

A Conceptual and Operational Understanding of Social Resilience in a Primary Resource Industry

– Insights for optimizing social and environmental
outcomes in the management of Queensland's
commercial fishing industry



Thesis submitted by

Nadine A. Marshall B.Sc. (Hons) *Melbourne*, M.Sc. *Monash*.

For the degree of Doctor of Philosophy
in the School of Tropical Environment Studies and Geography
James Cook University, Townsville

STATEMENT OF ACCESS

I, the undersigned author of this work, understand that James Cook University will make this thesis available for use within the University Library and, via the Australian Digital Theses network, for use elsewhere.

I understand that, as an unpublished work, a thesis has significant protection under the Copyright Act and;

I do not wish to place any further restriction on access to this work

Signature

Date

ELECTRONIC COPY

I, the undersigned, the author of this work, declare that the electronic copy of this thesis provided to the James Cook University Library, is an accurate copy of the print thesis submitted, within the limits of the technology available.

Signature

Date



THESIS ABSTRACT

Resource-protection policies are frequently implemented without prior knowledge of the likely social and economic outcomes. The consequences of these management strategies can, however, severely erode the ability of resource-users to cope and prosper. The conflict, political turmoil and lack of compliance that are often associated with changes in resource policies can seriously undermine their conservation goals. Design and implementation of policies that are capable of achieving both conservation goals and social and economic sustainability require a better understanding of how resource-users respond to policy change and adapt.

Resilience theory provides a useful framework to examine the ability of resource-users to cope and adapt to changes in resource policy. Holling introduced the concept of resilience to the sustainability sciences in 1973 as a means to better understand how ecological systems can persist in the face of change. This has provided the foundation for a shift towards the resilience-based management of natural resources and the social systems that depend on them. Despite theoretical advances, however, our conceptual and practical knowledge of the social dimensions of socio-ecological systems remains limited. In this study, I aim to improve our understanding of several aspects of social resilience using the commercial fishing industry in North Queensland as a case study.

A conceptual model of social resilience to policy change is developed in the first part of the thesis as a precursor to an operational model. In developing the model, the level of dependency on the resource and a fisher's perception of policy change were identified as potentially important influences on social resilience. The model depicts the key characteristics of, and the linkages that are likely to exist between, social resilience, resource dependency and policy perception. The model was developed using a novel combination of resilience and social science theory.

The conceptual model is tested for its applicability to a primary resource industry in the second part of the thesis. Survey scales are developed to quantify social resilience, resource dependency and policy perception, and to examine the relationships between them. One hundred commercial fishers and their families from five coastal communities (Cooktown, Port Douglas, Innisfail, Townsville and Bowen) are quantitatively and qualitatively surveyed. This ‘mixed-method’ approach provides an opportunity to combine the benefit of quantitative techniques, which condense data in order to better see patterns, with qualitative techniques, which enhance data to see key aspects of phenomena more clearly.

The response of commercial fishers to changes in fisheries policy was found to comprise four components. These were characterised as (i) a fisher’s perception of the risk associated with a change in policy, (ii) their ability to plan, learn and reorganise, (iii) their proximity to the threshold of coping, and (iv) their level of interest in change. These components were found to be strongly influenced by resource dependency and policy perception.

A fisher’s perception of the risk associated with policy change was found to be significantly correlated with the level of attachment to the fishing industry and the level of employability (measures of social resource dependency) as well as by a negative perception of policy change. A fisher’s perception of the ability to plan, learn and reorganise correlated with the business size and approach (measures of economic resource dependency). A fisher’s perception of their ability to cope is strongly related to their level of attachment to the occupation and employability, the business size and approach and the perception of policy change. In contrast, the level of interest in change was not observed to be significantly correlated with any aspect of resource dependency or perception of policy change.

Qualitative data revealed key mechanisms for the influence of resource dependence and policy perception on social resilience. Fishers that are especially dependent on the fisheries resource are limited in the flexibility with which they can approach policy change. Dependent fishers were characterised by a strong attachment to their occupation, older age, few transferable skills, a business approach that was ‘lifestyle-oriented’ and rarely involved employing others. These fishers can be limited through their attitude, employability, family, financial situation and capacity to develop innovative solutions. Fishers who are

meaningfully involved in the decision-making process are more likely to be resilient to policy change because they are more likely to understand and trust the need for change, and because they feel some control over their future.

