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Ningaloo Collaboration Cluster: Socio-economics of Tourism

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1. SUMMARY OF MAJOR FINDINGS AND THEIR IMPLICATIONS

1.1 Objectives

The aim of this project is to develop a dynamic model –the Ningaloo Destination Model (NDM)[1] – that incorporates socio-economic and load implications of tourism, and that can be integrated with an ecological model of the region. The project had three objectives:

- to collect and collate current data on tourism in the Ningaloo Coast region;
- to undertake a consultative process for modelling tourism and tourism development; and
- to develop a tourism destination model capable of assessing tourism development scenarios taking into consideration social, economic and environmental indicators.

1.2 Outcomes

The major outcomes of the project above are as follows. First, the collected tourism data was used to assess the current status of tourism in Ningaloo and to provide reliable baseline data for the models. These data constitute the most comprehensive tourism dataset and the most extensive dataset about resident impact assessment collected in the region. The survey data has already informed tourism planning in the region.

Second, the consultation process for building understanding of the tourism research proved a reliable process for encouraging participation and building a tourism destination model. The process identified the relevant indicators through a process of scenario building, and incorporated information from stakeholders and experts from a variety of disciplines. This component also built understanding and trust among the researchers, industry, managers and the community, and developed support for the model and its use for planning

Third, this project produced the Ningaloo Destination Model, an applied planning tool that assesses a range of future scenarios for the Ningaloo Coast region. The NDM serves as a "computer simulator" tool that can help managers, businesses and communities make decisions that relate to tourism, and set and achieve goals. This model can be used on its own to understand the social and economic consequences of different tourism plans and developments, and the impacts of these plans on water, waste and power demand. The model can also be linked to an ecological model developed by CSIRO to assess the ecological impacts of different development pathways.

[1] The Ningaloo Destination Modelling project was funded by the CSIRO Wealth from Oceans Flagship and the Sustainable Tourism Cooperative Research Centre. In-kind contributions were provided by researchers from Curtin University (lead institution), Murdoch University, Edith Cowan University, University of New South Wales, Victoria University, Monash University, Griffith University, and University of Queensland.

1.3 Non-technical summary

The economy of the Ningaloo coastal region, and in particular Exmouth and Coral Bay, relies on nature based tourism. Land use conflicts are frequent, and the region has seen hotly debated disputes over resort developments, marine sanctuaries, and World Heritage nomination. This project addresses land use planning issues by capturing the complexity of the tourism system using the Ningaloo Destination Model (NDM). This project involved three major components of research:

1) Determining the current status of tourism in the region;
2) A process for consulting and developing a model of tourism in the region; and
3) Evaluating different tourism futures using a tourism destination model linked to an ecological model

Doctoral research has added value to the project through the detailed analysis of four significant features of tourism to the Ningaloo Coast: research uptake, coastal camping, repeat visitation, and whale shark tourism.

1.3.1 Current Status of Tourism in the Ningaloo and Gascoyne Regions

Data were collected for the NDM using techniques for assessing visitor's characteristics, preferences and expenditure, and for assessing residents' perception of the impacts of tourism on themselves and on their communities. The data showed that the Ningaloo Coastal Region attracts large numbers of interstate and international visitors despite its remote location. Western Australians constituted the largest proportion of visitors (53%). Analysis of 1574 visitor surveys indicates that tourists are primarily attracted to the natural environment of Ningaloo, particularly the Ningaloo Reef. The main type of visitor to the region is the self-drive visitor seeking nature-based experiences, wanting to escape the cold and to 'get away from it all'. Maintaining the remote nature of the region is a key factor in ensuring that the environment retains the values that attract visitors and creates a sense of place where people feel that they can escape.

For the year ending September 2008, tourism expenditure in the region was estimated at $141 million, with 179,352 visitors staying for an average of 9.9 nights each at an average nightly expenditure of just under $80. Different types of tourists prefer different types of activities. Overall, snorkelling was the most important recreational activity in the region, followed by sightseeing, going to the beach and then fishing. Different types of tourists have different environmental, social and economic impacts based on their preferred activities. Managers can influence the type of visitors coming to the region by changing the mix of available accommodation. This approach could be used to increase the desired effects of tourism, and decrease the undesired impacts.

The residents' perceptions of the impact of tourism were assessed from 287 completed questionnaires. The data were analysed separately for Coral Bay (110), Carnarvon (5572) and Exmouth (2063).[2] While residents from all three communities rated the impact of tourism positively, differences in perception were found between the towns. Coral Bay residents were

[2] Based on data from the latest (2006) census statistics (www.abs.gov.au).

more likely to be positive about tourists, due to the community's high reliance on the tourism industry. Although the overall perception of residents of Exmouth was positive, a larger proportion of respondents were negative because of the issue of housing dislocation. Carnarvon respondents were most likely to be unconcerned about tourism. This town is large enough for tourists to have little impact on residents' lifestyle. Residents in all three towns perceived employment to be the most positive impact of tourism.

1.3.2 Consultation and Development Process for Modelling Tourism and Tourism Development

The tools used to develop the Ningaloo Destination Model were scenario development, conceptual modelling, and numerical modelling. These were supported by ongoing formal and informal meetings along with data collection and dissemination, thereby engaging stakeholders in the development of the model. The scenarios selected for evaluation were chosen to ensure that the model was relevant to stakeholder concerns, and the conceptual modelling identified important feedback loops and linkages. The model draws attention to cumulative impacts and thresholds that are often overlooked in planning processes. The model also provides a wide range of indicators stakeholders can use to assess different plans and management strategies. In addition, the process of putting together a destination model can strengthen the *coordination* and *commitment* elements of a regional planning process. Thus, the processes of both developing and using a destination model help build institutional capacity to manage social-ecological systems, and increase regional resilience to unexpected events and change.

The flexibility and communication requirements for ensuring model uptake in this project were not foreseen. Because tourism and other extractive industries are part of complex social-ecological systems, they tend to be dynamic and unpredictable. Behaving 'adaptively' can help researchers work in turbulent systems. By iteratively conversing with a range of stakeholders while developing models and promoting model uptake, researchers can create increase diversity and connectivity among the people (agents) in the system under study. Complexity theory suggests this leads to emergence of new, more adaptive patterns of behaviour in organisational systems. For example, as Ningaloo researchers intensified their interaction with stakeholders, they became more responsive to stakeholder needs and concerns. In response, local individuals and groups became more interested in using the models, and began to self-organise in ways that facilitated the transfer of modelling knowledge and capacity to the region. However, as these new patterns of behaviour emerged, they were also countered by factors inhibiting to uptake, such as stakeholder anxiety and slow response times.

To take advantage of emerging behaviours, modelling projects require local involvement at the level of research management, the capacity to act quickly to encourage emerging behaviours and the capacity to identify and take advantage of information systems within stakeholder groups. They also require modellers who are well and regularly connected to a diversity of organisations to begin a process of change. Researchers also need to respond quickly to factors that may inhibit emergence, and therefore model uptake. Such 'emergent approaches' may prove to be more realistic and practical in turbulent situations where structured engagement processes can be frustrated by the dispersed, polarized and/or fluid nature of the stakeholder groups and the 'wicked' nature of the problems involved.

