AUGUST 2011

SOCIAL SCIENCE RESEARCH FOR OUR NATURAL RESOURCES

What it is, how it works, and why it matters

The information contained in this publication is intended for general use to assist public knowledge and discussion and to help improve the development of rural and regional regions and primary industry. You must not rely on any information contained in this publication without taking specialist advice relevant to your particular circumstances.

Researcher Contact Details

Dr Kate Brooks
PO Box 3287
Prahran East VIC 3181

Phone: +61 3 9917 2665
Fax: +61 3 9917 2665
Email: kate@kalanalysis.com.au

RIRDC Contact Details

FRDC Contact Details

FOREWORD

THIS publication is a joint initiative of Rural Industries Research and Development Corporation (RIRDC) and the Fisheries Research and Development Corporation (FRDC). Both corporations invest in research, development and extension that covers a wide base of land and aquatic based primary industries and the natural resources on which they depend.

This publication provides an explanation of the benefits of social science, how to undertake social science research and how it can be applied by industry and government. Social science is the study of human groups and individuals, social systems, social institutions and social behaviour. It is a fundamental tool for natural resource management. The key to ecological sustainable development is managing the people and their interactions. Studying only the environment in absence of either social or economic components will lead to outcomes that do not balance human needs with the environment.

Social science is now an integral part of all primary industries' natural resource research investment. This publication has been designed to inform industry and government on the practical application of social science. It comes at a time when there is an increasing need to consider social issues in natural resource management, whether that be water use or access to aquatic habitats.

RIRDC and FRDC recommend this publication to anyone who has an interest in primary industries natural resource management.

Craig Burns
Managing Director
Rural Industries Research and Development Corporation

Patrick Hone
Executive Director
Fisheries Research and Development Corporation

SOCIAL SCIENCE RESEARCH FOR OUR NATURAL RESOURCES

What it is, how it works, and why it matters

AUTHORS:

Dr K Brooks, KAL Analysis Pty Ltd and Adjunct Senior Fellow, RSSS, Australian National University
Dr J Schirmer, Fenner School of Environment and Society, Australian National University
Ms E Loxton, Fenner School of Environment and Society, Australian National University.

CONTENTS

EXECUTIVE SUMMARY

Photo courtesy of WAFIC

The behaviour of people is fundamental to maximising management outcomes.

Use of social sciences is potentially limited by a lack of understanding about what it is, how it can be used and its potential benefits.

Social science can illuminate ways to improve engagement and compliance with sustainable use of natural resources.

Use of the social sciences can improve adoption of management objectives.

UNDERSTANDING how people interact with the environment—how they value and use it—is an essential part of identifying best practice management for both industry and government, in order to improve the sustainable use of Australia's natural resources.

Interest has grown during recent years in the contribution of social sciences towards the management of natural resources. However there are lingering issues with how industry and government have accepted and adopted it in management practices, largely associated with a lack of understanding of exactly what social science research is, what it can do for industry and government, and what can reasonably be expected from it in different circumstances.

Social science research is the study of human groups and individuals, social systems, social institutions and social behaviour. It is a fundamental tool that industry people, managers and government agencies can use to understand natural resource management challenges, which often result from the actions of humans. As importantly, or perhaps more so, social science research can identify the ways and means to change how humans interact with natural resources to maximise both production and sustainability.

The social sciences are commonly broken down into different specific disciplines, such as economics, geography, history, political science, psychology and sociology. Research in these disciplines can help rural, natural and aquatic resource managers better understand how individuals and groups who use resources (directly or indirectly):

- respond to current management activities and why

- are affected by management actions

- perceive issues differently in relation to management of natural resources

- can be influenced to change their practices and compliance with voluntary and/or compulsory governance of natural resources.

Achieving social sustainability is part of ecologically sustainable development and as such has become an important objective for many organisations in the public and private sectors. This has resulted in increased interest in the use of social science as a tool to achieve this goal.

Photo courtesy of WAFIC

THIS report examines the ways in which social science research can assist natural resource managers (be they fishers, farmers or foresters) and those working in government agencies managing natural resources. It identifies and provides examples of what social science is in the context of natural resource management, what difference it can make, and how social science research can be implemented in the natural resource management sector.

Understanding how people interact with the environment— how they value and use it—is an essential part of identifying best practice management practices for both industry and government in order to improve the sustainable use of Australia's natural resources. The social dimensions of natural resource management are integral to identifying the causes of, and solutions to, environmental problems arising from human actions.

Natural resource management challenges include a wide range of issues, such as those arising from the effects of climate change and climate variability, dryland salinity, declining water quality, clearing or degradation of vegetation or overfishing. These issues typically arise as a result of

human management, particularly human use of these resources for primary production.

Human interaction with natural resources takes many forms and can impact on the environment on both positive and negative ways. This interaction also affects our ability to use natural resources for primary production (for example, food and commodity production).

The objective of effective natural resource management is to minimise any negative impacts and maximise positive impacts. Achieving this requires understanding of and an ability to manage human behaviours in relation to the use of resources, as this is what drives environmental and production outcomes.

Interest is increasing in the contribution social sciences can make to improving natural resource management across a range of primary industries and interactions with our natural resource environments. However there are lingering issues with acceptance of the use of social science to inform management practices—from both industry and government.

What is social science research?

SOCIAL science research involves the study of groups of individuals, social systems, social institutions and social behaviour. In general this term refers to the science of studying society and the relationships of individuals within it.

Within this field of study there are a number of disciplines that focus on different elements of our social systems including: economics, geography, history, political science, psychology, social studies, and sociology.

Social science research can be either quantitative (the what, where and when; usually expressed numerically) or qualitative (the why and how of decision making or circumstance). Qualitative research is usually used to inform the circumstances or background of the quantitative data— how or why those numbers exist.

Social science research, as with any other scientific research, is based on either:

- **Primary data — collected specifically for the purposes of the research at hand**

- **Secondary data — collected at another time for another purpose**

Data collection can be undertaken using any one of a wide range of collection and analysis methods, including (but not limited to) those following.

Photo courtesy of John McGrath, FFI CRC

Photo courtesy of Kathleen Davies

Photo courtesy of FRDC

QUANTITATIVE ANALYSIS

Quantitative analysis—is undertaken using either primary or secondary data collected from identified interest (or stakeholder) groups. Primary data can be collected using mail, phone, internet or face-to-face surveys. Secondary data can be accessed from statistics gathered by organisations such as the Australian Bureau of Statistics, Safework Australia, or any other independent, State or national data centre. Quantitative data is typically presented using numerical analyses of how many people have particular characteristics. Quantitative data collection and analysis may be combined with qualitative approaches to ensure that not only the state of a circumstance can be described but also the reasons for it.

QUANTITATIVE MODELLING

Quantitative modelling—involves manipulation of quantitative data to represent or forecast some aspect of human society and its behaviour. This may use either primary or secondary data, but it generally has the specific purpose of being able to predict likely future reactions to events. Modelling is often employed to develop policy or industry management approaches to predict future reactions to specified scenarios.

QUALITATIVE COLLECTION AND ANALYSIS OF PRIMARY DATA

Qualitative collection and analysis of primary data— uses interviews, focus groups, observation or surveys to collect data directly from individuals and groups. It is generally analysed 'thematically'; in other words according to themes that commonly emerge from the data or are predetermined by the circumstances of the issue. Results are typically presented descriptively, with only minimal (or no) use of numerical analysis.

QUALITATIVE ANALYSIS OF SECONDARY DATA

Qualitative analysis of secondary data—uses desktop-based research to analyse historical records and accounts or previous research, to understand issues (for example, to explore the culture of an area or an industry). Information gained in this way helps us understand past responses to events or changes in circumstances, and can be used to assist in predicting future reactions and modifying industry responses or policy frameworks to minimise negative and maximise positive outcomes of industry or government actions.

PARTICIPATORY RESEARCH

Participatory research—aims to improve public participation in decision-making or research. During recent years, social science techniques have shifted to incorporate more activities that actively engage with those people involved in an issue; commonly referred to as 'participatory techniques' or 'action research'. These may include holding public meetings, asking for written submissions, developing community consultative committees, workshops or advisory groups. They are distinguished from other social science methods in that rather than having a researcher or decision-maker make all decisions regarding data collection and analysis, and decide how this information will influence decision making, a wider range of people is involved.

This approach to research requires careful management of participant expectations and information flows. Clear and well articulated boundaries, objectives, expectations and timelines must be established at the outset of any participatory research and regularly reinforced or revised as necessary.

6 HOW CAN SOCIAL SCIENCE RESEARCH CONTRIBUTE?

Photo courtesy of Belinda Cooke

Photo courtesy of Kathleen Davies

How can social science research contribute?

CLARIFYING how different people and groups perceive, behave and interact in particular situations and how they are likely to respond to changes, benefits decision makers in industry, communities and government, by providing understanding about the likely outcomes of implementing new management or policy frameworks.

Social science research helps natural resource managers better understand how individuals and groups who use resources (directly or indirectly) respond to management activities, the impacts of their actions on different groups and how different people perceive issues related to natural resources. This type of research is a sensible tool to be employed as part of developing and implementing a range of management or policy activities.

WHAT CAN IT DO?

ISSUES that can benefit from social science research include, those where conflict and concern has been expressed about a particular industry or natural resource management policy; government or council are not able to achieve high adoption of a new program; or an industry or council are considering a new venture that will entail changes to the visual or physical environment of a community.

Any one of these issues can benefit from social science

research through providing insights to and information about:

- the circumstances of a group of people (community), identifying their strengths and vulnerabilities and capacity to adapt to changing circumstances

- how the actions taken by natural resource managers affect different individuals and communities

- how and why concern or conflict arises over natural resource management, and the types of changes that may be needed to address these concerns. These may include changing the way resources are managed as well as improving communication and community engagement

- identifying strategies that can successfully encourage changes in human behaviour needed to achieve ecologically sustainable use of natural resources.

SUSTAINABILITY

INCREASINGLY, achieving sustainability has become an important issue and objective for many organisations in the public and private sectors.

In Australia the principle of ecologically sustainable development states that achieving ecologically sustainable development requires 'increasing the total quality of

life, now and in the future' when using, conserving and enhancing resources such as natural areas and fish stocks (Commonwealth of Australia 1992). Achieving ecologically sustainable development requires ensuring sustainable social and environmental outcomes.

Social research can be used to:

• define what 'social' sustainability means in the context of a particular industry or government policy

• identify which aspects of social sustainability require focus in the context of a particular issue or event

• clarify the parameters and influencing factors around issues such as 'equitable allocation' which is a socially constructed but commonly-used term in natural resource management

• identify the data needed to monitor and inform the development of strategies for achieving desired industry or government outcomes.

INFORMATION VS. DECISIONS

IT is important not to confuse collecting social data with making important moral and ethical decisions about the principles by which decisions will be made. While social science methods can be used to provide scientifically-derived information, such as identifying which people and/or groups believe particular moral or ethical stances are appropriate, they are not a substitute for, or simple answer to, identifying what values should be used to make management decisions.

Social science research can be undertaken most effectively when there is clarity from the outset as to how the data will be used to inform decision making and management by an organisation (private or government). It is important researchers clearly understand what the objective may be. For example, is the issue at hand requiring:

a) information to inform the development of industry ideas/ directions/policy/ products/or business opportunities; or

b) an understanding of reactions to a specific proposed activity/product/venture or policy change?

SOCIAL RESEARCH TO INFORM POLICY AND MANAGEMENT DECISIONS

'Policy' in the following examples generally relates to government policy around natural resource management be it federal, state or local. However these ideas and approaches can equally be interpreted in the context of how an industry interacts with its workers, customers or those in the community affected by its operations. These provide some examples as to how social research can assist the development of policy and industry management decisions around resource use.

Table 1 summarises the decisions needed to frame and direct the gathering of sound social data. The criterion noted in the centre column is the policy or management information required to clarify the type of data that will assist meeting each objective and management need identified. It also identifies the types of social information that may be used to develop strategies to achieve the identified management objectives. ■

Achieving ecologically sustainable development requires ensuring sustainable social and environmental outcomes

HOW CAN SOCIAL SCIENCE RESEARCH CONTRIBUTE?