An operational model of social resilience for resource industries such as the commercial fishing industry is developed on the basis of these results. The model provides insight as to what determines the resilience of socio-ecological systems, generally. It suggests that the nature of the relationship with the resource can influence the ability of resource-users to cope and adapt. Policy design and implementation are also found to have a significant role in maintaining system resilience.

This information is important for the management of socio-ecological systems. To successfully navigate through policy-change transitions, resource-users require flexibility (or low resource dependency) and a positive perception of policy change. This is especially true of the commercial fishing industry in North Queensland. This study has developed methods to measure these qualities, thus giving resource managers the ability to assess social resilience prior to the implementation of conservation initiatives. Understanding the influence of these qualities provides resource managers with knowledge of the important system properties that require management. This knowledge can underpin progressive management approaches aimed at more effective and equitable resource protection. For example, managers could use the approaches developed in this study to identify resource-users with a strong level of dependency on the resource. The resilience of these users could be increased prior to a policy change through assistance to develop skills to plan and reorganise, or to build capacity for alternative employment. Managing the perception of policy change is another important consideration. Resource managers may benefit from increasing the quality of communication with resource-users or by providing opportunities and incentives for resource-users to participate in policy design and decision-making processes. Improved knowledge of the linkages between people and the environment, and new tools such as those developed in this study, better position resource managers to meet the challenge of managing for resilient socio-ecological systems.

Statement of Sources Declaration

This thesis is entirely my own work except where stated specifically. This work has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is provided.

Nadine Marshall
October 2005.

Table of Contents



Title page	...i
Abstract	...ii
Declaration	...v
Table of contents	...vi
List of tables	...viii
List of figures	...ix
Acknowledgements	...xi
Part A. A Conceptual Development of Social Resilience	
Chapter 1. General Introduction	...2
1.1 The problem	...2
1.2 Resilience as a concept to assist in resource management	...3
1.3 The commercial fishing industry as a case study	...5
1.4 General aims and significance of the study	...9
Chapter 2. A Conceptual Understanding of Social Resilience	...11
2.1 Introduction	...11
2.2 Conceptualising resilience within a socio-ecological context	...13
2.3 Incorporating social theory into resilience theory	...17
2.4 A conceptual model of social resilience	...21
Chapter 3. The Influence of Resource Dependency on Social Resilience	...25
3.1 Introduction	...25
3.2 Historical descriptors of the relationship with the environment	...28
3.3 The social nature of the relationship with the resource	...29
3.4 Characterising dependency on the resource	...30
3.4.1 Social factors	...31
3.4.2 Economic factors	...38
3.4.3 Environmental factors	...41
3.5 A conceptual model of the influence of resource dependency on resilience	...43
Chapter 4. The Influence of Institutional Change on Social Resilience	...47
4.1 Introduction	...47
4.2 The institutional basis of resource governance	...49
4.3 Characterising institutional change	...51
4.4 A conceptual model of the influence of institutional change on resilience	...59

Chapter 5. A Conceptual Development of Social Resilience	...61
5.1 Introduction	...61
5.2 A conceptual model for social resilience	...61
5.3 Testing the model on the commercial fishing industry	...63
5.4 A note on the level of analyses used	...64
Part B. An Operational Understanding of Social Resilience	
Chapter 6. Methods	...67
6.1 Introduction	...67
6.2 Study sites and community profiles	...69
6.3 Assessing resilience, resource dependency and perception of policy change	...73
6.3.1 Phase 1. The scoping study	...74
6.3.2 Phase 2. Developing the survey: the pilot study	...76
6.3.3 Phase 3. Administration of the survey	...77
6.3.4 Phase 4. Qualitative interviews	...78
6.3.5 Phase 5. Data analyses	...80
6.4 Description of the sample of commercial fishers	...81
Chapter 7. Results I. Defining Social Resilience	...84
7.1 Introduction	...84
7.2 Methods	...85
7.3 Results	...87
7.3.1 Defining social resilience	...87
7.3.2 Validity and interpretation of the results	...90
7.4 Discussion	...99
Chapter 8. Results II. The Influence of Resource Dependency on Resilience	...106
8.1 Introduction	...106
8.2 Methods	...107
8.3 Results	...109
8.3.1 Developing the scale for resource dependency	...109
8.3.2 The influence of resource dependency on social resilience	...115
8.3.3 Interpretation of results	...116
8.4 Discussion	...137
Chapter 9. Results III. The Influence of the Perception of Policy on Resilience	...143
9.1 Introduction	...143
9.2 Methods	...144
9.3 Results	...146
9.3.1 Developing the scale for policy perception	...146
9.3.2 The influence of policy perception on social resilience	...147
9.3.3 Interpretation of results	...148
9.4 Discussion	...158
Chapter 10. General Discussion	...161
10.1 Introduction	...161
10.2 An operational model of social resilience	...161
10.3 Implications for future research	...167
10.4 Management Implications	...170
References	...172
Appendix 1. The structured survey	...209