1.3.3 Evaluating Tourism Futures Using a Tourism Destination and Ecological Model

The Ningaloo Destination Model (NDM) applies a system dynamics approach using Vensim software. The model integrates primary and secondary data and addresses feedback loops and delays to capture the behaviour of the tourism system. It can also be integrated with CSIRO's ecological model (which uses Ecosim with Ecopath software). The outputs of the models are demonstrated in this report through two cases: an examination of the *Ningaloo Coast Regional Strategy* (2004, p. 6) and a comparison of two 500 bed development options for Gnaraloo Station homestead. The Gnaraloo case examines the dynamics and outputs of the model in detail. It shows that by using four feedback loops (accommodation capacity, worker availability, social impacts, and visitor response to environmental regulation) together with visitor preferences, destination modelling can estimate and compare the economic, environmental and social impacts of different tourism developments. By addressing visitor preferences and destination capacities, these feedback loops capture the transformative elements of the Tourism Area Life Cycle developed by Richard Butler (2006). Using feedback loops moves away from deterministic assumptions linking impacts to "stages" of development, revealing the range of impacts that development can bring.

The NDM also provides a much wider set of indicators for assessing and comparing potential developments than is currently used. These include electricity, water and waste demand generated by visitors, and the ecological impacts of visitor activities (e.g. fish stocks, catch rates, coral damage, turtles, and more). The NDM empowers users to plan for and manage the capacities of a site, thereby avoiding site/destination decline due to depletion of valued resources or inappropriate development. The NDM has four broad applications to planning in the region:

- operational planning (e.g. new campsites or accommodation in Cape Range National Park or pastoral stations),
- regional planning (e.g. assessment of the *Ningaloo Coast Regional Strategy),*
- participatory planning and collaboration, and
- monitoring and evaluation of plans through adaptive management processes.

The structure of the model is also applicable to other regions in Australia. Development of a generic modelling framework would allow simple models to be built quickly using existing data (5–8 days). However, more comprehensive models would require further data collection and more time to develop (10–15 days). Visitor and resident surveys provide the most comprehensive data, but take much longer (4–6 months) to organise, run, enter the data and produce results to inform the modelling. The extent of data collection should be determined by the intended use of the destination model. If a model is intended to be a general tool to inform a tourism planning exercise, then a quick and inexpensive approach may be appropriate. However, if the intention is to make use of the model to monitor and assess tourism development, then we recommend a greater investment in data collection. Additionally, modelling software and modelling expertise would be required.

1.3.4 The Structure of this Report

Chapters 1 and 2 summarise the modelling project and its communication strategies. Chapters 3 and 4 analyse the primary data and provide an introduction to the history and characteristics of the region. Chapter 3 focuses on the visitor surveys, while Chapter 4 examines residents' perceptions of tourism's impacts. The consultation and development processes for destination modelling are described in Chapter 5, which also provides details about the project's activities, and model outputs for a case study on *Ningaloo Coast Regional Strategy* (Western Australian Planning Commission, 2004). Chapter 6 explains the structure of the NDM and explores the dynamics and outputs of the model through a case study of development options for the Gnaraloo Station homestead. Chapter 7 provides a critical appraisal of the consultation process through the work on research uptake being done by doctoral student Kelly Chapman. An assessment of the applications of the NDM in the region is provided in Chapter 8, together with the applicability of destination modelling techniques to other regions and sectors. In addition, the doctoral research of Philippa Chandler, Anna Lewis and James Catlin is included in Appendix A. While this doctoral research contributed data to the NDM, it also contributes more broadly to the fields of cultural geography and leisure studies (repeat visitors), recreational ecology (coastal camping), and wildlife tourism (whale shark tour industry).

1.4 Implications for Management

The findings of the NDM project have applications to most of the generic marine park management strategies of the WA Department of Environment and Conservation (DEC), and broader application for other agencies and bodies, including the Shires of Carnarvon and Exmouth, the Department of Planning, Landcorp, Tourism WA, Department of Fisheries, the Gascoyne Development Commission, pastoralists and local community groups. The subsections below address DEC before turning to the other bodies. References to the outcomes of doctoral research are also included where relevant.

1.4.1 Management Frameworks

The NDM can assist with planning and developing visitor infrastructure in the Ningaloo Marine Park (NMP) and Cape Range National Park (CRNP; e.g. campsites, access roads, boat ramps, etc). Furthermore, the model can help commercial tour operators manage their activities to meet visitor expectations and conservation objectives.

More broadly, because of the breadth of its indicators, the NDM can facilitate participation of a number of groups in planning activities. For instance, the NDM can facilitate DEC comment and advice on regional planning activities, including the impacts on the NMP and CRNP caused by tourism growth in other areas including the town sites and pastoral stations. The model would enable stakeholders to weigh up economic goals against social and ecological impacts. For example, the model would provide an avenue for DEC to provide advice on changes to management strategies, and community groups to comment on potential impacts on leisure and commercial activities. The NDM can also assess the cumulative impacts of planning strategies and the impacts of broader regional changes or unexpected events.

The doctoral research in Appendix A also has relevance to management frameworks. It provides information on the management of whale shark tourism, including licensing issues with whale

shark tour operators. Research into coastal campsites measures user's preferences and impacts, and assesses potential management frameworks. Research about repeat visitors provides insights into the social and cultural structures that support their experiences, and can assist with managing changes to locations and activities that would impact this group.

1.4.2 Education

The NDM functions as a heuristic device for education and information on tourism planning. It provides information on the potential impacts of increased tourism and can be used to broaden community understanding of the need for management actions or conservation. The NDM can test alternative strategies for protecting particular sites or values (for instance, changing recreational fishing regulations versus attracting visitors who prefer not to fish). It also can demonstrate the possible mitigating effects of education and enforcement on natural values. Additionally, repeat visitor research (Appendix A) provides insights into the social histories of the region and whale shark tourism research assesses the interpretation provided to tour participants.

1.4.3 Surveillance and Enforcement

The NDM can help plan for future surveillance and enforcement needs by demonstrating likely trends in visitor activities, including fishing and camping. Coastal camping research (Appendix A) measures the impacts of coastal camping, and indicates current practice for pertinent environmental issues including waste disposal and loss of vegetation.

1.4.4 Management Intervention

The NDM can assess the effects of developing visitor infrastructure in the Ningaloo Coastal region, including inside and adjacent to the NMP and CRNP. It can also help prepare for future growth based on current planning (regional, towns and site-specific) and test different types of interventions (e.g. changes to regulations, education, changing development location, etc.). The coastal camping research (Appendix A) provides information on local disturbances and camper preferences for different management interventions. Research into repeat visitors also provides indications of which management interventions would be considered to be appropriate for regular users of the coastline during the peak holiday period.

1.4.5 Public Participation

The NDM provides an integrated set of outputs for estimating future impacts of planning or management decisions. These outputs can be used to present the impacts of proposed management decisions to a general audience. The NDM can also test different management options through a participatory process, and assist with negotiating trade-offs between interest groups.

