a natural resource management context, connectivity matrices of this type may be developed to describe other forms of social change which impact on communities.

Figure 8 is based on information drawn from a SIA of the South East Trawl fishery which includes coastal waters in southern NSW, Victoria, Tasmania and South Australia (Fenton & Coakes, 2001). The information to construct the matrix was based on structured interviews with trawl fishers and secondary data drawn primarily from ABS census statistics.

The matrix in Figure 8 is read from the upper left. The primary and secondary resource catchments represent an area of fisheries resource use for trawl businesses based in the home port of Lakes Entrance. This component of the matrix could equally represent a specific development proposal or environmental change. If there is a change in the use of the resource the matrix describes the key dimensions along which social impacts may occur and includes in this example changes in the size of the trawl catch that is landed, business and household expenditure, the residential locations of business operators and employees and the use of schools and community groups. Again for development proposals or other environmental changes, different social impacts may be used in developing the matrix.

Figure 8 also identifies several town locations in which these impacts may occur and the matrix defines the strength of the linkage or dependency between the potential impact and each of the towns. For instance while the strength of the dependency or linkage between each of the potential impacts and Lakes Entrance is very high, there is moderate dependency, through the use of schools and the use of community groups, on the town of Bairnsdale.

Each of the towns shown in Figure 8 are also described in relation to their resilience using the four CSI indicators discussed in Section 3 and a measure of industry growth. Red markers in the matrix identify towns which are vulnerable to change, while blue markers indicate towns which are more robust. Port Welshpool is clearly a town which is less resilient to change on the dimensions that have been used, however this town is only used as a location for landing the fisheries catch and is unlikely to be impacted by changes in resource use.

The town of Yarram on the other hand has high levels of age dependency and has experienced a decline in industry growth since 1997. It is also a town in which fishing business and employees purchase business and household goods and services. Further it is the residential location of several businesses operators and provides community activities that are used by business operators and employees.

While Figure 8 illustrates the connectivity matrix in the context of a SIA of potential changes in fisheries resource use, the same structure and logic which underpins the matrix may be extended in identifying and describing flow-on impacts associated with other development proposals or sources of environmental change.