List of Tables



Table 6.1	General characteristics of each community within the study	...72
Table 6.2	General social characteristics of fishers in each community	...72
Table 6.3	Variables identified through the literature and scoping study as being potentially important predictors of resilience in fisheries policy	...75
Table 6.4	Sample sizes and response rates for each community	...77
Table 6.5	Descriptive statistics for the sample of 100 commercial fishers	...82
Table 7.1	Descriptive statistics and reliability analysis for social resilience	...88
Table 7.2	Matrix of the responses of commercial fishers to policy change	...89
Table 7.3	Pearson Correlation Matrix between (i) related items in the survey, and (ii) each of the factor scores for social resilience	...92
Table 8.1	Descriptive statistics and reliability analysis for 'social dependency'	...110
Table 8.2	Descriptive statistics and reliability analysis for 'economic dependency'	...111
Table 8.3	Descriptive statistics and reliability analysis for 'environmental dependency'	...113
Table 8.4	Principal components analysis on the social component of dependency	...114
Table 8.5	Principal components analysis on the economic component of dependency	...114
Table 8.6	Principal components analysis on environmental component of dependency	...115
Table 8.7	Results of the Pearson Correlation between (i) the factors scores for resilience and (ii) the factor scores for resource dependency	...115
Table 9.1	Descriptive statistics and reliability analysis on the statements designed to quantify the perception of policy change	...146
Table 9.2	Principal Components Analysis on policy variables	...147
Table 9.3	Results of the Pearson Correlation between (i) the factor score for the perception of policy change and (ii) the factor scores for resilience	...147



List of Figures

Figure 1.1	Map of Queensland showing the extent of the coastline available to commercial fishing.	...7
Figure 2.1	A description of the resilience of a socio-ecological system using a stability landscape	...14
Figure 2.2	A conceptual understanding of social resilience for a resource industry	...22
Figure 3.1	The key characteristics of resource-users that influence their dependency on the resource	...44
Figure 3.2	The key characteristics of resource-users that influence their dependency on the resource and their likely resilience to policy change	...45
Figure 4.1	Arnstein's eight rung ladder of citizen participation	...52
Figure 4.2	A conceptual model of the key features of institutional change and their influence within resource-dependent communities	...60
Figure 5.1	A conceptual model of social resilience for a resource industry such as the commercial fishing industry of North Queensland	...62
Figure 6.1	A map of Queensland showing the location of the 5 communities	...69
Figure 6.2	Five major steps in the development of a scale	...73
Figure 7.1	The components of the response of commercial fishers to changes in fisheries policy.	...89
Figure 7.2	An operational understanding of social resilience to policy change within the commercial fishing industry	...100
Figure 8.1	Direction of influence of employability on (i) the assessment of risk and (ii) the ability to cope	...117
Figure 8.2	Direction of influence of attachment to the occupation with (i) the assessment of risk and (ii) the ability to cope	...117