1.4.6 Research

The NDM project provides baseline information on tourism visitation, resource use (water, electricity and waste) and resident attitudes to tourism. It also provides predictions of future pressures caused by changing patterns of tourism activities, planning or management decisions, or uncertain events (for instance, a cyclone, a terrorist attack or cheap airline tickets).

Additionally, the doctoral research provides an assessment of how whale shark tourism has changed since 1995. Campsite and camper surveys provide a baseline for campsite numbers, camping impacts and camper preferences. Research into repeat visitors records the social history of visitation to Ningaloo and assesses attitudes to change.

1.4.7 Monitoring & evaluation

Ideally the modelling would be integrated with monitoring (of visitor numbers, waste, human waste, activity hours) to refine the model inputs and provide current information for DEC and other management agencies on how regional pressures are changing (tourism numbers, activity patterns, visitor mix). A process of testing and refinement would allow the model to contribute to adaptive management.

1.5 Other Benefits

1.5.1 Tools, Technologies and Information for Improved Ecosystem Management

The Ningaloo Destination Model (NDM) is a management tool that links tourism development and management decisions to economic, environmental and social impacts. It provides a means of estimating probable impacts, testing mitigation measures, comparing planning and management approaches, and working collaboratively across agencies and groups. The information from the project will be communicated in a number of different ways, depending on the user group.

First, the NDM provides detailed outputs across a range of scales and variables. To enable easy access for regular users of the NDM, a Graphical User Interface (GUI) has been developed for planners and managers who are prepared to receive training in model use. Training sessions were run in October 2010 including guidance in integrating the modelling into planning processes.

The NDM can also contribute to broader public education. A general audience will be able to explore and learn about the impacts of different planning decisions through four online tools. First, a webpage has been developed for a targeted audience of key decision makers and user groups that simply compares different development strategies. This will also be able to be accessed by the general public. Working with Curtin students in multimedia and design and Prof. Geoff West in Spatial Sciences, we have developed a graphical user interface (GUI) that provides more information across a range of fields, a Google Earth tool that spatially represents modelling results, and animations with a popular culture and education focus that will promote the research through social network media. The online tools will be launched in two phases. The webpage for the targeted audience will be launched first with public relations campaign aimed at engaging key people. The other tools will be launched separately at Curtin and promoted as educational tools.

Finally, the model itself can be accessed through coordination with the NDM team, as the structure of the model and the techniques used advance the field of tourism modelling, and further development may be required if there are unanticipated questions.

1.5.2 Forecasting for Natural Resource Management Decisions

The NDM is a forecasting tool for tourism development that assesses economic, social, environmental and ecological impacts of decisions. It can be used to assess specific planning decisions related to tourism in protected areas, such as an expansion of campsites in Cape Range National Park. It can also assess regional planning frameworks, such as the *Ningaloo Coast Regional Strategy*, for future impacts and compare them to other planning frameworks. The NDM can be used to estimate the future effectiveness of decisions and to test mitigation strategies such as changes to fishing regulations. The NDM is also a support tool for participatory processes, where different interest groups can negotiate tradeoffs between economic, social and environmental impacts to reach mutually acceptable decisions.

1.6 Problems Encountered

The only significant problem encountered during the project has been the issue of identifying a custodian for the model. The Ningaloo Sustainable Development Office was identified early in the project as the appropriate custodian and talks were well advanced with the NSDO. With the change in Western Australian government in 2008, funding for the NSDO was not renewed and it closed. Identifying one or more custodians for the model in the absence of the NSDO has proved challenging. DEC, Tourism WA, Planning and the Gascoyne Development Commission have all expressed strong interest in the NDM, but have not committed the resources to ensure that it will be easily available for groups in the region or in Perth. We are continuing to promote the NDM to these groups and in the region, and the NDM continues to receive strong support. We will be providing a desktop version of the model for local groups along with training in model use and adaptive management in October 2010. We are also involved with other members of the Ningaloo Collaboration Cluster in actively promoting the research to decision makers, and are involved with CSIRO personnel in Cluster Project 6 on Integration in their planning for model uptake and maintenance as they are facing the same issues.

1.7 Further Developments

There are three areas of further development stemming from this research: 1) modelling and adaptive management training sessions will continue in 2011 in Perth, Exmouth and Carnarvon (where the NDM will be utilised by CSIRO researchers in the training sessions); 2) there will be ongoing promotion of the NDM and identification of pathways for research uptake; and 3) tools for communicating the modelling results are being developed, including a targeted promotional tool and media campaign, and a Google Earth tool with support from the CSIRO's Marine and Atmospheric Science Division.

1.8 Acknowledgements

We acknowledge the generosity of the many groups and organisations that donated their information and time to the project. These include the Shires of Exmouth and Carnarvon, the WA Department of Environment and Conservation, in particular the Exmouth Office, Tourism WA, Tourism Australia, the Water Corporation and Horizon Power, the Visitor Centres for Exmouth and Carnarvon, the accommodation providers in the region and the station owners for access to the tourists staying on their properties. Special thanks go to Ronnie Fleah, and Rogé

Kempe from the Shire of Exmouth, Arvid Hogstrom, Jennie Cary, Roland Mau, Ray De Jong and Kelly Waples from DEC, Arleen Schmertz, David Nunn, David Temple-Smith and Colleen Henry who were working in the Ningaloo Sustainable Development Office, and Alison Mills and Graham Wilks from the Shire of Carnarvon. EC3 Global also provided us with data on the resource use of different accommodation types, which was a valuable check on our data.

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Students played an important role in this research with Curtin multimedia design students under the supervision of Gonnie Bruekers and later with Geoff West providing visualisations of the modelling results. Tania Morris, Jonathon Mann and Andy Jelinek made special contributions to this project. In particular, we acknowledge the hard work of our PhD students Philippa Chandler, Anna Lewis, Kelly Chapman and James Catlin whose own research substantially enhanced both the tourism modelling and our engagement in the region.

1.9 References

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Western Australian Planning Commission. (2004). *Ningaloo Coast Regional Strategy Carnarvon to Exmouth*. Perth, Australia: Western Australian Planning Commission.

2. COMMUNICATION OF PROJECT RESULTS AND DATA

2.1 Publications and Planned Publications

2.1.1 Articles:

T. Jones, J. Glasson, D. Wood & B. Fulton. (In press). 'Regional Planning and Resilient Futures: Destination Modelling and Tourism Development – the case of the Ningaloo Coastal Region in Western Australia.' *Planning Practice and Research*.

T. Jones, D. Wood, J. Catlin, & B. Norman. 2009. 'Expenditure and Ecotourism: Predictors of Expenditure for Whale Shark Tour Participants.' *Journal of Ecotourism*. 8 (1): 32-50.

K. Schianetz, T. Jones, P. Walker, L. Cavanagh, D. Wood, D. Lockington. 2009. 'The Practicalities of a Learning Tourism Destination: a Case Study of the Ningaloo Coast.' *International Journal of Tourism Research*, 11 (6): 567-581.