TABLE 1.
INFORMATION NEEDED TO ACHIEVE SOCIAL OBJECTIVES AND MANAGEMENT NEEDS

OBJECTIVE/ MANAGEMENT NEED	CRITERIA NEEDED TO GUIDE COLLECTION OF SOCIAL INFORMATION AND DECISION-MAKING	INFORMATION THAT CAN BE PROVIDED BY SOCIAL SCIENCE RESEARCH THAT WILL BENEFIT DECISION MAKERS
Achieve equitable resource allocation	Definition/principles for equitable allocation Definition of which groups/people resources are to be allocated between	Understanding of equity outcomes of different allocation options for different users
Optimise resource allocation between users	Definition of 'optimal' allocation on which analysis of social impacts can be based Define which users are to be included in analysis	Understand social impacts of alternative allocation options on different users
Undertake effective community engagement and communication with stakeholders and the general community	Define which people/groups are to be engaged Define what types of community engagement will be undertaken Define who is responsible for undertaking community engagement	Effectiveness of different methods for community engagement (effectiveness of staff delivering engagement; effectiveness at reaching different people/groups; effectiveness at examining different issues)
Maximise resource related social benefits for which management is responsible	Identify social benefits for which management is responsible	Monitor the extent to which social benefits are being achieved and the distribution of benefits
Minimise negative and maximise positive social impacts of management activities	Identify the activities which may be having impacts	Identify positive and negative social impacts of management activities, analyse for depth and longevity of impacts and predict future social impacts Identify strategies for minimising negative and maximising positive social impacts Monitor and report on ongoing impacts
Understand and sometimes influence human behaviour and perceptions relating to natural resources	Identify behaviours and perceptions to be studied	Study behaviour and perceptions Identify factors influencing behaviour and perceptions Develop, implement and monitor strategies for influencing behaviour and/ or perceptions
Design effective structural adjustment packages	Identify where, when and to which groups any structural adjustment will be provided	Identify social consequences of different structural adjustment options. This may involve predicting future impacts as well as monitoring and mitigating impacts

Why use social science research?

SOCIAL science research has the potential to improve resource management outcomes in a range of ways for industry, government and, most importantly, the community at large.

Understanding more about how different people and groups behave and interact in particular situations, and the values and beliefs that underpin those responses to changes, has clear benefits to understanding the likely outcomes of implementing new management or policy arrangements.

Social science research can assist industry or government decision makers in a number of ways.

Understanding how people use natural resources and the factors influencing their behaviour—can help decision-makers identify the efficacy and any unforeseen perverse effects of management strategies. This can directly assist the design of effective strategies to account for human behaviour and meet triple bottom line requirements in policy and natural resource industry management. For example, studies of the ways people respond to closure of a fishing area or water reallocation can help identify the different behaviours that are likely to occur following similar decisions. Some people may choose to concentrate on alternative activities or re-locate their regular activity, others may reduce their activities; others may choose to act illegally, flouting an imposed management regime.

Monitoring perceptions of how natural resources are valued and being used—can assist managers to identify the implications for acceptability of different management approaches, the variety of ways different people understand resource related issues, the strategies likely to work in influencing perceptions and the efficacy of such management strategies.

Understanding the social impacts of natural resource management processes on the lives of different stakeholders—can help managers (industry or government) identify improved methods to maximise positive and minimise negative impacts when updating or designing management strategies and plans. Or alternatively, for industry to understand how proposed development plans may affect (positively or negatively) communities associated with their activities, to facilitate modifications before initiating approval processes and encountering negative, potentially unexpected, reactions.

CONSIDERATIONS

IT is worth considering whether employees need to be explicitly trained to understand the nature of social research and if they can act as a 'bridge' between social scientists and managers or policy makers. This type of training would develop an adequate knowledge and understanding of the design of sound social research, ensuring the identified objective is informed. It is also essential at the policy and industry level, that the expertise is available to translate the results of social science research into readily useable recommendations in the context of the particular industry or policy operating environment.

LIMITATIONS

SOCIAL science research is often viewed as having the potential to answer all the questions policy makers may have about the impacts of their policies on human communities

and human behaviour. In reality, as with any kind of research, social science research has limitations.

Social systems are not static — society and user groups are dynamic, changing entities. People learn from experience and therefore change how they respond to situations as a result. This means people may not respond to a situation, such as closure of a fishery or forestry coop, or declaration of a national (land or marine) park, in the same way over time. Having acquired experiences, they may behave differently in future situations.

Behaviour and responses will be influenced by many factors, including those external (exogenous) to the situation and unable to be influenced by resource managers. A resource may be well managed and used by those who access it (for example, fishers, foresters or farmers), but a shift in social values may make a particular use of a resource less socially acceptable. For example, an international focus on the effects of trawl fishing on turtles may result in pressure on management in a particular country or locality to take action irrespective of current local use and practices. For example, beliefs that trawl fishing worldwide undertakes the activity only by dragging nets across the ocean floor—a practice not participated in by fleets of trawlers that operate in particular fisheries in Australia.

The dynamic nature of human behaviour and response means that predicting people will respond to an event or intervention is limited by the factors examined. Consequently, demonstrating explicit causal relationships in social science is difficult due to the inability to have absolute knowledge of all influencing externalities.

In the same vein, oversimplifying social relationships and interactions can lead to poor recommendations. It can be tempting to respond to the complexity of social life by focusing on one or two high-profile issues affecting a resource, and then examining or modelling only the social variables most obviously associated with the issue. This can lead to models that are limited by the factors included in the research, to inform real-life decisions. Caution must be exercised when considering the use of modelling or a limited number of variables, particularly when trying to predict human behaviour and the impacts of management decisions.

Sound and useful social science data can be expensive to generate. Inadequate investment leads to poor results (for example, a poorly-designed survey is unlikely to generate useful information). It is better to carefully choose a few areas to examine well, rather than spreading resources too widely and achieving results that do not provide useful options for natural resource management.

Although social science can be used to identify the different values, morals and ethics of people and what they believe is appropriate with regard to natural resources, it cannot provide a way to choose which values, morals or ethics are 'right'. And it is not a substitute or 'way out' of making these challenging decisions. It is however, invaluable in providing information about the perceptions, values and ethics of groups. While it cannot definitively predict behaviour, it can provide a guide to some typical ways different groups may respond to a particular situation, and the likely ways a particular management decision will affect different people.

Understanding how people and groups behave and interact in particular situations, and the values and beliefs that underpin their response to change, will benefit the outcomes of implementing new management or policy arrangements

THE TOOLS OF SOCIAL SCIENCE RESEARCH

Photo courtesy: Kathleen Davies, courtesy Glenn Innes Examiner

Photo courtesy of ABS

The tools of social science research

THE following tools are discussed with the emphasis on 'when' and 'how' each may provide useful information to inform managers and policy makers aiming to achieve the different objectives identified in Box 1:

- Media analysis

- Document analysis or desktop review

- Qualitative interviews

- Group interaction techniques, such as focus groups, group interviews and workshops

- Quantitative sample surveys

- Analysis of demographic and other statistics

- Modelling approaches and decision support systems.

While each tool is examined separately, it is common to mix multiple approaches or 'tools' when gathering social science data. This is done to triangulate (or verify) the date obtained. For example, qualitative interviews or focus groups are often combined with quantitative surveys. A Social Impact Assessment (SIA) may mix any, and sometimes all, of the methods listed above. Each method may be integrated into a participatory community consultation process, or undertaken with little or no participatory elements.

Box 1

Possible social objectives and management needs of an industry agency using or managing, natural resources.

1. **Identify values and beliefs attached to particular natural resources**

2. **Achieve equitable allocation of resources**

3. **Optimise resource allocation between users**

4. **Undertake effective community engagement and communication with stakeholders and the general community**

5. **Maximise social benefits arising from management approaches**

6. **Minimise negative and maximise positive social impacts of management activities**

7. **Understanding and sometimes influencing human behaviour and perceptions relating to resources**

8. **Design effective adjustments to existing management or policy approaches.**

Media analysis

MEDIA analysis, in the context of social science research, focuses on identifying publicly reported perceptions about a subject—in this case natural resource management—and for documenting changes in public concerns and perceptions. It is generally used in conjunction with other social data, to enable comparison of media representations with the views of people expressed through mechanisms such as surveys.

Unlike marketing media analysis, it is not focused on evaluating the efficacy of a campaign, message, policy, or nature of an agency or organisation's competitors or reputation.

WHAT IS IT?

MEDIA analysis refers to analysing media articles to identify how their reporting of particular issues changes over time. Media analysis is often used to better understand how public perception may have been influenced by media content over time and to document the changing values evident about particular issues over time. Some argue this can assist in predicting the likely public perceptions about an issue, as the media is believed to have an important influence on people's perceptions, although the extent of influence is sometimes debated. Others argue that changes in the media are likely to reflect substantive shifts in public perception. In reality, it is likely that what is reported in the media influences public perception and that public perception plays a role in influencing what is reported in the media.

HOW IS IT DONE?

MEDIA analysis ranges from qualitative documentation of the content of articles to quantitative analysis of the number of times a particular perspective or view has been reported over a period of time.

PLANNING AND COSTING

MEDIA analysis can be relatively low cost. When planning it is essential to identify:

- the media sources that are most relevant and how accessible these are. Ask whether articles be accessed in electronic format enabling easy search for key words, or whether a hard copy would have to be scanned (resulting in much higher cost)

- the purpose of the analysis is to determine whether a qualitative understanding of media representation is required, or whether quantitative documentation of the number of times reports reflect a particular perspective is needed. The cost of staff time to analyse reports will depend on the issues being examined.

HOW USEFUL IS IT?

TABLE 2 describes the potential uses of media analysis in achieving potential management objectives.

TABLE 2.
USES OF MEDIA ANALYSIS TO MEET OBJECTIVES AND MANAGEMENT NEEDS

OBJECTIVE/MANAGEMENT NEEDS	POTENTIAL USES OF MEDIA ANALYSIS
Identify beliefs and values attached to a natural resource	To identify the common values, interpretations, issues and beliefs associated with, or attached to, specific natural resources in popular culture (for example, in print/television/film/music)
Achieve equitable allocation of resources	To identify perceptions of equity of allocation discussed in the public media, and how public reporting of allocation issues has changed over time To identify how media has reported perceived equity outcomes of allocation decisions for different groups
Optimise resource allocation between users	See above—identify how media reports about resource allocation decisions
Undertake effective community engagement and communication with stakeholders and the general community	Media analysis can be used as an evaluation tool, especially for identifying whether consultation processes have reduced community concern about natural resource management – fewer media reports of conflict and concerns may indicate success Track public reporting about community consultation, community concerns, communication about fisheries Media reports are one method of identifying parties with an interest in natural resource management and the nature of their different interests
Maximise resource-related social benefits for which management is responsible	Identify social benefits and costs reported in media. May have limited usefulness compared with other methods
Minimise negative and maximise positive social impacts of management activities	Identify perceptions about social impacts reported in media. May have limited usefulness compared with other methods
Understand and influence perceptions relating to natural resources	Identify messages being communicated in public media about natural resources In conjunction with surveys and interviews about perceptions, this can identify likely extent of media influence on perceptions
Understand and influence human behaviour relating to natural resources	Identify perceptions about human behaviour reported in the media. Useful for identifying common perceptions about behaviour, otherwise limited usefulness
Design effective structural adjustment packages	Limited usefulness

MEDIA ANALYSIS

BENEFITS AND LIMITATIONS

MEDIA analysis is a useful way of understanding publicly communicated messages about natural resources. It gives some indication of public perceptions about issues, can be undertaken relatively quickly and is reasonably low cost.

Caution is needed when interpreting media analysis. In particular:

- Particular forms of bias that need to be understood and examined as part of the analysis often influence Media reports.