Figure 8.3	Direction of influence of business size with (i) the ability to plan and (ii) the ability to cope	...118
Figure 8.4	Direction of influence of business approach with (i) the ability to plan and (ii) the ability to cope	...118
Figure 8.5	A summary of qualitative results: a mechanism to describe how attachment to the fishing occupation can affect social resilience	...123
Figure 8.6	A summary of qualitative results: a mechanism to describe how personal attributes, attitudes and abilities can affect resilience to change	...125
Figure 8.7	A summary of qualitative results: a mechanism to describe how business characteristics can significantly affect resilient to change	...133
Figure 8.8	An operational model of the influence of resource dependency on social resilience	...142
Figure 9.1	Direction of influence of policy implementation with (i) the assessment of risk and (ii) the ability to cope	...149
Figure 9.2	Direction of influence of the interpretation of anticipatory impacts with (i) the assessment of risk and (ii) the ability to cope	...150
Figure 9.3	Direction of influence of the perception of policy to meet conservation goals with (i) the assessment of risk and (ii) the ability to cope	...150
Figure 9.4	Direction of influence of the quantity of involvement in the decision-making process with (i) the assessment of risk and (ii) the ability to cope	...151
Figure 9.5	Direction of influence of the quality of involvement in the decision-making process with (i) the assessment of risk and (ii) the ability to cope	...151
Figure 9.6	A summary of qualitative results: a mechanism describing how the quality of involvement in decision-making can affect resilience to change	...155
Figure 9.7	A summary of qualitative results: a mechanism describing how policy involvement and interpretation can affect resilience to change	...158
Figure 9.8	An operational model of the influence of policy perception on social resilience	...160
Figure 10.1	An operational model of social resilience to institutional change for the commercial fishing industry of North Queensland	...163
Figure 10.2	A stability landscape model to describe the social resilience of commercial fishers to policy change	...166

Acknowledgements



This thesis was made possible only because of the extraordinary help and encouragement I received from many people.

I am especially in awe of my husband, Paul Marshall who made special contributions at all stages of the thesis. Our innumerable conversations relating to social resilience, natural resource management and the potential of the social sciences were incredibly valuable and fun. His critical reading of every version of the thesis and tremendously insightful suggestions are sincerely and deeply appreciated. He provided love and support, and understood when our leisure time was perhaps not as it should have been.

I am sincerely grateful to my supervisor, Dr. Mark Fenton. He has converted me from an ecologist to a social scientist. He provided a stimulating and exciting forum within which to learn and explore. I am indebted to his numerous informative discussions, his approach to learning and his supervision.

I am also eternally indebted to Dr. Steve Sutton who stepped in when I was 'supervisor-less'. I am very grateful for his enormous encouragement and support, for his critical reading of the thesis, his time and for his excellent advice. He has made substantial improvements on the manuscript.

Very, very special thanks go to the 100 fishing families that generously gave up their time to be involved in this research. Without their insight, advice and patience my research would not have been possible. I am so grateful for the support, encouragement, coffee, meals and warmth that I received.

Fabulous assistance has also been provided by several other people. I extend my deepest thanks to David King for reading an earlier version of the manuscript and to Heidi Schuttenberg for constructive comments. Many thanks to my task associate, James Innes, from the Great Barrier Reef Marine Park Authority, for initial guidance in forming relevant research questions. I am sincerely appreciative of Professor Helene Marsh, an inspiration and a mentor, for encouraging me in the first place to do a PhD and for seeing me through until the end. Many thanks to Dave Williams who encouraged me to sit on the Scientific Advisory Group for the Reef-line fisheries here in Queensland which has provided wonderful opportunities to see 'behind-the-scenes'. Sincere thanks to Dr. Carl Folke for a very inspiring and enlightening discussion during the formative stages of the thesis. I have enormous appreciation of Dr. Per Olsson who took the time to discuss, support and clarify various aspects of my research at the very final stages. I owe many thanks to Tim Harvey for proof-reading the final version and to Adella Edwards for producing the maps. Many thanks are also due to the students and staff within the Effects of Fishing team at the Reef CRC for their generous and broad support as well as their efforts in ensuring that the research results are made known to the fishing community. Generous financial support was provided by the Reef CRC, the School of Tropical Environment Studies and Geography at James Cook University and the Great Barrier Reef Marine Park Authority.

My work would not be the same without the delightful company that I keep. My family and family-in-law as well as my special friends are a constant source of motivation. Thank-you for your patience. And finally, this thesis has seen the arrival of our first baby, Indiana. Our second daughter arrives in only a few weeks time. I dedicate this work to my two little girls and to my husband.