T. Jones & D. Wood. 2008. 'Researching Tourism to the Ningaloo Reef, Western Australia, or how the Social Sciences can Collaborate in Researching Complex Problems'. *Interdisciplinary Journal of the Social Sciences*, 3 (6): 137-44.

J. Catlin, T. Jones & R. Jones. 2011. Revisiting Duffus and Dearden's Wildlife Tourism Framework. *Biological Conservation* 144 (5): 1537-1544.

J. Catlin, R. Jones, T. Jones, B. Norman, & D. Wood. 2010. 'Discovering wildlife tourism: a whale shark tourism case study.' *Current Issues in Tourism* 13 (4): 351-61.

J. Catlin, T. Jones, D. Wood, & B. Norman. 2010. 'Consolidation in a wildlife tourism industry: the changing impact of whale shark tourist expenditure in the Ningaloo Coast region.' *International Journal of Tourism Research*, 12 (2): 134-48.

J. Catlin, R. Jones & T. Jones. In press. Balancing needs: licensing as a means to manage nature based tourism.' *Journal of Sustainable Tourism*.

P. Chandler & T. Jones. Under review. Adventure Before Dementia: Grey Nomads and Place Attachment at Ningaloo, Western Australia.

A. Lewis, M. Hughes, T. Jones. Under review. Ningaloo Coast Remote Campers: A Comparison of Preferred Campsite Attributes and Activities.

2.1.2 Refereed Conference Proceedings:

T. Jones, J. Glasson, D. Wood & B. Fulton. 2010. *Regional Planning, Tourism and Resilient Destinations: Destination Modelling for Sustainable Tourism Planning*. Advances in Tourism Research Conference Proceedings. Oviedo, Spain.

T. Jones, D. Wood & J. Glasson. 2010. *Planning Resilient Futures: Modelling the Ningaloo Coastal Region in Western Australia.* Council of Australian University Hospitality and Tourism Educators (CAUTHE) Conference Proceedings. Hobart, Australia.

T. Jones & D. Wood. 2009. *The Challenges of Managing Destinations: Understanding Sustainability and Change through Destination Modelling*. Council of Australian University Hospitality and Tourism Educators (CAUTHE) Conference Proceedings. Fremantle, Australia.

T. Jones, D. Wood, J. Catlin & B. Norman. 2007. *Expenditure and Ecotourism: Predictors of Expenditure for Whale Shark Tour Participants*. Council of Australian Universities Tourism & Hospitality Education (CAUTHE) Conference Proceedings. Manly, Australia.

2.1.3 Non-refereed conference papers:

P. Chandler. 2010. *Home Away from Home: Western Australian Retirees and Annual Seasonal Travel*. Royal Geographical Society Annual International Conference. 1-3 September. London, UK.

A. Lewis. 2010. *Worlds Apart: Ningaloo Reef VS the Recreation Ecology Literature*. The Eleventh Humanities Graduate Research Conference. 11-12 November. Perth, Western Australia

A. Lewis. 2010. *Visitor preferences in relation to different management regimes: Coastal camping at Ningaloo Reef, Western Australia*. ICCCM'10 (International Conference on Coastal Conservation and Management in the Atlantic and Mediterranean). 12-15 April. Estoril, Portugal, April 12-15.

A. Lewis. 2010. *Planning for sustainable tourism development in a sparsely populated remote landscape: Camping along the Ningaloo coastline.* Ningaloo Research Day for Students. 30 March. Floreat, Western Australia.

P. Chandler. 2009. *The Middle of Nowhere*. Resorting to the Coast: Tourism, Heritage & Cultures of the Seaside Conference. 25-29 June. Leeds Metropolitan University, Blackpool, UK.

P. Chandler. 2009. *Reef Encounters*. Ningaloo Research Symposium. 28-29 May. Department of Environment and Conservation, CSIRO Wealth from Oceans Flagship, Murdoch University and Western Australian Marine Science Institution. Murdoch University, Perth, Australia.

K. J. Chapman. 2009. *Tourism research to tourism practice: potential barriers to building adaptive institutions in Western Australia's Ningaloo Region.* Paper presented at CAUTHE: See Change: tourism & hospitality in a dynamic world. Fremantle, Western Australia.

K. J. Chapman, P. Horwitz, T. Jones, J. Northcote, P. Scherrer & G. Syme. 2009. *Translating research into practice: Working to build institutions for sustainable tourism in Western Australia's Ningaloo Region*. Paper presented at 3rd Annual Ningaloo Research Symposium. Exmouth, Western Australia.

T. Jones, D. Wood & J. Glasson. 2009. *The Ningaloo Destination Model: A Scenario Planning Tool for Tourism Development on the Ningaloo Coast*. The 5th Western Australian State Coastal Conference. 7-9 October. Fremantle, Australia.

T. Jones, D. Wood, M. Hughes & J. Orsini. 2009. *Resilience and Destination Modelling: the Ningaloo Destination Modelling Process and Model Use*. Third Annual Ningaloo Research Symposium. 26-27 May. Department of Environment and Conservation, CSIRO Wealth from Oceans Flagship, Murdoch University and Western Australian Marine Science Institution. Novotel Exmouth, Perth, Australia.

P. Chandler. 2008. *21 Winters in a Row: Travel Narratives of Return-Visitors to the Ningaloo Area*. International Australian Studies Association, 26-28November. Queensland University of Technology, Brisbane, Australia.

A. Lewis. 2008. *Challenges and Innovations: Recreation impact methodologies at Ningaloo Reef, Western Australia*. Curtin Humanities 9th Graduate Research Conference: Engaging place(s)/engaging culture(s,). 5-8 November. Perth, Western Australia.

A. Lewis. 2008. *Sustainable Camping at Ningaloo Reef, Western Australia: Overcoming Methodological Challenges*. The 4th Monitoring and Management Visitor Flows in Recreational and Protected Areas Conference. 14-19 October. Monticatini Terme, Italy.

T. Jones & D. Wood. 2008. *The Ningaloo Destination Model: Combining Scientific and Social Research for Sustainable Tourism Planning*. Third International Conference on Interdisciplinary Social Sciences. 22-25 July. Prato, Italy.

T. Jones & D. Wood. 2008. *Ningaloo Collaboration Cluster Project 3: Tourism Planning for the Ningaloo Coast*. Ningaloo Marine Park Symposium 28-29 May. Department of Environment and Conservation, CSIRO Wealth from Oceans Flagship, Murdoch University and Western Australian Marine Science Institution. Murdoch University, Perth, Australia.

T. Jones & D. Wood. 2007. *Ningaloo Collaboration Cluster Project 3: a Tourism Destination Model for the Ningaloo Coast*. Ningaloo Marine Park Symposium July 2007. Department of Environment and Conservation, CSIRO Wealth from Oceans Flagship, Murdoch University and Western Australian Marine Science Institution. Murdoch University, Perth, Australia.

2.1.4 Posters

P. Chandler. 2010. *Work Is For People Who Can't Fish*. New Ageing Populations Seminar. 8 July. Kings College, Brunel University, London, UK.

This poster was the winner of the Best Poster Competition at the 2010 New Ageing Populations Seminar.