- Not all events or perceptions are reported in the media, and media reports alone should not be relied on to document history of particular events. The limitations of media coverage of issues must be understood when studying how the media have represented a particular issue.

- The links between public perceptions and media reports are strongly debated. While most agree there is a link, agreement is not the same for the nature and direction of the link.

EXAMPLES OF MEDIA ANALYSIS

EXAMPLES of the use of media analysis in studies relating to natural resource use are given in Box 2 and Box 3.

Media analysis can be a quick and reasonably low cost way of understanding publicly communicated messages about natural resources

Box 2

Real-world problem

Public opinion can help shape fisheries policy and so it is necessary to understand how media affects this opinion. The research was based on the idea that the media plays an important role in influencing public perception of, and therefore public pressure for, more stringent management of commercial fishing.

Methods

This problem was investigated by analysing two newspapers to investigate the media's portrayal of commercial fisheries harvesters in the Galveston Bay area, Texas, United States. Research involved locating, using a keyword search, all articles and editorials on commercial fishing over an eight-year period (1987–1994). The location and type of article was recorded, then arranged chronologically and counted. People's quotations and photos were also analysed. The conclusions mapped the changing use of print news coverage and outlined issues of representation and the political, economic and power relations between and within parties.

Outcomes

The research found that representations of the commercial fishing industry within the local and regional media accurately represented some sectors of the fishing industry—other sectors were misrepresented, which led to these sectors being politically and economically marginalised.

Sullivan, KM 1999, 'Fishing in the Media: Mainstream Print News and the Commercial Fishing Industry in Texas', *Culture & Agriculture*, vol. 21, No. 3, pp. 31–43.

Box 3

Real-world problem

The public values attached to forestry can affect the ways in which policy and industry is developed or constrained. Understanding public values and how these may be grouped into 'value orientations' around valuing the resource for its productive capacity, or for its ecological environmental value, can assist in identifying the most appropriate methods of management.

Methods

This article explores the expression of three forest value orientations that emerged from an analysis of Australian news media discourse about the management of Australian native forests from 1997–2004. Computer-coded content analysis was used to measure and track the relative importance of commodity, ecological and moral/spiritual/aesthetic forest value orientations. The number of expressions of these forest value orientations followed major events in forest management and policy, with peaks corresponding to finalisation of Regional Forest Agreements and conflicts over forest management.

Outcomes

Over the time period analysed, it could be demonstrated that the relative share of commodity value orientation decreased and the shares of the ecological and moral/spiritual/aesthetic value orientations increased. The shifts in forest value orientations highlight the need for native forests to be managed for multiple values and the need for continued monitoring of forest values.

Webb, TJ, Bengston DN & Fan, DP 2008, 'Forest Value Orientations in Australia: An Application of Computer Content Analysis', *Environmental Management*, vol. 41, pp. 52–63.

Document analysis (desktop review)
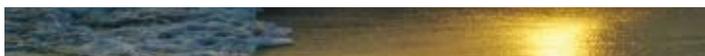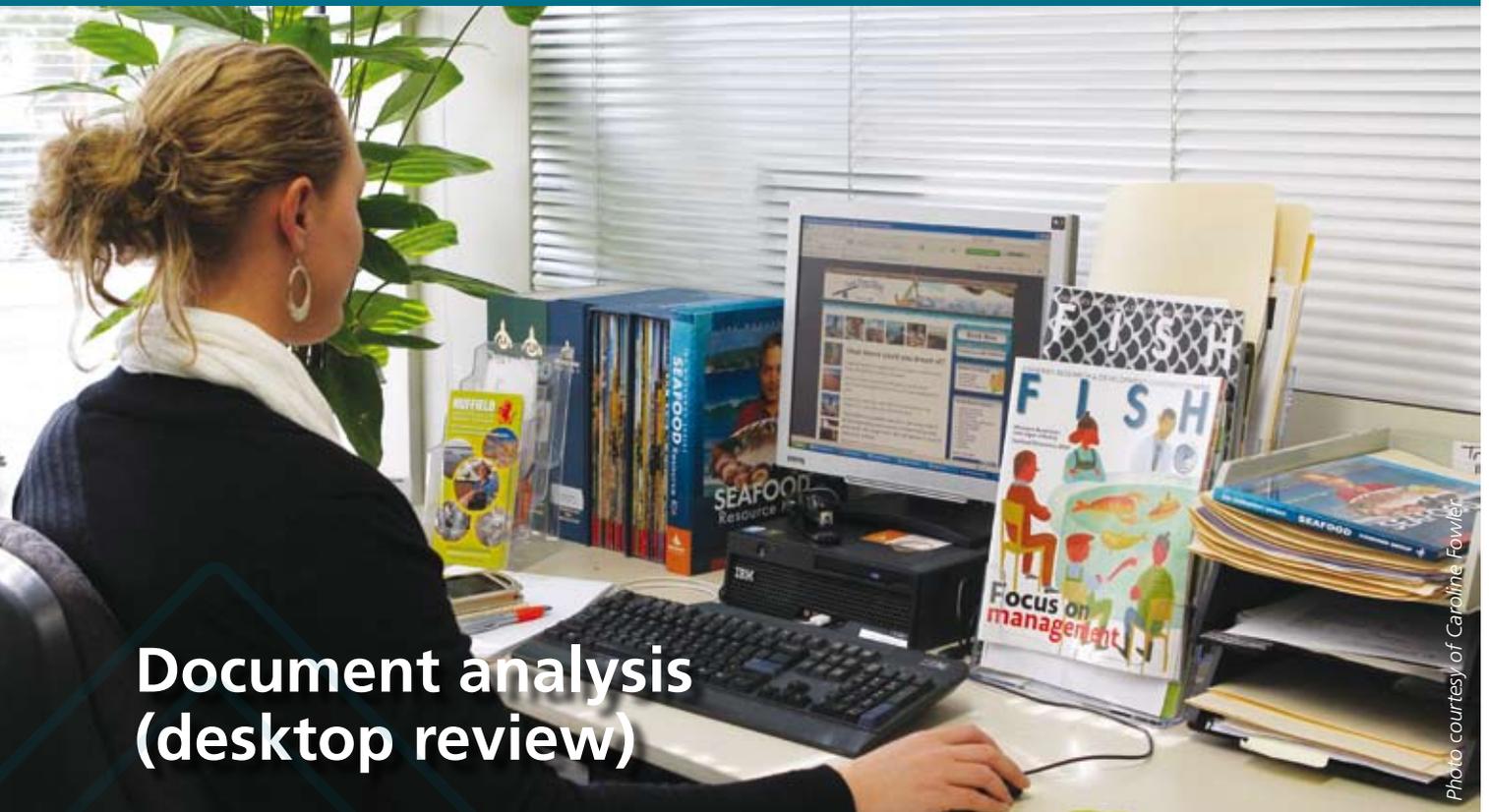
Photo courtesy of Caroline Fowler

DOCUMENT analysis can be useful when there is a need to better understand current knowledge about a particular issue through reviewing recent research, and when the policies, perspectives and interactions of groups about particular natural resource management issues need to be better understood. It is commonly used in community consultation processes to gain a better understanding about the history of interested party interactions, as historical cooperation or conflict is likely to influence how groups interact in a consultation process and the positions they adopt. The knowledge developed can be used to inform development of improved consultation strategies.

WHAT IS IT?

DOCUMENT analysis refers to analysing documentary evidence, typically to construct a history of an event or issue, and/or to identify the ranges of perspectives expressed about that issue. Also called secondary data analysis or desktop review, it typically involves no direct contact with people to gather data from them. It may include any kind of documentation of events and perspectives such as books, newspapers, video, organisational reports, results of previous research studies, Hansard transcripts and other sources.

HOW IS IT DONE?

DOCUMENT analysis typically involves qualitative analysis of the documents relevant to the topic being studied. Qualitative analysis can use many techniques, but often involves developing a history or timeline of events from different perspectives, and coding data into thematic categories, which may for example identify the groups of themes or perspectives held by particular groups to assist their comparison.

PLANNING AND COSTING

DOCUMENT analysis is typically a low-cost method of analysing social data. Planning document analysis requires identification of what is being examined, over what timeframe and accessibility of documents. Cost will vary based on this, as different analyses will require varying amounts of time.

HOW USEFUL IS IT?

TABLE 3 describes the potential uses of document analysis in achieving management objectives.

TABLE 3.
USES OF DOCUMENT ANALYSIS TO MEET OBJECTIVES AND MANAGEMENT NEEDS

OBJECTIVE/MANAGEMENT NEEDS	POTENTIAL USES OF DOCUMENT ANALYSIS
Identify beliefs and values attached to a natural resource	Examine previous reports/articles/policy/industry papers to ascertain the values and beliefs upon which previous decisions have been made
Achieve equitable allocation of resources	Document history of views and actions of different groups relating to allocation issues. Helps understand likely response in future
Optimise resource allocation between users	Document history of views and actions of different groups relating to allocation issues. Helps understand likely response in future
Undertake effective community engagement and communication with stakeholders and the general community	Analyse the views, actions and interactions of different interested groups (usually in conjunction with interviews, group interviews or surveys) Assess the efficacy of consultation processes Information may assist design of new consultation strategies and policy
Maximise natural resource related social benefits for which management is responsible	Identify social benefits and costs reported in relevant documents, and how these vary
Minimise negative-and maximise positive social impacts of management activities	Identify social impacts reported in relevant documents, and how these vary
Understand and influence perceptions relating to natural resources	Identify perceptions about natural resources reported in different documents
Understand and influence human behaviour relating to natural resources	Identify perceptions about human behaviour reported in different documentary sources. Useful for identifying common perceptions about behaviour, otherwise limited usefulness
Design effective structural adjustment packages	Review previous experiences of structural adjustment and lessons learned

DOCUMENT ANALYSIS (DESKTOP REVIEW)

BENEFITS AND LIMITATIONS

DOCUMENT analysis is a useful way of reviewing what is currently known about a particular issue and the history of that issue. It can be undertaken relatively quickly and is reasonably low cost.

The usefulness of document analysis depends largely on the type and amount of documentary evidence available for analysis. If little documentation is available, or the documentation available is heavily biased to one particular perspective out of many, documentary analysis will have limited value. It is essential to clearly document gaps in documentary evidence and other limitations to ensure these are clearly understood.

EXAMPLES OF DOCUMENT ANALYSIS

EXAMPLES of the use of document analysis in previous studies are provided in Box 4 and Box 5.

Photo courtesy: WAFIC

Document analysis is a useful way of reviewing what is currently known about a particular issue and the history of that issue

Box 4

Real-world problem

This research investigated the social causes of conflict between groups of people affected by coastal zone management in the Port Curtis catchment, Queensland. In particular the research examined whether the existing coastal management framework—where there are few mechanisms for negotiation, transparency of decisions or feedback on consultation—was contributing to reduced conflict.

Methods

This research used two participatory social research tools—social mapping and stakeholder analysis—to assess the values, interests, aspirations and attitudes of different groups.

The first step in the research involved interviews and document analysis to gain an understanding of the stakeholders' views. The information gathered was used to create 'social maps', visual representations of stakeholders' relationships with each other. These maps provided a basis for discussion between groups. The second step involved the identification, with stakeholders, of strategies to reduce conflict in relation to management decisions.

Outcomes

The research found that conflict often arises in situations where opportunities for discussion and negotiation between different groups do not exist. Discussion and negotiation leads to the prevention of conflict and encourages collective action in an environment of diverse views. Reduced stakeholder conflict leads to improved coastal zone management, thus illustrating how social science can be used to improve decision-making.

Jennings, SF & Lockie, S 2002, 'Application of stakeholder analysis and social mapping for coastal zone management in Australia', in: Gomes, F.V. et al. (Ed.) *Littoral 2002: 6th International Symposium Proceedings: a multi-disciplinary Symposium on Coastal Zone Research, Management and Planning*, Porto, 22–26 September 2002: vol. 1, pp. 285–294.