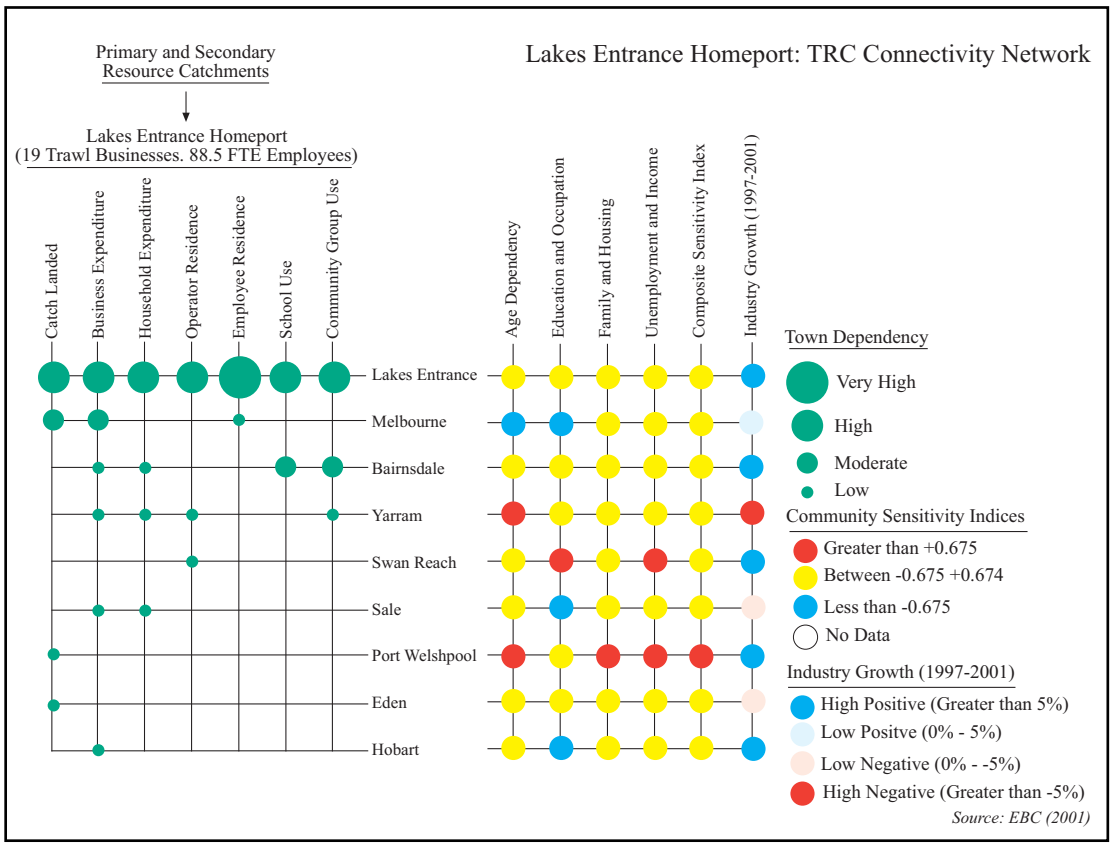


Figure 6. An example of a connectivity matrix

6.2 TOWN RESOURCE CLUSTER ANALYSIS (TRC ANALYSIS)

Town Resource Cluster Analysis (TRC-Analysis) has been developed in Australia for undertaking SIA research within a natural resource management and planning context (Fenton, Coakes and Marshall 2002; Fenton and Marshall, 2002). While the approach has been applied at a regional planning scale and specifically in a number of resource management contexts; including fisheries, forestry, mining and water resources, the framework is sufficiently broad that opportunities exist for it to be applied within other natural resource management contexts and possibly within an urban planning context.

TRC-Analysis recognises two embedded systems as critical components of any approach to social assessment within natural resource management and planning. On the one hand, there are resource systems which are defined with reference to satisfying human needs in terms of their utility value to social systems. Fisheries, water and forest resources are clearly of utilitarian value and define important resource systems for many people.

In addition to resource systems there are social systems. Social systems may be characterised in terms of a number of underlying qualities including their biophysical, health, cultural,

social, political, legal, economic and psychological components (Gramling and Freudenburg, 1992) and may be impacted on in any number of ways as described in Section 1.

Given the existence of both social and resource systems, the relationship or nature of the linkage(s) between the two systems and the extent to which a change in one system may 'impact' on the other related or dependent system becomes critical.

Within the context of a social system the question arises as to what constitutes community, what is the most meaningful unit of analysis. For instance, where changes occur in the use of natural resources, the linkage from resource to a specific town may be a direct one, or there may be indirect or flow-on impacts to a number of additional towns in the region. In this example should community now be defined as a collection of inter-dependent towns within a region? If this is the case then questions arise as to how we define the boundaries of community and distinguish one community, or collection of towns or communities from another?

One of the primary objectives of TRC-Analysis is to define meaningful spatial units on which to base later social impact and assessment processes. Such locationally and geographically distinct social units are referred to as Town Resource Clusters (TRCs).

The approach used to define communities in TRC-Analysis is essentially one of defining a social catchment, which consists of mutually interdependent towns and communities dispersed throughout a region. Based on previous research in several natural resource management contexts (Fenton, 1998d, 1998e, 1999a, 1999b) the interdependencies amongst towns may be defined using single or multiple measures of inter-town dependency. To date these measures have included:

- **Business Expenditure:** for those businesses directly involved in resource production, the town location for business purchases including the magnitude of the expenditure in actual dollar amounts.
- **Employee Expenditure:** for those business employees directly involved in resource production, the town location for purchases of household goods and services and the magnitude of that expenditure in actual dollar amounts.
- **Employee Residential Locations:** for those business employees directly involved in resource production, their residential town locations, expressed as a percentage of employees resident within each town,
- **Social Infrastructure Services and Facilities:** for those business employees directly involved in resource production, the town location in which social infrastructure services and facilities are used. This generally includes schools, medical and health services and the use of sporting facilities and is usually expressed as the percentage of employees using services and facilities in specific towns.
- **Social Networks:** for those business employees directly involved in resource production, the residential locations of significant others including friends and relatives expressed as the percentage of employees with friends or relatives in specific locations.