2.1.5 Reports

T. Jones, D. Wood, M. Hughes, T. Pham, D. Pambudi, R. Spurr, L. Dwyer, M. Deery and L. Fredline. 2010. *Tourism Destination Modelling: Building a Sustainable Planning Tool for Australian Tourism Destinations*. Gold Coast: Sustainable Tourism Cooperative Research Centre.

T. Jones, M. Hughes, D. Wood, A. Lewis and P. Chandler. 2009. *Ningaloo Coast Region Visitor Statistics: Collected for the Ningaloo Destination Modelling Project*. Gold Coast: Sustainable Tourism Cooperative Research Centre.

2.2 Communications

Hall, S. 'Interactive website aims to simplify data' (2010, 15 October). *The World Today*. Australia: ABC.

Radio interview between Tod Jones and presenter Lachlan Macara on *ABC North West WA Radio* on 22 October 2009 on the Ningaloo Models workshops.

Radio interview between Tod Jones and presenter Lachlan Macara on *ABC North West WA Radio* on 4 May 2009 on the Ningaloo Tourism Futures Forums.

Two interviews in 2008 of David Wood with *ABC North West WA Radio*.

An interview in 2008 of Tod Jones with RTR FM's environmental program.

'Plotting Tourism's footprint' (2007, 25 August). *West Australian*, p. 3.

Roy, M. 'Hi-tech help for Ningaloo future' (2007, 21 June). *Countryman*, p. 10.

Roy, M. 'Computer models Ningaloo future' (2007, 20 June). *Northern Guardian*, p. 3.

'Tourism workshop in Exmouth' (2007, 6 June). *Pilbara News*, p. 18.

Roy, M. 'Ningaloo tourism doubt' (2007, 6 June). *Northern Guardian*, p. 1.

Fitzsimmons, H. 'Visitor influx takes toll on Exmouth environment', (2007, 30 May). *7:30 Report*. Australia: ABC.

Additionally, four newsletters produced by the project were distributed to interested groups and individuals via an email list developed through our workshops, and via local information channels such as the Visitor Centre email lists.

Through the activities of Kelly Chapman, we formed a regional reference group to assist with communication activities in the region, which has benefitted the entire Ningaloo Collaboration Cluster through both use of local distribution channels and through providing advice on communication activities and materials.

2.3 Presentations

The meetings listed below are confined to public presentations and organised group presentations to specific departments or stakeholder groups. It excludes the many smaller meetings with individuals from government departments, local government, the private sector, and community members and groups.

2.3.1 Meetings Held in 2007

Ningaloo Tourism Futures Workshop, Exmouth. TAFE, Exmouth. 7 June.

Scenarios for Ningaloo Tourism Workshop. TAFE, Exmouth. 8-9 June.

Ningaloo Tourism—Planning for a Sustainable Future. Curtin University, Perth. 12 June.

Ningaloo Coast Groundwater Workshop. Humanities Boardroom, Curtin University, Perth. 21 August.

Ningaloo Tourism Futures Workshop, Carnarvon. Lotteries House, Carnarvon. 2 September.

Ningaloo Tourism Futures Workshop, Coral Bay. Ningaloo Reef Resort, Coral Bay, Carnarvon. 3 September.

2.3.2 Meetings Held in 2008

Ningaloo Tourism Futures Forum 2, Carnarvon. Yacht Club, Carnarvon. 22 May.

Ningaloo Tourism Futures Forum 2, Coral Bay. FESA Shed, Coral Bay. 22 May.

Ningaloo Tourism Futures Forum 2, Exmouth. TAFE, Exmouth. 23 May.

Ningaloo Tourism Futures Forum, Perth. Humanities Boardroom, Curtin University, Perth. 7 August.

Environmental Impacts of Camping Workshop. Curtin University Sustainability Policy Institute, Fremantle. 4 December.

2.3.3 Meetings Held in 2009

All meetings after May 2009 were held in conjunction with Ningaloo Collaboration Cluster Project 6: Integration, and presented modelling results produced through the integration of the Ningaloo Destination Model with an ecological model (built using Ecopath with Ecosim) developed by Beth Fulton. Tod Jones, Beth Fulton and Kelly Chapman jointly presented the research.

Ningaloo Tourism Futures Forum 3, Carnarvon. Yacht Club, Carnarvon. 5 May.
Ningaloo Tourism Futures Forum 3, Exmouth. TAFE, Exmouth. 4 May.
Ningaloo Tourism Futures Modelling Workshop, Shire of Exmouth. 16 & 19 October.
Ningaloo Tourism Futures Modelling Workshop, Shire of Carnarvon. . 20 & 21 October.
Ningaloo Tourism Futures Modelling Workshop, DEC Exmouth Office. 22 & 23 October.
Meeting with DEC Senior Managers to Discuss Model Uptake. DEC Kensington, Perth. 4 December.

2.3.4 Meetings Held in 2010

Public Presentation in Carnarvon. Gascoyne Development Commission, Carnarvon. 8 March.
Presentation to Tourism Strategy Steering Group. Shire of Carnarvon, Carnarvon. 9 March.
Public Presentation in Coral Bay. Coral Bay Adventures, Coral Bay. 13 March.
Public Presentation in Exmouth. Novotel Hotel, Exmouth. 15 March.
Presentation to the Shire of Exmouth. Shire of Exmouth, Exmouth. 16 March.
Presentation to the Whale Shark Operators. Novotel Hotel, Exmouth. 17 March.
Carnarvon Ningaloo Modelling Workshop. Gwoonwardu Mia Culture and Heritage Centre. 25-26 October.
Public Presentation in Carnarvon. Gwoonwardu Mia Culture and Heritage Centre. 25 October.
Exmouth Ningaloo Modelling Workshop. Exmouth Fishing Club, Exmouth. 28-29 October.
Public Presentation in Exmouth. Exmouth Fishing Club, Exmouth. 29 October.

2.3.5 Meetings Held in 2011

Perth Ningaloo Modelling Workshop. Curtin University Sustainability Policy Institute, Fremantle. 1 March.

2.3.6 Presentations to Students

The Ningaloo Destination Model: Tourism Planning for the Ningaloo Coast. Presentation to Curtin University Planning Students. Curtin University, Perth. 31 March 2008.
The Ningaloo Destination Model: Planning for Tourism as a Complex System. Presentation to Masters of Sustainability students. Curtin University Sustainability Policy Institute, Fremantle. 25 August 2009.

2.3.7 Other Communications Activities

2.3.8 Ningaloo Uncovered

Working with Hello-World, an online media development company, we developed a human-centred design process developed in conjunction with a media campaign that focused on user audience segments. This process optimised system design while also guiding communication to ensure all relevant stakeholders use and refer the platform. Analytics enabled the project to profile and track the movement of users. The platform and engagement process developed have broader application for disseminating research to targeted stakeholder groups in conjunction with broader media campaigns. The platform can be viewed at:

http://uncovered.hello-world.net.au/home

2.4 Student Projects

2.4.1 Completed Doctorates

Catlin, J. 2010. Development and Change in the Whale Shark Tourism Industry at Ningaloo Marine Park, Western Australia. Doctorate of Philosophy, Curtin University, Perth, Australia.