URL:http://www.io-warnemuende.de/homepages/schernewski/Littoral2000/docs/vol1/Littoral2002_33.pdf, viewed 23 January 2008.

Box 5

Real-world problem

Although collaboration and multi-stakeholder partnerships have become a common feature in natural resource management throughout the world, various problems are associated with attempts to up-scale community-based natural resource management from the local to the regional level. This research sought to look at two examples of how this might be done.

Methods

This article reports on two collaboratives in Australia: local Landcare groups, and regional natural resource management bodies. Recent government-induced changes have shifted the focus from local Landcare group action to strategic planning and implementation by regional NRM bodies. Two typologies of collaboratives are applied to analyse the characteristics of both these groups. The study used data from 52 qualitative interviews with key informants at the local and regional level in Victoria and Tasmania—participant observation, literature and document analysis. The article illustrates how the groups' distinct characteristics can cause conflicts when the different types of collaboratives operate in parallel. In addition, the article reports how stakeholders perceive the level of community participation in decision-making processes.

Outcomes

The key message is that the benefits of community participation and collaboration that arise at the local level can be lost when these approaches are up-scaled to the regional level, unless there is an intermediary or 'mediating structure' to facilitate communication and create the link between different types of collaboratives.

Prager, K 2010, 'Local and Regional Partnerships in Natural Resource Management: The Challenge of Bridging Institutional Levels', *Environmental Management* Vol. 46, No.5 (Nov): pp. 711–24.

URL: http://www.springerlink.com.virtual.anu.edu.au/content/m58776071975234r/fulltext.html, viewed 3 February 2011

DOCUMENT ANALYSIS (DESKTOP REVIEW)

Photo courtesy of WAFIC

Interviews are one of the best approaches to explaining human behaviour and perceptions

SOCIAL SCIENCE RESEARCH FOR OUR NATURAL RESOURCES

QUALITATIVE INTERVIEWS

Photo courtesy of FRDC

Qualitative interviews

QUALITATIVE interviews with individuals are a key method for gathering data that helps explain human behaviour and perceptions. Gathering qualitative data though interviews enables better understanding of how and why people have chosen to act in particular ways; whereas quantitative surveys do not enable this type of understanding to be developed.

WHAT IS IT?

QUALITATIVE interviews are interviews, undertaken face-to-face, by phone or online through a conversational medium such as instant messaging. They may be semi-structured or unstructured.

Semi-structured interviews discuss a pre-set list of topics, with in-depth discussion allowed for each topic.

Unstructured interviews, by nature, have less structure with a general topic used to start discussion. Interviews may be recorded by taking notes, audio recording, or video recording. Interviews are commonly transcribed and analysed using qualitative analysis techniques such as coding.

HOW IS IT DONE?

INTERVIEWS typically follow a process of identifying how people to be interviewed will be chosen. This may be based on their experience with a particular issue, with 'key informants' who have in-depth knowledge of experience

often interviewed. It can also be based on randomly sampling a particular population following the format of deciding on interview questions, interviewing the sample and analysing interview data.

In some cases, interviews are structured so they can elicit both qualitative and quantitative data (see the 'examples' section for illustrations of how this has been done in some studies on fisheries-related topics).

PLANNING AND COSTING

INTERVIEWS can be high cost and time consuming. The cost depends on how many people are interviewed and the extent of data analysis (for example, whether interviews are transcribed word for word or notes are taken during the interview). Interview planning requires deciding on:

- the purpose of the interviews and interview topics

- the sampling approach for interviewing and total number of interviewees

- the analysis approach to be used—descriptive/structural/thematic.

HOW USEFUL IS IT?

TABLE 4 describes the potential uses of qualitative interviews in achieving management objectives.

TABLE 4.
USES OF QUALITATIVE INTERVIEWS TO MEET OBJECTIVES AND MANAGEMENT NEEDS

OBJECTIVE/MANAGEMENT NEEDS	POTENTIAL USES OF QUALITATIVE INTERVIEWS
Identify beliefs and values attached to a natural resource	Interview stakeholders in the issue with a focus on their beliefs and values around that issue, examining where these were derived from, and how flexible they may be
Achieve equitable allocation of resources	Gain in-depth understanding of how and why different individuals (for example, representatives of different groups) perceive equity impacts of different allocation options Develop improved allocation approaches
Optimise resource allocation between users	Gain in-depth understanding of how and why different individuals (for example, representatives of different groups) perceive different allocation options. Develop improved allocation approaches
Undertake effective community engagement and communication with stakeholders and the general community	Gain an in-depth understanding of different stakeholder's perspectives and actions Evaluate effectiveness of community consultation and engagement
Maximise natural resource related social benefits for which management is responsible	Gain an understanding of social benefits experienced by different individuals and the factors influencing the extent and nature of the benefits experienced
Minimise negative and maximise positive social impacts of management activities	Gain an understanding of the mechanisms by which positive and negative social impacts occur in different situations. Determine what factors contribute to changing the nature of impacts (including external factors not influenced by management) Determine what actions are possible to maximise positive and minimise negative impacts
Understand and influence perceptions relating to natural resources	Understand how and why perceptions have formed, and what influences them, for different individuals
Understand and influence human behaviour relating to natural resources	Explore the reasons why people choose to behave in particular ways. For example, identify the reasons for different responses to closures of areas to recreational fishing. This can provide invaluable information to help design strategies to improve implementation of strategies aimed at or requiring a change in behaviour of particular groups
Design effective structural adjustment packages	Understand likely responses to different types of structural adjustment, and hence the efficacy of different structural adjustment strategies

QUALITATIVE INTERVIEWS

BENEFITS AND LIMITATIONS

INTERVIEWS are one of the best approaches to explaining human behaviour and perceptions. Whereas quantitative data can reveal how many people behaved a particular way, or hold a particular perception, qualitative interviews enable an exploration of why people may act or perceive an issue in a particular way. This explanation is necessary when designing sound policy as it enables policy makers to specifically respond to the triggers and causes of particular actions or perceptions, instead of making assumptions about why these have occurred.

The key limitation of interviews is that it is usually not possible to interview enough people to obtain a statistically significant sample. Therefore, it is difficult to know if the represented interview selection provides enough information to be useful in explaining behaviour and perception. For this reason, many researchers combine qualitative data collection in interviews with surveys that identify what proportion of a particular population act in particular ways or hold specific perceptions.

EXAMPLES OF USE OF QUALITATIVE INTERVIEWS

THE following boxes provide examples of the use of qualitative interviews in previous natural and fisheries-related studies.

Photo courtesy: Kathleen Davies

Box 6

Real-world problem

This research investigated whether fishers' local knowledge can be used to inform management policies and increase the overall body of knowledge. It also sought to determine whether there are other benefits to including fishers in the production of knowledge about local marine resources. The research explored in what ways fishers' knowledge is different to scientific knowledge.

Methods

The full paper reports research carried out with Australian Indigenous and Brazilian caiçaras fishers who fish for a migratory fish. Interviews were conducted with the fishers using standardised questionnaires. Quantitative analysis was carried out assessing the percentage of interviewees that mentioned a certain answer to the questions which were asked. Qualitative analysis was carried out by comparing citations by Brazilian and Australian fishers. The information provided by the fishers was compared with scientific data.

Outcomes

The study found that the fishers' knowledge was similar to the scientific knowledge (which is limited), suggesting that local knowledge can be used in management policies. It was also found that this form of research may lead to increased dialogue between fishers and scientists, thus increasing the body of knowledge, as well as the fishers' political and cultural strength. The findings support the use of co-management schemes which, if put into place, would change the current, management policy.

Silvano, RAM & Begossib, A 2005, 'Local knowledge of a Cosmopolitan Fish Ethnoecology of *Pomatomus saltatrix* (Pomatomidae) in Brazil and Australia', *Fisheries Research*, vol. 71, pp. 43–59.

Box 7

Real-world problem

Successful reconstruction or restoration of formerly cleared landscapes depends on land-use history and its legacies. Program's developed without consideration of these legacies may fail to be effective and lack credibility. However, compiling landscape histories is not simple. This work looked at how community engagement assisted with developing landscape histories.

Methods

Participatory workshops with long-term local residents combined spatial data on landscape change with facilitated conversations [structured qualitative interviews] to compile a history of landscape change. Timing and extent of key environmental and socioeconomic drivers of woody vegetation cover change since European settlement were established. Some drivers of clearing were relatively well-known, such as drought, or clearing for surface mining and pastoralism. However, others including important interactions like prolonged drought intersecting with declining wool prices, were less known. These workshops verified provisional data, tested focus and methods, and identified critical time periods for further investigation.

Outcomes

The workshops were a powerful transdisciplinary research tool that enhanced the understanding of researchers and participants beyond expectations. Other researchers should consider the general approach when assembling landscape history as a basis for documenting the degree and causes of change.

Duncan, DH, Kyle, G & Race, D 2010, 'Combining facilitated dialogue and spatial data analysis to compile landscape history ', *Environmental Conservation*, Vol. 37, No.4 (Dec) pp. 432–441.

Box 8

Real-world problem

The issue was to assess the social impacts relating to the development of natural reserves as well as the human impacts on these reserves. These impacts were related to multiple uses of natural parks, including tourism and recreation, fishing industries and Maori culture, in New Zealand for the New Zealand Management of Conservation.

Methods

Initial research involved the review of related literature, which formed a background to later research based on three case studies. The case study-related methods included surveys completed by local businesses, and semi structured interviews conducted with residents, business operators, commercial fishers and key informants such as field officers working with the Management of Conservation. The interviews used a list of 26 key words as prompts and assisted the use of computerised content analysis.

Outcomes

The initial results of the research were presented at several meetings and workshops, which allowed for discussion of the findings and, in the latter, development of policies strategies and guidelines for the future development of natural reserves.

Taylor, N & Buckenham, B 2003, 'Social Impacts of Natural Reserves in New Zealand', *Science for Conservation*, No 217. Published by New Zealand Management of Conservation.

Researchers can combine qualitative data collection in interviews with surveys that identify what proportion of a particular population act in particular ways or hold specific perceptions

Group interactions:
Focus groups, group interviews, workshops

FOCUS groups, group interviews and workshops are useful ways of gaining a rapid understanding of the views held by a number of people. Similarly to qualitative interviews, they are a key method for gathering data which helps explain human behaviour and perceptions. Gathering qualitative data via these 'group interaction' methods enables development of understanding of how and why people have chosen to act in particular ways.

Focus groups, group interviews and workshops enable interaction amongst participants, and hence are useful ways to generate new ideas and possible solutions to problems which are acceptable to a range of stakeholders and groups.

WHAT IS IT?

FOCUS groups, group interviews and workshops are all forms of group interaction. Definitions of each differ, but their format may often be very similar if not identical. In general, the distinctions made between the three terms is that:

• Focus groups generally involve gathering people who have similar characteristics together to comment on or discuss a particular issue. The similarity may be that the people involved all come from the same industry, same locality, gender or age groups, or they may be chosen for some other similar characteristic. A focus group will usually only be brought together on a single occasion, although

in some cases repeated focus groups may be undertaken with the same group of people.

• Group interviews are typically chosen to include people who may have a diversity of views about a particular subject. For example, the participants may all come from the same region but are chosen to reflect the diversity of ages, occupations, and other relevant characteristics of the population of that region. Similarly to focus groups, a group interview is usually undertaken once.

• Workshops usually refer to bringing people with expertise on a particular topic or issue together to actively work on that issue for a period of time. The objective is often to arrive at results or recommendations for moving forward. A workshop may be a 'one-off' event, or a series of workshops may be held on a particular issue.

HOW IS IT DONE?

GROUP interactions have traditionally been held as face-to-face meetings, although increasingly use is being made of online forums or websites such as 'Second Life' to hold virtual group meetings. The former is still preferred for reducing the chance of misunderstandings. Participants are able to better understand each other's contributions when they can observe body language and hear how a person said something, as well as what they said. Interacting using the written word has a higher probability of leading to

misunderstandings as the 'tone' in which something was said is more difficult to interpret.