Through the use of structured interviews or survey research with business owners and employees directly involved in resource production (i.e., fishers, timber workers, logging contractors, irrigation farmers) information on the level of inter-town dependency is relatively easily acquired and the data used as a basis for identifying mutually interdependent clusters of towns and communities, which are referred to as Town Resource Clusters (TRCs).

In an example drawn from the social assessment of the Queensland commercial fishing industry in Australia (Fenton and Marshall, 2000), the identification of Town Resource Clusters (TRCs) was undertaken using locational information drawn from survey data collected from structured interviews with commercial fishers. The number of fishing businesses located in each town on the Queensland coast was identified. Additional linkages and interdependencies amongst towns were identified using information on the location of (a) business expenditure (b) employee expenditure (c) employee residential locations and (d) social infrastructure services and facilities.

Figure 9 shows how a TRC is identified. Figure 9a shows a number of proximate towns with fishing businesses located in them, including Lucinda (28), Dungeness (2), Halifax (5) and Ingham (5). The location of resource use amongst the 50 businesses is shown in Figure 9b, which identifies a primary resource catchment of more frequent resource use and a secondary resource catchment of less frequent resource use. It should be immediately apparent that any change in resource use or access, particularly within the primary resource catchment, has the potential to impact on the four towns.

Figure 9c shows that although the majority of fishing businesses are located in the town of Lucinda, fishing businesses across all four towns purchase their business goods and services primarily from the town of Ingham. In addition Figure 9d shows that the majority of employees of these businesses are located in the towns of Lucinda and Ingham, and that household expenditure occurs mainly within the town of Ingham (Figure 9e) and the use of social services also occurs primarily within Ingham (Figure 9f).

Figure 9 illustrates that a network of relationships exist between the resource system on the one hand and towns and communities dependent upon that resource. As is illustrated in Figure 9, changes in resource use and access may result in social impacts occurring on a number of dimensions in towns and communities dependent upon the resource. In some instances, as shown in Figure 9, impacts do not always occur in the town in which the majority of resource use businesses are located but other towns and locations within the town resource cluster.