2.4.2 Doctoral Candidates

Chandler, P. Reef Encounters: How Repeat Visitors to the Ningaloo Region are Impacted by Changing Management. Expected completion time: August 2011.

Chapman, K. Translating research into practice: working to build adaptive institutions for sustainable tourism in Western Australia's Ningaloo Region. Doctorate of Philosophy, Edith Cowan University, Perth, Australia. Expected completion time: December 2011.

Lewis, A. Sustainable tourism development in a sparsely populated remote landscape: Camping along the Ningaloo coastline. Doctorate of Philosophy, Curtin University, Perth, Australia. Expected completion time: August 2011.

2.5 Data Accessibility

2.5.1 Meta data description

The data requiring storage is the tourist survey data which is in SPSS format. This will be held at Curtin University and at AIMS.

The Ningaloo Destination Model will also be held at Curtin University and at AIMS. It requires Vensim software to run and it is highly recommended that the model only be used by people who have received training from Tod Jones due to the nature of the data involved.

A desktop version of the model has been distributed to managers in Exmouth and Carnarvon for use in planning decisions. This version of the model can only be modified by

2.5.2 Who is the custodian of the data

Custodians of this data are Tod Jones and David Wood, Curtin University.

2.5.3 Raw data and data products description

The visitor survey data consists of 1574 visitor surveys issued between July 2007 and September 2008 in six survey runs programmed temporally to capture the variation caused by holiday periods and weather conditions, and spatially ranging from Carnarvon in the south, along the coastline through the coastal campsites and Coral Bay, Cape Range National Park and the northwest cape to the town of Exmouth. Care was taken to capture visitors staying in a range of accommodation types and at a range of visitor attractions. This data is described in more detail in Chapter 3.

The resident survey data consists of 287 completed surveys in Carnarvon, Exmouth and Coral Bay using face-to-face interviews (Exmouth and Coral Bay) and phone interviews (Carnarvon). All surveys were conducted in 2008. This data is described in more detail in Chapter 4.

The Ningaloo Destination Model is a numerical model of differential equations that models the behaviour of the tourism system to the Ningaloo Coast. It is described in detail in the introduction and chapters 5, 6 and 8.

3. CHARACTERISTICS AND BACKGROUND OF TOURISM TO THE NINGALOO COAST: VISITOR SURVEY RESULTS

3.1 Summary

Tourism is the most important economic activity for the Ningaloo Coast region, a coastal area between the townships of Exmouth and Carnarvon in the Gascoyne region of northwest Western Australia. The purpose of this chapter is to define the characteristics of tourism in the region, using the results of a visitor survey conducted to inform the Ningaloo Destination Model (NDM). The visitor survey was issued between July 2007 and September 2008 and had 1574 valid responses. It constitutes the most comprehensive resource on tourism ever undertaken in the region, and is an important baseline for the Ningaloo Destination Model and future research. This chapter also provides valuable background information about the region along with a description of tourism that forms the context for this report. The main science findings are as follows:

- The Ningaloo Coastal Region attracts large numbers of interstate and international visitors despite its remote location, with Western Australians constituting the largest proportion of visitors (53%).
- The primary attraction of the region is its natural environment, and the Ningaloo Reef is the region's major drawcard. Visitors prefer non-extractive activities to extractive activities.
- Snorkelling is the most important recreational activity in the region (rated as very important or important by over 60% of respondents), followed by sightseeing and going to the beach, then fishing from the shore and fishing from a boat.
- Visitors to the region predominantly drive themselves, are seeking nature-based experiences and wanting to escape the cold and to 'get away from it all'. Different types of tourists prefer different types of activities.
- For the year ending September 2008, expenditure in the region by visitors was estimated at $141 million, with 179,352 visitors staying for an average of 9.92 nights each. Average nightly expenditure was $79.46.

Management implications are as follows:

- Based on the latest available data, the natural environment is very important for tourism, and tourism is the most important economic activity in the region. Maintaining the remote nature of the region is a key factor in ensuring that the environment retains the values attractive to visitors and in creating a place where people feel that they can escape.
- Different types of tourists have different environmental, social and economic impacts based on their preferred activities. Managers can influence the type of visitors coming to the region by changing the accommodation mix. This approach can be used to increase the desired effects of tourism, and decrease the undesired impacts.

3.2 Introduction

The Ningaloo Coastal region stretches from Carnarvon in the south to the Muiron Islands in the north. It is known primarily for the Ningaloo Reef, the largest fringing coral reef in Australia stretching over 300 km along the northwest coast between the towns of Carnarvon and Exmouth (Figure 3.1). The region includes 7 745 residents living mainly in Carnarvon (71%), Exmouth (27%) and Coral Bay (2%). The majority of land in the area is held within pastoral leases, including the coastal Quobba, Gnaraloo, Warroora, Cardabai and Ningaloo stations. Carnarvon, the southern-most tip of the Ningaloo Coast region, is 905 km from Western Australia's capital city of Perth. The region's economy is based on tourism, fishing, mining, horticulture and livestock, with tourism being the most important economic activity.

The region has exceptional conservation values, including marine and terrestrial flora and fauna, karst formations and subterranean fauna, and remoteness values. Nature-based and wilderness tourism is the main source of income in Exmouth and Coral Bay, and the region is marketed nationally and internationally as a premier tourism destination (Western Australian Tourism Commission, 2003). Tourism activities include unique water-based experiences, such as whale watching and swimming with whale sharks, dolphins and manta rays. The two most prominent protected areas for tourism are Cape Range National Park and the Ningaloo Marine Park, described as the state's "premier marine conservation icon" by the Western Australian Department of Environment and Conservation, the agency responsible for managing Western Australia's public protected areas (Department of Conservation and Land Management, 2005).

Between July 2007 and September 2008, the NDM project conducted six survey runs, collecting data from 1574 visitors staying in towns and in campsites on the pastoral stations and in Cape Range National Park. The survey draws on methodologies developed through a series of Sustainable Tourism Cooperative Research Centre (STCRC) projects examining cost-effective ways of measuring and explaining visitor characteristics and expenditure. It is currently the most comprehensive resource on visitors' characteristics and psychographics in the region, and serves as the primary data set for the Ningaloo Destination Model (NDM). The purpose of this chapter is to describe the characteristics of tourism on the Ningaloo Coast, using the survey data.

3.2.1 The Region: Characteristics and History

Long before William de Vlamingh mapped the Northwest Cape in 1618 and pastoral stations were established (from 1886), the region was inhabited by Aboriginal tribal groups. Aboriginal people are known to have been in the region from at least 32 000 years ago (Morse, 1993). Around 1900, Aboriginal communities left the area, for reasons that are not entirely clear but likely to be connected to white settlement, and their descendents are now largely based in Carnarvon and Onslow. Five language groups from the region constitute the Gnulli native title claimants (Baiyungu, Inggarda, Thalanji, Thudgarri and Malgana), which formed as a group in 1996 and whose claim stretches from north of the Northwest Cape to Shark Bay. The Baiyungu Aboriginal Corporation gained ownership of Cardabai Station, just north of Coral Bay, in 1999 and they are now involved in developing the worker's accommodation in Coral Bay. Additionally, planning has begun for Aboriginal themed walking trails on parts of the coastline between Carnarvon and Exmouth.