Face-to-face group interactions typically involve meeting for a period of time—anything from 1–2 hours to several days—to discuss a particular topic. Many group interactions are guided by trained facilitators who can guide group interaction to ensure it is as positive as possible. This is particularly important in conflict situations. Interactions may be recorded by taking notes, audio or video recording, with these notes/recordings then analysed.

PLANNING AND COSTING

GROUP interactions are often a less expensive option than individual interviews. Costs will vary depending on decisions made when planning the interaction, including:

• whether a trained facilitator is paid to run the interaction

• whether participants are paid or have their costs covered to attend the focus group/group interview/workshop

• number of participants

• extent of preparation required, for example preparation of data to be discussed at the interaction

• extent of subsequent analysis of data. For example, costs of a workshop will be higher if all discussions are recorded and fully transcribed than if analysis is based on notes taken at the workshop.

HOW USEFUL IS IT?

THE uses of group interaction methods of collecting data are similar to those of individual interviews. Key differences between the two approaches are that some people may be more willing to speak freely during an individual interview than in group situations as they are not as concerned about criticism or potential consequences of expressing a contentious view. This is a particularly important consideration in situations where groups are in conflict with each other.

Group interactions must also be carefully facilitated to ensure all participants have an opportunity to have their views heard and discussed, and avoid a small number of people dominating the interaction.

In group interactions, the interaction is argued by some to produce more innovative ideas and solutions to problems than occurs when people are interviewed individually.

Group interactions are often (but not always) less costly than conducting individual interview.

Table 5 describes the potential uses of group interactions in achieving management objectives.

Gathering qualitative data via 'group interaction' methods enables development of understanding of how and why people have chosen to act in particular ways

TABLE 5.
USES OF GROUP INTERACTIONS TO MEET OBJECTIVES AND MANAGEMENT NEEDS

OBJECTIVE/MANAGEMENT NEEDS	THE POTENTIAL USES OF GROUP INTERACTIONS
Identify beliefs and values attached to a natural resource	Undertake a workshop or focus group with a focus on their beliefs and values around an issue, examining where these were derived from, and how flexible they may be in a group dynamic
Achieve equitable allocation of resources	Gain an in-depth understanding of how different participants (for example, representatives of different groups) perceive equity impacts of different allocation options Develop improved allocation approaches
Optimise resource allocation between users	Gain an in-depth understanding of how different participants perceive different allocation options Develop improved allocation approaches
Undertake effective community engagement and communication with stakeholders and the general community	Gain an in-depth understanding of different participants perspectives and actions Evaluate effectiveness of community consultation and engagement
Maximise natural resource related social benefits for which management is responsible	Gain understanding of social benefits experienced by different participants, and the factors influencing the extent and nature of the benefits experienced
Minimise negative and maximise positive social impacts of management activities	Gain an understanding of the mechanisms by which positive and negative social impacts occur in different situations. Determine what factors contribute to changing the nature of impacts (including external factors not influenced by the management) Determine what actions are possible to maximise positive and minimise negative impacts
Understand and influence perceptions relating to natural resources	Understand how and why perceptions have formed, and what influences them for different participants
Understand and influence human behaviour relating to natural resources	Explore the reasons why people choose to behave in particular ways. For example, identify the reasons for different responses to closures of areas to recreational fishing. This can provide invaluable information to help design strategies to improve implementation of strategies aimed at or requiring a change in behaviour of particular groups
Design effective structural adjustment packages	Understand likely responses to different types of structural adjustment, and hence the efficacy of different structural adjustment strategies

GROUP INTERACTIONS

BENEFITS AND LIMITATIONS

THE benefits and limitations of group interactions are similar to those of individual interviews. Group interactions are valuable in helping to explain human behaviour and perceptions. They are also commonly used to generate new, shared solutions and strategies about an issue of common interest to the group in question.

The key limitations of group interactions are firstly, that it is usually not possible to include enough people to obtain a statistically significant sample. Therefore it is difficult to know if the people interviewed have been 'representative enough' to provide useful explanations of behaviour and perceptions. Secondly, group interactions have potential to exacerbate existing, or contribute to, new tensions between different individuals and groups if not facilitated skilfully, especially when sensitive or contentious issues are discussed.

EXAMPLES OF USE OF GROUP INTERACTIONS

THE following examples demonstrate use of group interactions in previous natural and fisheries-related studies.

Photo courtesy of Kathleen Davies

Box 9

Real-world problem

The research was designed to address the lack of knowledge and attention given to the multiple issues surrounding gender in the fishing sector, and the implications for policy implementation. Without understanding the complexity of gender roles in the development process in many coastal West African States, the goal of sustainable livelihoods from fishing is unlikely to be achieved.

Methods

The paper presents the results of a workshop held in Benin. The workshop, entitled 'Room to Manoeuvre: Gender and Coping Strategies in the Fisheries Sector' brought together 14 participants from Europe and Africa representing fisheries organisations, universities, research, administration, development and non-government organisations. Discussion was carried out using a framework based on the 'Sustainable Livelihoods Approach', which encourages a holistic approach, including human, social, physical, natural and financial capital.

Outcomes

The research provided guidance to policy makers as to where interventions might be most useful to achieve the goal of sustainable livelihoods from fishing. The recommended policy interventions addressed the underlying 'deep-rooted' causes of problems, rather than the immediate challenge (or 'symptom').

Bennett, E 2005, 'Gender, Fisheries and Development', *Marine Policy*, Vol. 29, pp. 451–459.

Box 10

Real-world problem:

Financial feasibility and return are two key issues that farmers and land owners consider when deciding between alternative land uses such as arable farming, forestry and agroforestry. Moreover regional variations in yields, prices and government grants mean that the relative revenue and cost of such systems can vary substantially within Europe. This project sought to aid understanding of these variations, through the development of a new a new economic model.

Methods

The initial stages included establishing criteria for the model with end-users and reviewing the literature and existing models. This indicated that the economic model needed to allow comparison of arable farming, forestry and agroforestry systems at a plot-scale and a farm-scale. The form of comparisons included net margins, net present values, infinite net present values, equivalent annual values, and labour requirements. It was decided the model would operate in a spreadsheet format and the effect of phased planting patterns would be included at a farm-scale. Following initial development, additional user feedback led to a final choice on a model name, a final method of collating input data, and the inclusion of field-based operations such as varying the cropped area, replacing dead trees, and pruning. In addition options in terms of improved graphical outputs and the ability to undertake sensitivity analysis were developed.

Outcomes

Some of the key lessons learnt include the need to establish clear model criteria and the benefits of developing a working prototype at an early stage to gain user-feedback.

Graves, AR, Burgess, PJ, Liagre, F, Terreaux, J-p, Borrel, T et al 2010, 'Farm-SAFE: the process of developing a plot- and farm-scale model of arable, forestry, and silvoarable economics'. *Agroforestry Systems*, vol. 81, No.2 (Feb) pp. 93–108

Box 11

Real-world problem:

Water catchments worldwide are experiencing increasing pressure on the quantity and quality of ground and surface water resources. Water managers are increasingly consulting community and stakeholder groups to ensure their decisions reflect the values and preferences of water users. Growing tensions between different water users require the use of techniques that can enable stakeholders to learn about each others' positions and deliberate about the costs and benefits of alternative water allocation scenarios.

Methods

This paper describes the use of scenario development, a small group deliberative process (citizens' jury) and multi-criteria analysis to assist in water planning for the Howard River catchment in the Northern Territory of Australia. Water planning processes in the NT are in their infancy.

Outcomes

This research provides information about stakeholder preferences where none was previously available and demonstrates the use of a new water planning tool. The research found that the process in this case was most useful in providing information to stakeholders, dispelling some unhelpful myths about water use in the catchment, and coalescing opinion about important criteria for assessing future options.

Straton, AT, Jackson, S, Marinoni, O, Proctor, W & Woodward, E 2011, 'Exploring and Evaluating Scenarios for a River Catchment in Northern Australia Using Scenario Development, Multi-criteria Analysis and a Deliberative Process as a Tool for Water Planning', *Water Resources Management*, vol. 25, No.1 (Jan) pp. 141–164.

Photo courtesy: WAFIC

Quantitative sample surveys

QUANTITATIVE sample surveys are important tools that can be used to understand the proportion of a population that holds particular views or undertakes particular actions. To be effective, however, they need to be well designed and implemented—quantitative surveys often fail due to a lack of professionalism in their design and implementation, which can easily result in a low response rate to the survey, or data with limited usefulness.

Quantitative surveys are used in many circumstances to gather important social information. They are commonly used as a tool in social impact assessment, perceptions studies and increasingly in community consultation processes to ensure the views of the entire population are known on an issue.

WHAT IS IT?

QUANTITATIVE sample surveys are surveys that target a statistically significant sample of a defined population of people (for example, commercial fishers operating in a particular fishery, the adult population of a particular town or region, recreational fishers in a defined region). They typically ask questions designed so the responses can be analysed numerically to produce statistics on the proportion of the sample with particular characteristics. For example, they may ask respondents to tick 'yes' or 'no' questions, which ask about activities they 'have' or 'haven't' undertaken, or to rate the strength of their feelings about a topic on a scale of one to five.

When sample surveys achieve a statistically significant response rate, it is possible to extrapolate from the survey results to identify the characteristics of the total population from which the sample was drawn. This means that a well-designed sample will enable valid conclusions to be drawn about the characteristics of a much larger population.

HOW IS IT DONE?

QUANTITATIVE sample surveys take the forms of questions asked of a carefully designed sample of people. Typically the process involves designing questions, carefully selecting an appropriate sample, delivering the survey, entering and analysing data.

Surveys may be delivered in various ways, including:

Face-to-face surveys—these are expensive compared with other survey modes, but reduce potential for misinterpretation of questions. It can be difficult to specifically target an exact sample, and the location and time chosen for face-to-face surveying may bias the sample achieved.

Mail surveys—these are the lowest-cost survey option after internet and email surveys. It is possible to target surveys to a very specific sample. However, response rates are typically low (20% or less) unless measures are taken to improve response rate, such as providing a payment for those who complete the survey, sending reminders to complete the survey up to six times and providing toll-free phone numbers survey recipients can call for assistance when compleing the survey. Mail surveys take longer than some other options such as phone surveys.

Phone surveys—these are mid-range in terms of cost and enable rapid survey of people, with data able to be entered into a form as people are surveyed on the phone. It can be challenging to achieve a representative sample and response is affected by factors such as the time of day at which phone calls are made.

Internet and email surveys—internet and email surveys are becoming increasingly popular. They are low cost and can be easily designed, particularly using online survey instruments such as those available from http://www.surveymonkey.com. The key difficulty is that it is often difficult or impossible to establish a valid sample frame and to select the sample desired, and so results are not necessarily able to be extrapolated to the rest of the population being sampled.

PLANNING AND COSTING

WELL-DESIGNED surveys cost a reasonable amount, but are often surprisingly cost effective, especially when compared to the cost of undertaking time intensive data collection using methods such as individual interviews. They cannot, however, gather the same types of information as some of the qualitative methods described above.

The cost of a survey will vary depending on:

- Survey delivery method used

- Number of people surveyed

- Number and type of questions asked. It takes less time to analyse 'close-ended' questions in which people tick a box or rate their opinion on a scale, than to analyse 'open-ended questions' in which respondents provide written answers, which then have to be categorised to enable numerical analysis

- Type of analysis to be undertaken.

Table 6 provides two examples of planning a survey of residents of a region about fishing issues.