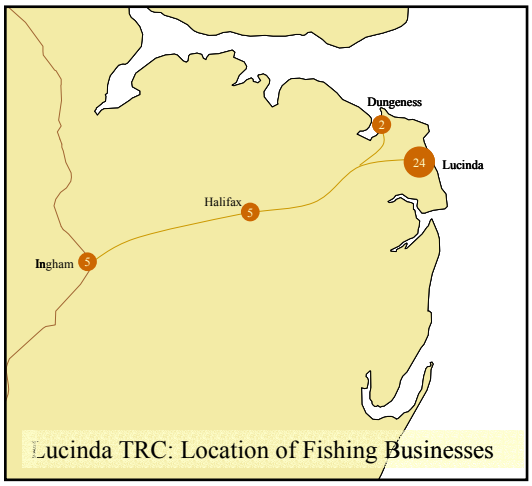


Figure 9a

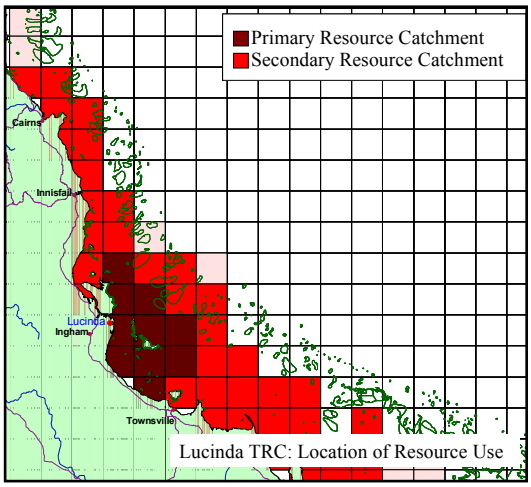


Figure 9b

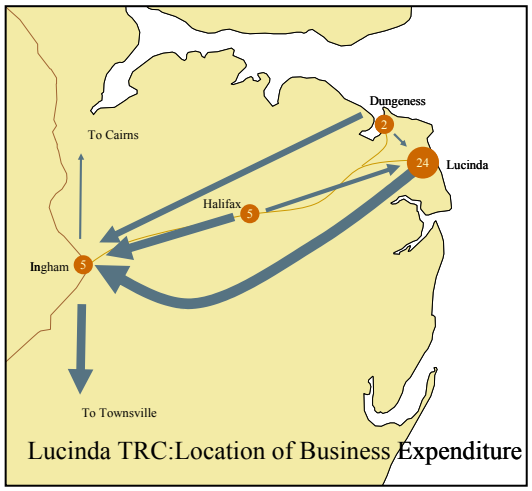


Figure 9c

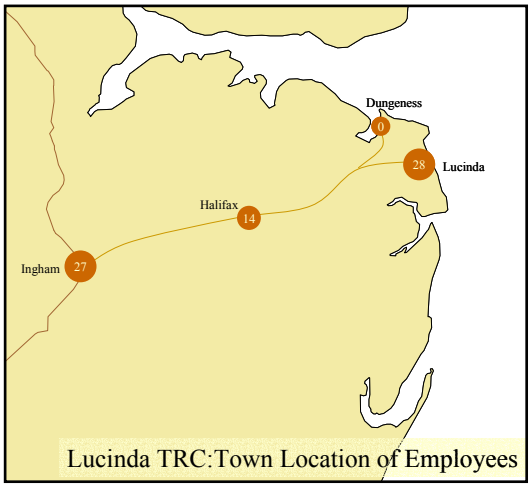


Figure 9d

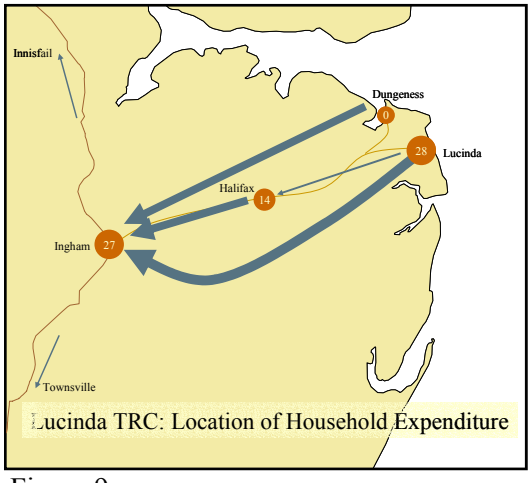


Figure 9e

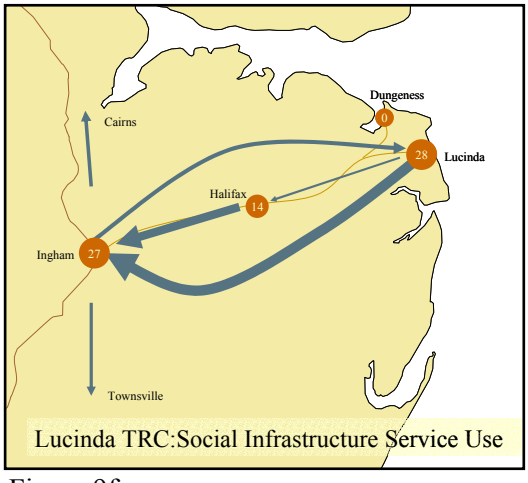


Figure 9f

Figure 9. An example of networks in TRC-Analysis

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