Pastoral leasehold tenure began from 1876, but with the exception of two lighthouses and a whaling station, larger scale activity did not start until World War II when the fall of Singapore gave the Exmouth Gulf considerable strategic significance. As part of the war effort, a short-lived submarine base operated in Exmouth Gulf, Learmonth Airforce base was established, and a radar station operated on Vlamingh Head from 1942 until 1946. In 1962, the Australian and United States Governments agreed to construct a Cold War Communications base at North West Cape, and to establish the town of Exmouth, which was officially opened in 1967. In 1993, America decided to withdraw the bulk of their troops. 700 Americans left Exmouth (approximately a third of Exmouth's population) and 185 houses were placed on the market. The sale of the houses funded a marina development in Exmouth which is ongoing. Tourism assisted the town's recovery from losing a significant portion of its population.

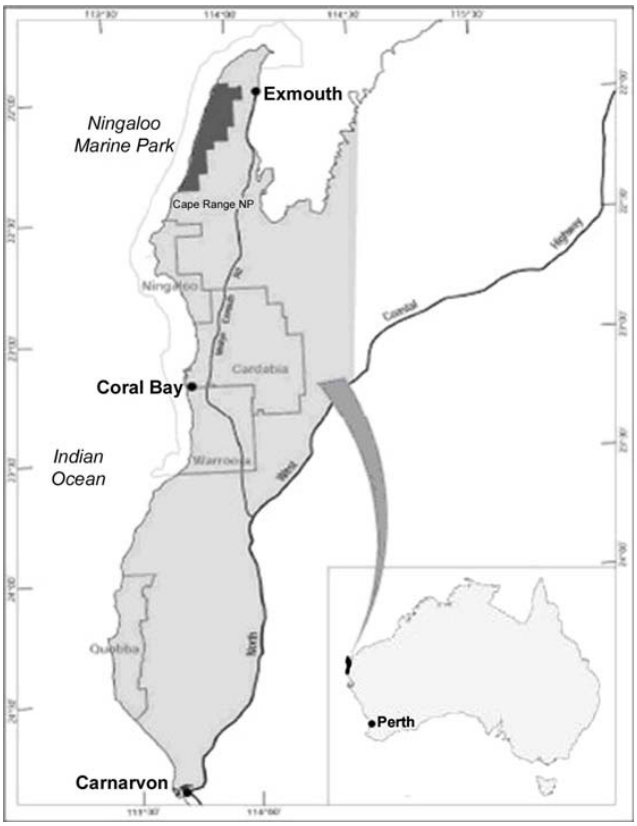

Figure 1: the Ningaloo Coastal Region

The number of tourists to the Ningaloo Coast in 2008 was 176 000.[3] The highest recorded number of visitors was 2004 when 208 000 people visited the region. Although reliable statistics are not available for the early 1990s, it is thought that visitor numbers have increased markedly from that time (Wood & Dowling, 2002). Much of the tourism occurs during the southern winter, when temperatures in the region drop to the mid to high 20s. The temperature often exceeds 40 degrees Celsius between December and March. In order to stop the Ningaloo Coast "being 'loved to death' through unsustainable people pressure and inappropriate

[3] This figure is a four year average (due to small sample size) of statistics from Tourism Research Australia's International Visitors Survey and National Visitors Survey.

development", the Western Australian Planning Commission (2004) prepared the *Ningaloo Coast Regional Strategy Carnarvon to Exmouth*. This strategy provides a comprehensive framework for sustainable tourism development in the region, limiting the construction of high impact developments, such as marinas and canals, to the towns of Carnarvon and Exmouth. We return to the *Ningaloo Coast Regional Strategy* in chapter five as the planning context is an important framing element of the NDM project.

Two television documentaries (Masters, 2006; Murphy, 2009) and other research (Jones *et al.*, 2007) indicate the presence of conflicts between repeat visitors (generally Western Australians) who camp on or use remote sections of the coast in the Ningaloo Marine Park, pastoral station owners, local residents and Western Australian state agencies. These conflicts have come to the fore through two planning processes that took place between 2002 and 2004 that both aimed to manage coastal impacts on the pastoral stations where almost all of the campsites (as distinct from caravan parks) are located. The first process was an expansion of the no-take zones in the Ningaloo Marine Park (NMP) in 2003 from 10 percent to 34 percent of the NMP, which significantly reduced opportunities for recreational fishing (Ingram, 2008). The second process was the advent of a new 30 year land use plan for the region, the *Ningaloo Coast Regional Strategy* (Western Australian Planning Commission, 2004). While addressing issues of equity of access by maintaining some coastal campsites, the *Coastal Strategy* zoned a number of tourism developments (up to 500 bed tourism nodes) on other existing campsites in order to cap the number of visitors staying on the coast.[4] The Ningaloo Coast's recent World Heritage nomination (Department of Environment and Conservation, 2010) by the Western Australian and Federal governments is likely to further increase government and tourists' attention on the region. Local residents have also opposed both extension of the sanctuary zones and the World Heritage nomination. Interviews in the region indicate that opposition is most likely due to the perceived impacts on local leisure activities. Roy Jones, Colin Ingram and Andrew Kingham's (2007) exploration of the conflicts between repeat visitors, state agencies and pastoralists notes the tensions are caused by repeat visitors fearing that their coastal experience is under threat from increased management, and agencies fearing that increasing numbers of camping visitors will cause unacceptable environmental impact. Under these circumstances, the coastal camping experience is likely to come under pressure from increasing government interventions for greater environmental management, for tourism development, and conversely increasing pressure from repeat visitors for formalising the current arrangements for coastal camping (Jones & Selwood, In Press). The reaction of residents (for instance, negative local reactions to the proposed world heritage listing, Smith, 2009) reflect a concern in the region that decisions affecting its future are being made in Perth with little regard for local opinions and interests.

Given the importance of tourism to the Ningaloo Coast, and its links to many conflicts in and plans for the region, it is important to have a clear understanding of the characteristics of tourism and what tourists' priorities are for their time in the region. The visitor survey data presented here provides the most comprehensive assessment of tourism ever undertaken at Ningaloo, providing important insights into tourism and a solid baseline of data for both the NDM and future research in the region.

[4] A particularly contentious element of this strategy is a state government excision of a two kilometre coastal strip from the pastoral stations, to aid environmental management and tourism development. The proposed excision is to take place when pastoral leases are renewed in 2015. The excision area is where the majority of campsites outside the national park are currently located.

3.3 Materials and methods

3.3.1 Survey Methodology

The survey methodology was developed through a series of STCRC projects examining cost-effective ways of measuring and explaining visitor characteristics and expenditure.[5] Questions requesting details of expenditure on categorised items and length of stay in the region were central components of the survey, along with questions assessing the characteristics and motivations of visitors to the region and the location of activities and accommodation. The survey collects information on a number of visitor characteristics that are common to many visitor surveys and appropriate for assessing the features of tourism to a destination (Cooper, 2005). These are: place of residence, age, gender, travel group, household income, activities, information sources, expenditure, accommodation type and location, travel method, and trip expectations and satisfaction.