TABLE 6.
EXAMPLES OF PLANNING AND COSTING A SURVEY OF RESIDENTS IN BUNBURY AND WA

SAMPLE SURVEY OF BUNBURY RESIDENTS	SAMPLE SURVEY OF WESTERN AUSTRALIAN POPULATION
Step 1: Identify sample required The population of the local government area of Bunbury during August 2006 was 29 702, of which about 22 500 residents were 18 years and older. Assuming a simple random sample of the adult population, a sample of 378 is required to achieve a valid sample with 5% confidence interval and 95% confidence level. However, as the response rate to the survey will not be 100%, at least twice that number should be surveyed to ensure a valid response. To be cautious, 1000 residents will be surveyed **Step 2: Develop questions** Question design requires (a) identifying relevant topics, (b) developing a draft questionnaire, (c) testing the questionnaire on a small sample of people and (d) revising the questionnaire to improve validity of response. This typically requires at least 2–3 weeks. The questionnaire is assumed to be around eight pages long, bound into a B5 size booklet. **Step 3: Decide survey method.** In this example, a mail survey with up to five reminders will be used. **Costing considerations:** Questionnaire printing: consider quality and type of printing used appropriate to intended recipient. Postage and envelope costs, including return stamped envelope. Toll-free telephone number providing survey advice. Staff time to design and deliver survey: minimum 12 weeks. Survey data entry (assume 400 surveys received) 4 days. Data analysis: 15 weeks.	**Step 1: Identify sample required** The population of Western Australia in August 2006 was 1 959 088. Of these, about 1 462 000 were adult age. A simple random sample would require a sample of 384 people to be achieved. In reality a stratified sample of different populations would likely be undertaken, to enable the responses from particular regions to be analysed (for example, you might want a statistically significant sample from the South Coast region, West Coast region, Gascoyne region and Pilbara/Kimberley region). This would require a much larger sample — probably about 1600 people. Assuming a response rate of 50%, at least 3200 surveys need to be sent out. **Step 2: Develop questions** The same process is used as for the Bunbury survey, but more extensive testing of the questionnaire may be needed to identify if particular groups respond to questions differently or have difficulty understanding the survey **Step 3: Decide survey method** A mail survey will be used again, with up to five reminders. An internet completion option will also be given to enable more rapid response to the survey and speed up response. **Costing considerations:** Questionnaire printing: consider quality and type of printing to be used appropriate to intended recipient. Postage and envelope costs, including return stamped envelope. Toll-free telephone number providing survey advice. Staff time to design and deliver survey: minimum 14 weeks. Survey data entry (assume 1600 surveys received): 16 days. Data analysis: 20 weeks.

HOW USEFUL IS IT?

TABLE 7 provides an indication of the usefulness of quantitative sample surveys for achieving different objectives and management needs.

TABLE 7.
USES OF QUANTITATIVE SAMPLE SURVEYS TO MEET OBJECTIVES AND MANAGEMENT NEEDS

OBJECTIVE/MANAGEMENT NEEDS	POTENTIAL USES OF QUANTITATIVE SAMPLE SURVEYS
Identify beliefs and values attached to a natural resource	Survey an identified 'community' or stakeholder group for their beliefs and values around an issue, checking possible sources of these and the flexibility of them
Achieve equitable allocation of resources	Identify the perceptions of a population about equitable allocation – what proportion has particular views about equity Use this knowledge to develop policies on equitable allocation based on what is known to be acceptable to a broad range of people
Optimise resource allocation between users	As above
Undertake effective community engagement and communication with stakeholders and the general community	Surveys can provide a useful understanding of the views of a representative sample of an entire population. This is particularly useful if there is concern that community consultation is leading to dominance of 'vested interests' whose views may not be representative of the broader community[1]
Maximise natural resource related social benefits for which management is responsible	Identify the distribution of benefits across a defined population, including who benefits more or less
Minimise negative and maximise positive social impacts of management's activities	Identify the distribution and nature of impacts across a defined population, including who is impacted more or less
Understand and influence perceptions relating to natural resources	Identify proportion of a population who hold particular views, and related information such as whether particular groups (for example, women, younger people) hold views different to others (for example, men, older people), social networks and communication channels which have influenced perceptions and how perceptions may be influenced by underlying values and worldviews
Understand and influence human behaviour relating to natural resources	Identify proportion of a population who behave in particular ways, and related information such as whether particular groups (for example, women, younger people) behave differently to others (for example, men, older people), social networks and communication channels which have influenced behaviour and how behaviour may be influenced by underlying values and worldviews
Design effective structural adjustment packages	As for examining social impacts

[1] See Davis and Whittington's (1998) online paper for a useful paper comparing the differences in views identified when using a community survey versus public meetings http://www.journals.uchicago.edu/doi/pdf/10.1086/452387

QUANTITATIVE SAMPLE SURVEYS

BENEFITS AND LIMITATIONS

Quantitative surveys can provide useful information enabling an understanding of the distribution of particular characteristics across a defined population. For example, whereas qualitative work could identify that some fishers have increased income following a management change, use of quantitative surveys can enable quantification of how many and which types of fishers have benefited. Quantitative surveys provide an understanding of how widespread different perceptions, behaviours and characteristics are—how many people typically believe that Marine Protected Areas (MPAs) are a useful management tool? Are they more likely to be young or old? Are recreational fishers more or less likely than other groups to be in favour of proposed or existing MPAs?

Quantitative surveys also have important limitations. In particular:

Quantitative surveys have limited explanatory power—for example, while it is possible to analyse survey data to identify if women are statistically significantly more likely than men to hold the view that MPAs have positive benefits, the causes of this correlation are not identifiable based on survey data. While regression analysis can construct explanations in which many factors explain a particular outcome, qualitative work is a useful, and often easier, way of exploring why people behave or perceive the way they do.

Quantitative surveys require considerable skill to design and implement well—question design, delivery methods and analysis are all areas in which specialists spend years developing skills, yet it is common for inexperienced staff members to be asked to deliver a survey that then achieves poor results. Common pitfalls include poor question design, poor sample design, and little use of techniques known to improve response rates. For example, a poorly-designed question may result in one respondent interpreting the question in one way, while another respondent interpreted the question as referring to something different.

EXAMPLES OF USE OF QUANTITATIVE SAMPLE SURVEYS

The following examples demonstrate use of quantitative sample surveys in previous natural and fisheries-related studies.

Box 12

Real-world problem

Everyday citizens and nonexpert stakeholders influence the uptake and success of oceans fisheries management. However, the link between public knowledge on oceans and support of measures taken by policy makers to restore the health of oceans is not known. How can public knowledge of ocean fisheries management be effectively enhanced?

Methods

The study used a mail and phone survey of more 3000 Pacific Northwest US citizens. The research was deemed necessary because a report issued by the Pew Ocean Commission suggested that increased public knowledge about ocean-related issues, particularly related to policy, will lead to increased public support for policy designed to restore and protect oceans. The research examined whether this occurs and analysed what are the best sources of policy-relevant knowledge.

Levels of knowledge were examined by asking questions relating to the natural environment. In addition to the use of multiple choice questions, respondents were also asked to indicate from a list of words, those they did and did not know the meaning of. Respondents were also asked how often they used media such as television, the internet or newspapers in order to examine the success of media sources in providing knowledge to the public.

Outcomes

This research found that increased knowledge leads to increased support for fisheries management measures and policies to restore oceans. The research also identified the most effective means for enhancing public knowledge.

Steel, B, Lovrich, N, Lach, D & Fomenko, V 2005, 'Correlates and Consequences of Public Knowledge Concerning Oceans Fisheries Management'. *Coastal Management*, vol. 33, pp. 37–51.

Box 13

Real-world problem

This study in the wake of 1990s fire catastrophes identifies and analyses underlying causes of vegetation fires in eight locations across Borneo and Sumatra.

Methods

Multidisciplinary and multiscale analysis integrates geospatial technologies with varied social research approaches and participatory mapping. It helps fill a void of site-specific evidence on diverse underlying causes of the Indonesian fires, despite emerging consensus on macro-level causes and impacts, and policy debates on preventing future fire disasters. Ethnographic methods intended to construct a picture of relationships among land users, land managers, and fire in each of the sites. The methods used included household surveys, group and individual interviews, participatory sketch mapping and field surveys, and a range of rural appraisal exercises. In most of the sites, local non-government organisations assisted with the social surveys.

Outcomes

Our most important findings include confirmation of multiple direct and underlying fire causes at each of the eight locations, no single dominant fire cause at any site and wide differences in fire causes among sites. Conclusions emphasise the importance of location specific studies within a regional analytical context. Our 'hybrid' research methods demonstrate the explanatory power of integrating geospatial and social analysis techniques, and the benefits of analysing fire causes and impacts at multiple scales in varied locations across diverse regions.

Rona, A, Dennis, et al 2005, 'Fire, People and Pixels: Linking Social Science and Remote Sensing to Understand Underlying Causes and Impacts of Fires in Indonesia, *Human Ecology*, vol. 33, No.4 (Aug) pp. 465–504.

Box 14

Real-world problem

The behaviour of small fishers in response to and the impact of the introduction of quota management systems is poorly understood. Did the introduction of the quota management system have adverse impacts—in particular, low levels of post-exit employment—on small fishers in New Zealand?

Methods

Research conducted for this paper profiled the fishers who have exited the New Zealand fishing industry since the introduction of the quota management system during 1986. The research involved the development of a questionnaire, which had been refined through a focus group involving exiters. The questionnaire responses were analysed to create a profile of pre-exit involvement, the process of exit, and post-exit employment.

Outcomes

The results of the survey found the impacts had not been particularly harmful to fishers as 97% of those who chose to exit the industry found employment before, or promptly after their exit. While there was no mention of policy implications, the research was useful to measure the impacts of policy using a variety of indicators, and, had the results been more negative, would have suggested that the social issues of quota management system required further attention by policy makers.

Stewart, J, Walshe, K & Moodie B 2006, 'The demise of the small fisher? A profile of exiters from the New Zealand fishery', *Marine Policy*, vol. 30 pp. 328–340.

Box 15

Real-world problems

The management of recreational anglers' behaviour requires an understanding of their motivation to fish. Social science research assists managers to predict anglers' responses to future management changes and therefore assists decision and policy making. Managers can thereby increase the likelihood that anglers will have a satisfying experience and will continue to support necessary and appropriate management actions in the interests of sustainable resource use.

Methods

The research presented in this paper involved a questionnaire completed by Massachusetts freshwater anglers. License receipts were used to identify anglers and a random selection of these anglers were sent a questionnaire by mail. The questionnaire provided scenarios outlining different fishing experiences depending on motivations regarding the size, number and species of fish caught and the previous success in terms of these same motivations.
The group was divided into three and each group was sent identical copies of eight scenarios so a total of 24 scenarios were tested. Respondents were asked to indicate on a seven-point Likert-type scale the importance of each motivation. The use of the scenarios allowed for a controlled experiment and analysis was carried out using a repeated measures ANOVA procedure.

Outcomes

Recreational anglers placed increasing importance on catching fish of a preferred size and number if they had not been successful in catching the preferred fish on previous trips (that is, they experienced catch deprivation). Overall, the level of importance given to catch motives was lower than expected. However catch motives increased in importance over non-catch motives as levels of catch deprivation increased.

Finn, KL & Loomis, DK 2001, 'The Importance of Catch Motives to Recreational Anglers: The Effects of Catch Satiation and Deprivation', *Human Dimensions of Wildlife*, vol. 6, pp. 173–187.
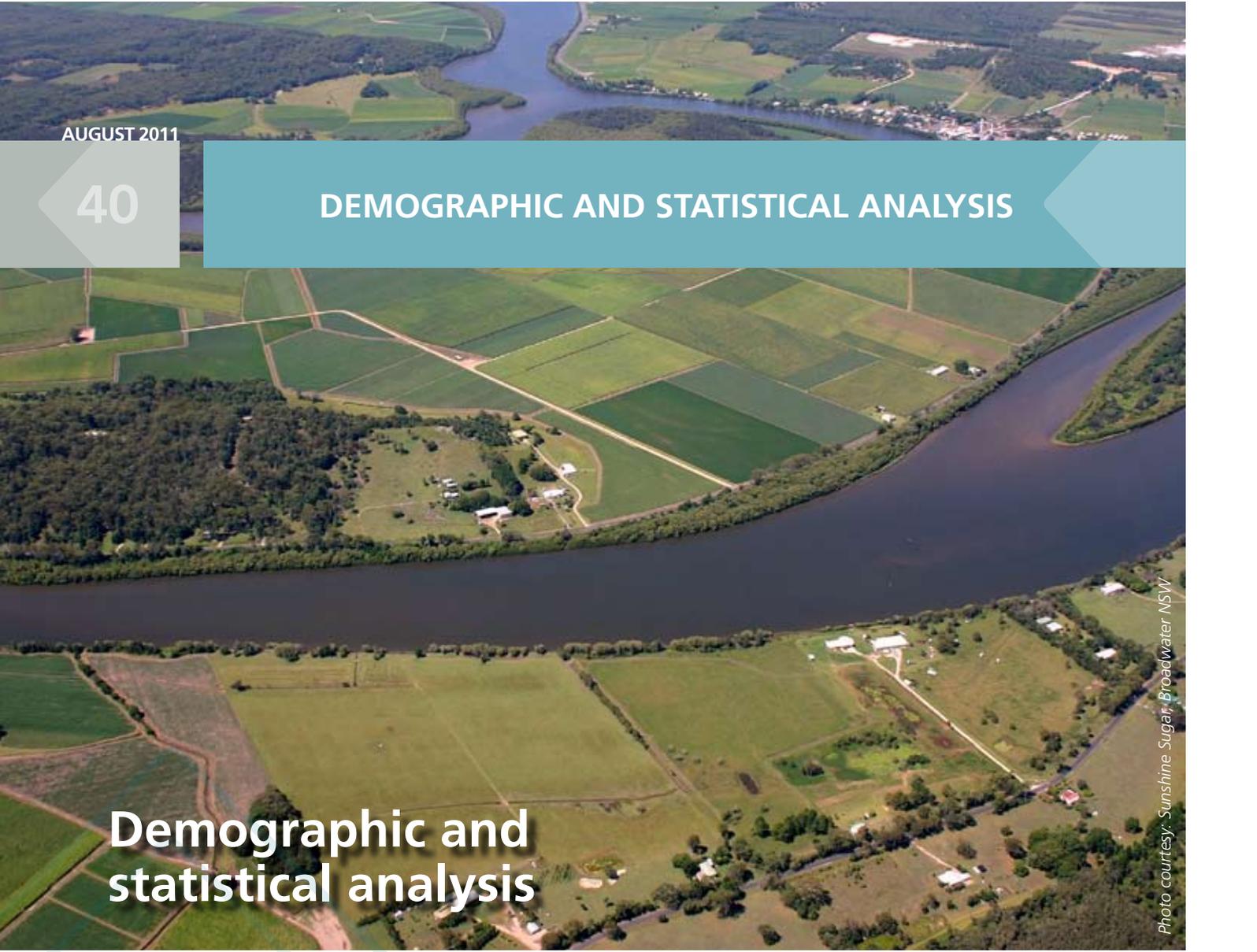
Demographic and statistical analysis

Photo courtesy: Sunshine Sugar, Broadwater NSW

ANALYSING available statistical data can be a useful tool to help inform managers and policy makers about the social environment in which natural management activities are taking place.

WHAT IS IT?

DEMOGRAPHIC and other 'secondary' (already existing) statistics are analysed to identify what they can reveal about either the characteristics of particular groups involved in using natural resources, or the communities in which groups such as commercial fishers live. For example, demographic analysis may be used to profile key statistics of communities that are highly dependent on commercial fishing as one of their industries. This may help to identify whether these communities have particular characteristics fisheries managers need to be aware of, such as low levels of literacy, a rapidly ageing population or high population turnover.

HOW IS IT DONE?

THE FIRST step in analysing statistical data is to identify what data will be useful and how results will be used. Then available data are identified, analysed and utilised. The key issue is usually data availability. Relatively little reliable data is collected on social characteristics of fishers and those dependent on fishing; it is often necessary to design and undertake a quantitative survey to generate statistical data.

PLANNING AND COSTING

THE KEY step in planning is to understand how and why statistical data will be collated and analysed. A common mistake made is to profile characteristics of fishers without first identifying how that data will be used. This can result in waste of considerable investment of money. Costing is often reasonably low, depending on the cost of access to available data.

HOW USEFUL IS IT?

TABLE 8 provides an indication of the usefulness of quantitative sample surveys for achieving different objectives and management needs.

TABLE 8.
USES OF DEMOGRAPHIC AND OTHER SOCIAL STATISTICS TO MEET OBJECTIVES AND MANAGEMENT NEEDS

OBJECTIVE/MANAGEMENT NEEDS	POTENTIAL USES OF DEMOGRAPHIC AND OTHER STATISTICS
Identify beliefs and values attached to a natural resource	Analysis of community statistics that are indicated to be related to beliefs and values around an issue
Achieve equitable allocation of resources	If data were available which assisted in measuring equity of outcomes, these would help measure outcomes of allocation decisions. This would require (a) carefully defining what measures of equity can appropriately be used, and (b) what statistics are available to measure this. Based on the author's current knowledge of availability of statistics on fishing, it is unlikely that useful data could be gathered except by using a direct survey of resource users
Optimise resource allocation between users	As above
Undertake effective community engagement and communication with stakeholders and the general community	This type of analysis is sometimes used to 'profile' key stakeholder characteristics. Other methods are often more effective in providing information that can be usefully utilised in engagement processes
Maximise natural resource related social benefits for which management is responsible	Statistics can be used to monitor social benefits; again, as few statistics are available, this may be challenging to implement in reality
Minimise negative and maximise positive social impacts of management activities	Statistical analysis can be used to identify whether the management activities have had a noticeable impact on a community, town or region (for example, whether the implementation of a closure has led to a change in the economic activity, tourism, and population in towns near the area closed)
Understand and influence perceptions relating to natural resources	This method cannot be used to understand perceptions—a direct survey is needed to identify perceptions
Understand and influence human behaviour relating to natural resources	Some data collected on fishing effort may also be able to be analysed to identify characteristics of fisher behaviour. This could be used in combination with methods such as qualitative interviews to better understand behaviour patterns
Design effective structural adjustment packages	As for examining social impacts

BENEFITS AND LIMITATIONS

THE KEY benefit of using available statistics is that it costs less than gathering data through interviews, group interactions or surveys.

The key limitation is that already available may not be detailed enough or may not meet the needs for which you wish to use it.

In Australia, limited social statistics are available on commercial fishers and almost none on other natural resource users that related directly to the nature of their use. Data on the former are collected by the ABS through the Census of Population and Housing, undertaken during August once every five years. It asks people about their occupation, and hence data on fishers, deckhands and those employed in seafood processing can be accessed. Detailed data can only be accessed for a fee, however. The data are sometimes patchy (for example, if a fishery does not operate during August, many fishers will be recorded as unemployed, rather than as working in the fishing sector).

Other sources of useful statistics include licence data which, in some cases, includes information on date of birth (allowing analysis of demographic characteristics) or other information about the resources user and their business.

EXAMPLES OF DEMOGRAPHIC AND SOCIAL STATISTICS ANALYSIS

THE FOLLOWING examples demonstrate use of demographic and statistical analysis in previous natural and fisheries-related studies.

Photo courtesy of WAFIC

DEMOGRAPHIC AND STATISTICAL ANALYSIS

Box 16

This report describes and analyses the main commercial marine users who are active in the South-West Marine Region. It focused on ports, shipping, ship and boat building, oil and gas, natural tourism, commercial and recreational fishing, and aquaculture. The objective was to provide a clear understanding of the existing uses of the marine natural resource to inform Marine Reserve planning.

Methods

Statistical analysis of historical activity was used to identify expected growth, change and key pressures. Marine uses were addressed in terms of current activity and distribution within the region, expected growth, key management and institutional arrangements, and main pressures affecting them. The report shows the key industries of the region have grown rapidly over the past decade or so. The most notable growth has occurred in marine tourism and recreation, ship building, and aquaculture. At the same time, ports and commercial fishing have remained important commercial activities in the region All of these industries underpin economic growth, employment, and social wellbeing in the cities, towns and small communities of the region. It is also clear that the industries of the region are far from static, and have experienced dynamic changes in their economic structure and geography. Recent years have also seen the emergence of new industries such as marine biotechnology and desalination, and the prospect of oil, gas and minerals extraction.

Outcomes

This report emphasises that existing and emerging industries face a number of risks associated with factors such as international trade, global and domestic economic growth, interest and exchange rates, labour market constraints, policy reform and demographic change. The report pointed out that from a marine planning perspective it is important to recognise that many of the industries are also dependent on the ecological sustainability of the region's natural environment.

Gardner, S, Tonts, M & Elrick, C 2006, 'A Socioeconomic Analysis and Description of the Marine Industries of Australia's South-West Marine Region', Institute for Regional Development, University of Western Australia, report for the Management of the Environment & Water Resources, Canberra.
URL: www.environment.gov.au/coasts/mbp/south-west

Box 17

Real-world problem

Marine Matters was developed in response to the need for a comprehensive and credible description of the range and extent of human activities in the South East Marine Region to inform regional marine planning.

Methods

Using GIS and ABS data, the project undertook and analysis of the location of fishing activity, fishers, and the demographic profiles of those communities most and their relationship to coastal planning provides a profile of the demographic characteristics of coastal communities in the region.

Outcomes

The Atlas facilitated the identification of those communities most closely associated with fishing activities, and the demographic strengths and weaknesses that were present in each, according to statistical local area demographics. This was the one of the primary mechanisms utilised in the development of the Commonwealth Government's Ocean Policy initiatives.

Larcombe, J, Brooks, K, Charalambou, C, Fenton, M, Fisher, M, Kinloch, M & Summerson, R 2002, 'Marine Matters: Atlas of marine activities and coastal communities in Australia's South East Marine Region', Bureau of Rural Sciences, Canberra.

Using available statistics, such as data collected by the ABS through the Census of Population and Housing, is a cost-effective way of demographic and social analysis

Modelling approaches and decision support systems

MANY social science projects involve attempting to establish a model or decision support system intended to provide a decision aid for managers of a resource such as a fishery. These have a history of being developed and then rarely used in practice to inform 'real life' management of a resource.

Another form of decision support tool that rationalises potentially opposing values and approaches to resource management is Q factor analysis (or methodology), which looks for correlations between subjects across a sample of variables. Q factor analysis reduces the many individual viewpoints of the subjects down to a few 'factors', which represent shared ways of thinking that can be mediated to identify a generally acceptable approach. The methodology is particularly useful when researchers wish to understand and describe the variety of subjective viewpoints on an issue. It has recently started to be used as one tool to support decisions regarding the development of management (industry or government) plans or policies.

WHAT IS IT AND HOW IS IT DONE?

A MODEL or DSS is generally developed in the form of a piece of software in which a dynamic set of actions and responses can be modelled. This modelling may, for example, aim to predict the likely impacts on population of a decision to change access to commercial and recreational fishing in an area. The model or DSS would be constructed to include all the variables believed likely to influence population, and rules which specify the nature of the links between fishing activities and population levels. In the final models, different types of change could be input and the model would predict changes in population as determined by the data and rules used to construct the model.

Q factor analysis involves procuring value statements (Q-set) from the full breadth of stakeholders and then having representatives of each stakeholder group rate the statements in the Q-set on a Likert scale. The distinctive element of Q-sorting is that all statements are ranked and scored together, enabling identification of clusters of values across all stakeholders.

PLANNING AND COSTING

MODELS and DSS range from the simple to the highly complex. Therefore the costing varies considerably and it is not possible to provide a 'ballpark' estimate of likely costs. Planning a model or DSS should involve carefully identifying whether enough knowledge of the relationships between key variables exists to build a useful model or DSS, and whether the data needed to populate the model or DSS are available or can be generated. The data collection methods discussed in other sections could all be used to generate data for modelling processes.

Equally Q-factor analysis can be a simple paper-driven process, or involve the use of more complex software to sort the Q-statements. However, statistical modelling packages are generally used in the factor analysis, to enable identification of clusters.

HOW USEFUL IS IT?

TABLE 9 on the following page provides an indication of the usefulness of models and DSS for achieving different objectives and management needs.

TABLE 9.
USES OF MODELLING AND DSS TO MEET OBJECTIVES AND MANAGEMENT NEEDS

OBJECTIVE/MANAGEMENT NEEDS	POTENTIAL USES FOR MODELLING AND DECISION SUPPORT SYSTEMS
Identify beliefs and values attached to a natural resource	Analysis and mediation of values of various groups of stakeholders using Q-factor analysis, to identify commonalities among otherwise apparently competing values
Achieve equitable allocation of resources	If rules about equity are known, and the impacts of different allocation decisions on equity are known, a model can be constructed which predicts the equity impacts of different allocation options
Optimise resource allocation between users	As above
Undertake effective community engagement and communication with stakeholders and the general community	DSS are sometimes used as a tool to assist decision making in a community consultation process. To be successful the model used must be built using a participatory process, to ensure all participants on the community engagement process trust and are willing to use the model or DSS
Maximise natural resource related social benefits for which management is responsible	If the processes leading to experience of benefits and costs are well known, they can be modelled to enable different scenarios of change to be examined
Minimise negative and maximise positive social impacts of management activities	If the processes leading to experience of positive and negative impacts are well known, they can be modelled to enable different scenarios of change to be examined
Understand and influence perceptions relating to natural resources	Modelling of perceptions is usually not undertaken
Understand and influence human behaviour relating to natural resources	If influences on behaviour are well known and understood, behavioural responses to different types of change can be modelled
Design effective structural adjustment packages	As for social impacts

46 MODELLING APPROACHES AND DECISION SUPPORT

BENEFITS AND LIMITATIONS

MODELS and DSS are only as useful as the data and the assumptions they are based on. If based on high-quality data, and on assumptions about human behaviour, which are realistic and useful, they too can be useful. If high-quality data is not available models and DSS are likely to be of limited use.

Similarly, if modelling some aspect of a social system requires considerably oversimplifying human interactions, it is questionable how useful the model will be in assisting the work of natural resource managers who have to focus on the 'real world' consequences of their decisions.

Q-factor analysis is currently perceived to avoid a number of these issues, however it is only useful in the mediation of apparently competing values, rather than in predicting future outcomes.

Box 18

Real-world problem

Recent decades have witnessed increasing attention in theory and practice to participatory approaches to policy appraisal, in part due to the potential of such approaches to facilitate reflexive policy appraisal. It has been observed, however, that in practice these approaches are often equally prone to being limited in achieving reflexivity as traditional, non-participatory appraisal techniques. This is due to the influence of interests and power and problems of representation.

Methods

This article explores the extent to which Q methodology, or Q, can play a role in 'opening up' policy to reflexive appraisal. A Q study of fire management discourses in Cape York, northern Australia, is presented exposing the existence of four key discourses in the region: discourse A — rational fire management; discourse B — fire-free conservation; discourse C — pragmatic, locally controlled burning; and discourse D — indigenous controlled land management. At present only discourses A and C are reflected in policy. Appraising existing policy on the basis of the different perspectives articulated by the alternative discourses (B and D) in relation to the purpose and practices involved in fire management is successful in opening up existing policy to reflexive appraisal.

Outcomes

In the face of considerable scientific uncertainty as to the ecological impacts of different burning regimes in northern Australia, this process of effective policy appraisal has important potential for assessing the true social desirability of existing policy and practice in the region. This analysis provides a practical demonstration of the potential of Q Methodology in opening up other important contemporary policy issues to reflexive appraisal. It also underpins the recommendation of expansion of participatory processes to facilitate stakeholder engagement in fire management policy and practice in Cape York.

David G Ockwell 2008, 'Opening up' policy to reflexive appraisal: a role for Q Methodology? A case study of fire management in Cape York, Australia', *Policy Sciences* (Dec) vol.41, No.4. pp. 263–292

Photo courtesy: Kathleen Davies, courtesy Glenn Innes Examiner

Consultation processes

COMMUNITY consultation processes form part of a continuum of 'public participation' activities and may involve activities ranging from informing stakeholders about planning activities to implementing forms of stakeholder control over decision making, as indicated in Figure 1.

METHODS FOR EFFECTIVE CONSULTATION

A WIDE range of methods is used to consult communities. Each may be effective in a particular context and its usefulness must be evaluated based on the particular issue about which consultation is occurring and the groups the consultation process aims to involve.

Common consultation methods include:

• Public submissions
• Public meetings
• One-to-one interaction
• 'Open houses'
• Field visits
• Advisory or management committees
• Surveys
• Letters and leaflets
• Public media
The pros and cons of each are described briefly in Table 10.

Inform the public	Listen to the public	Engage in problem solving	Develop agreements
Information Signs, Media Advertising	Notifications Letter drops	Toll free numbers / Public meetings	On site Field visits / Community advisory Groups	Community Management Committees

Figure 1. Continuum of public participation (adapted from Creighton 2005)

Photo courtesy WAFIC

Community consultation processes involves activities ranging from informing stakeholders about planning activities to implementing forms of stakeholder control over decision making

TABLE 10.
BENEFITS AND CHALLENGES OF DIFFERENT APPROACHES TO COMMUNITY ENGAGEMENT

COMMUNITY ENGAGEMENT METHOD	BRIEF DESCRIPTION	BENEFITS	CHALLENGES
Public submissions	Any interested person is invited to submit comments on a proposal or document. Most commonly, written comment is sought, although it is possible to also set up a free call phone number or other methods for making submissions. A set time period is usually given within which comments must be made. In some cases submissions can be anonymous if the person making the submission requests this	All are invited to participate Those who wish to comment can choose when and how they commit time during the comment period Anonymity possible for sensitive issues	Can be difficult to ensure all those who would want to comment are aware of the opportunity to comment Often relies on people having strong literacy skills—illiterate people are less able to contribute Limited time frame for making comment may prevent some from doing so
Public meetings	A meeting to which any interested member of the public is invited. The meetings take many forms. Some aim to disseminate information, others to seek input. The latter are more difficult to manage effectively, with good facilitation needed to ensure everyone's opinions can be heard. Best used in conjunction with other methods than as a stand alone approach	All are invited to participate Enables key questions to be answered and some interaction	The time and location of the meeting will determine who can or cannot attend—it is essential to plan this carefully to ensure stakeholders with an interest are not excluded Time and location must be well communicated to be effective Unless well facilitated, community members may feel their concerns have not been heard or responded to Can exacerbate conflict, and be co-opted easily for various purposes Many people feel uneasy speaking in front of others in a public setting
One-to-one interaction	Fisheries managers meet with stakeholders on a one-to-one basis to discuss issues and develop agreed plans/strategies for action	Enables rapport to be established on individual basis Ensures every individual stakeholder is listened to Enables a convenient time and location to be chosen	Can be time consuming Does not allow a wide range of stakeholders to interact together Can be time consuming; however, is public meetings generate conflict one-on-one meetings may be more effective
'Open houses'	Fisheries managers are available for 'drop in' visits at preset locations and times. Other interested parties drop in and discuss issues if they wish to	As above	As above, but less time consuming Need to ensure the times and locations chosen are appropriate

COMMUNITY ENGAGEMENT METHOD	BRIEF DESCRIPTION	BENEFITS	CHALLENGES
Field visits	All stakeholders visit a resource management site together to view how it operates and discuss key issues	Enables all to see the issues being discussed first hand Improves understanding of issues being discussed Can improve the communication within a group ('roadtrip' phenomenon)	Need to ensure all stakeholders can participate Can be difficult to work on some issues and concerns while in the field
Advisory or management committees	A group of representative stakeholders meet regularly to discuss and agree upon plans of action. The power given to the committee varies—some are advisory only; others have full decision making power over the issues they discuss	Enables longer-term discussion and negotiation of issues Group can build rapport With good facilitation, ensures the voices of all stakeholders are heard and acted upon	Can be time consuming It is essential to ensure people who claim to represent particular groups are in fact representing them—methods that facilitate and encourage discussions within the groups being represented are often needed as well as suitable methods for facilitation interaction between different groups Can be expensive Members must have time and capability to participate; this may require making payments
Surveys	A survey is distributed to a statistically-appropriate sample of people from a defined population/populations (for example, commercial fishers operating in a particular fishery or recreational fishers who fish at a particular location). The questions asked gauge opinion on key issues being discussed in a community consultation process	Ensures all opinions are heard, rather than only those with a very strong interest in a particular issue Provides good information on diversity of views	Attitudes and opinions change over time, and repeated surveys may be necessary The survey must ask appropriate questions and be well designed to be effective
Letters and leaflets	Letters and leaflets that provide information about management or invite participation in community consultation activities	Effective means of disseminating information and/or notifying of forthcoming activities	Does not allow for much feedback and interaction Relies on high literacy levels
Public media	Articles or advertisements in public media, such as television, radio and newspapers. These may act to inform about an issue or invite participation in a process	Effective means of disseminating information and/or notifying of forthcoming activities	Does not allow for much feedback and interaction Reaches only those who access the media sources utilised

CONSULTATION PROCESSES

Photo courtesy: Laura McKinley, Border Rivers-Gwydir Catchment Management Authority (BR-G CMA)

TOOLS FOR MONITORING AND EVALUATING CONSULTATIVE PROCESSES

MONITORING and evaluating success of consultation processes requires addressing the following questions:

a) What was the purpose and goals of the consultation process, and were these achieved?

b) What stakeholders did the process aim to engage?

c) Were these stakeholders provided adequate opportunity to participate through the consultation methods used?

Adequate opportunity may include evaluating:

• whether all relevant people received information informing them about how to take part.

• whether all interested parties were physically able to take part (for example, they could attend meetings at the times and locations where they were held)

• whether all stakeholders had the skills to take part (for example, online submission only can restrict ability to participate)

• If representation was used, did representatives of particular groups adequately represent the interests and needs of that group?

• whether adequate time was given to enable dialogue, debate and discussion

• whether stakeholder input was used to inform decision making

• whether interested parties have been informed how their views were (or weren't) used to assist decision-making.

The criteria by which each question is evaluated will vary for different consultation processes. Evaluating success requires a clear understanding of the purpose and goals of the consultation. Evaluating the success of a process that aimed to inform interested parties, but not to achieve their input into decision-making, will differ to evaluating a process in which the goal is to achieve full stakeholder participation in and consensus on decision-making.

Participatory processes (including consultation and other forms of community engagement and dialogue) are different to many other processes in that participatory approaches are typically used to monitor and evaluate their success. This means monitoring and evaluation needs to be based on ensuring those who took part in the process can provide their different views on its success.

References

REFERENCES to individual studies have been given in the example boxes provided earlier in the document. Other references are listed below.

Commonwealth of Australia 1992 National Strategy for Ecologically Sustainable Development 1992, Commonwealth of Australia 1992

Creighton, JL 2005, '*The Public Participation Handbook: Making Better Decisions through Citizen Involvement*', Jossey-Bass. San Francisco, CA.

Davis, J & Whittington, D 1998, 'Participatory Research for development Projects: A comparison of the Community Meeting and Household Survey Techniques'. University of Chicago.URL: http://www.journals.uchicago.edu/doi/pdf/10.1086/452387

Kaplan and McCay 2004, 'Cooperative Research, Co-management and the Social Dimension on Fisheries Science and Management', *Natural Policy*, vol. 28, pp. 257–258.

National Natural Fisheries Service (NMFS) *Guidelines for Assessment of the Social Impact of Fishery Management Actions*. Appendix 2(g) Accessed at: http://www.nmfs.noaa.gov/sfa/reg_svcs/social_impact_assess.htm Last updated: March 2001, viewed 19 December 2007.

Townsley, P 1998, 'Social Issues in Fisheries', FAO *Fisheries Technical Paper* No. 375. Accessed at: http://www.fao.org/docrep/003/W8623E/w8623e00.HTM, viewed 21 December 2008.