Tourism Research Australia (TRA) statistics are aimed at large geographical areas that attract larger numbers of tourists and assess a much broader range of activities. Smaller regions, like the Ningaloo Coast, generally have small sample sizes and their tourism features can get lost in the broader-brush approach needed for a national survey. One of the purposes for evaluating tourism is to provide operational assistance to decision-makers, planners and policy makers (Hall, 1995). The information from this project has already informed processes put in place by the Department of Planning and Infrastructure and the Department of Environment and Conservation.

Survey Distribution

Self-completion surveys were used. Respondents were approached and asked if they would be willing to complete a survey. If they accepted, they were provided with a survey and asked to immediately complete the survey form or else complete a form in their own time and mail back to the researchers with a six week cut-off

The majority of surveys were distributed in the three town sites, which is where most visitors stay and spend much of their time. Surveys were also distributed in campsites, popular visitor attractions, Learmonth airport, visitor centres and shopping areas both in the town sites and along the coast, including in the pastoral stations, and Cape Range National Park. Surveys with mail-back envelopes were also left with hotel staff because visitors who stayed in hotels were harder to directly access than visitors in campsites or caravan parks.

The total number of surveys distributed was 3100 (see Table 3.1 below). A total of 1574 completed questionnaires were returned for the whole survey period from July 2007 to September 2008. Of this total returned, almost a quarter were completed in the April 2008 survey round while the February 2008 round represents the least number distributed and returned. The low number of questionnaires distributed and returned in February 2008 coincides with the low point in the tourism season. As a consequence, there was a greater reliance on mail-back surveys distributed through hotels, the visitor centres and tourism operators during

[5] The methodology is explained in more detail in the STCRC technical reports *Assessment of the Economic Value of Recreation and Tourism in Western Australia's National Parks, Marine Parks and Forests* (Carlsen & Wood, 2004), Wood and Glasson (2006), and *Economic Evaluation of Tourism for Natural Areas: Development of a 'Toolkit Approach'* (Wood *et al.*, 2006).

this period. This approach generally results in fewer forms being initially distributed, although the response rate for the smaller number distributed was reasonable. The higher response rate in April 2008 reflects the presence of two research assistants rather than one, meaning a greater proportion of surveys were completed immediately on-site. Mail-back surveys generally have a lower response rate than on-site completion surveys (Stynes & White, 2006). The response rate for each round of surveys over the period was variable but generally quite high.

Table 3.1: Survey Distribution Information

Survey Date	Number of Forms distributed	Completed forms returned	Response rate (%)	Proportion of total Responses returned (%)	School Holidays
July 07	700	243	35%	15%	Yes
October 07	547	278	51%	18%	No
February 08	244	94	39%	6%	Yes
April 08	521	364	70%	23%	No
June 08	538	284	53%	18%	No
September 08	550	311	57%	20%	Yes
Total	*3100*	*1574*	*51%*	*100%*	

3.3.2 Estimating Direct Visitor Expenditure

The method used to measure economic value in this study has been the product of a number of years of economic research funded by the Sustainable Tourism CRC. Based on surveys developed by David Wood, the methodology was further refined by Carlsen and Wood (2004) and was subsequently accepted by the Western Australian Treasury Department as a reliable means of valuation. The approach is based on estimating total visitor expenditure in towns within a region. Attribution and substitution factors are then applied to calculate the direct expenditure value of protected areas for tourism in that region. This method was applied to visitor expenditure research in the Southern Forests and Gascoyne regions of Western Australia and has been successfully used by the Western Australian Department of Environment and Conservation (DEC) to argue for increased park management funding (Wood & Glasson, 2006). While key elements of the method are described below, a more detailed analysis can be found in the Wood *et al.* (2006) report available through the Sustainable Tourism CRC. The methodology has also been adapted into the Valuing Places Toolkit, an online tool for assessing the value of a tourism resource.

Visitor Expenditure

Expenditure was included as a category in the visitor surveys. To measure expenditure, survey participants were asked to indicate their expenditure in the region, itemised into six categories, during their current trip. The expenditure categories, similar to those suggested by Stynes and White (2006), included accommodation, food and drink, transportation, other costs (including souvenirs and retail), equipment costs and activities costs. Respondents were also asked to indicate their length of stay in the region and the number of people that the expenditure covered.

The total visitor expenditure in the region was calculated using the average daily expenditure per person, total annual visitor numbers to the region and the average length of stay as follows:

Total annual visitor expenditure = [Average daily visitor expenditure per person] x [average length of stay] x [total annual number of visitors]

This provides an estimate of the total annual direct expenditure by overnight visitors to the region.

3.3.3 Data Treatment

In order to generate reliable and robust estimates of average and total visitor expenditure, it was necessary to remove 'outliers' in the data set and address issues with secondary data. Outliers were identified as values more than two standard deviations from the sample mean. Given large numbers of visitors to the Ningaloo Coast, small variations in the expenditure data and the length of stay can have a large influence on expenditure value results. Such data treatment is common in survey estimates of visitor expenditure (Stynes & White, 2006) through the use of measures such as the one applied here or a five percent trimmed mean (eliminating the top and bottom 2.5% of the sample from the calculation).

Visitor Number Data

Visitor numbers for the regions were obtained from Tourism Research Australia (TRA). TRA figures are based on data collected through the National Visitor Survey (NVS) and International Visitor Survey (IVS). It should be noted that the smaller the geographic region for NVS and IVS data employed, the less reliable the data will be due to the small sample sizes. In order to reduce the standard error and improve the estimates, a rolling four year average was used.

Length of Stay Data

Responses that included an unusually large value for length of stay (outliers) relative to other responses can skew the average length of stay and significantly influence the park valuation. As a consequence, lengths of stay more than two standard deviations from the sample mean were filtered out of expenditure calculations (eliminating the length of stay data for people who stayed over 44.98 days from the sample). Due to the size of the standard deviations, this measure only affects large lengths of stay.

Expenditure Data

As with length of stay, expenditure data often contained outliers who spend significantly more than the average amount. This again can artificially skew results. Thus, daily per person expenditure figures more than two standard deviations from the sample average were excluded from further analysis. This was undertaken in each category of expenditure rather than the expenditure as a whole. Due to the size of the standard deviations, this measure only affects responses with very high levels of daily expenditure (over $244.65 in travel costs, $305.68 in accommodation costs, $179.11 in activities costs, $146.29 in equipment costs, $208.00 in food costs, and $219.48 in other costs).

3.4 Results

3.4.1 Characteristics of Visitors

The characteristics of visitors to the region are summarised in Table 3.2. Despite its remoteness, the Ningaloo Coastal region attracts a large proportion of international (25%) and interstate (21%) visitors (Table 3.3). Western Australians make up most of the visitors (53%). Interstate visitors from Victoria and New South Wales constitute 60% of all interstate visitors. The United Kingdom and Germany are the two most important international markets, constituting 52% of international visitors. Together, Europe, the UK and Ireland constituted 88% of international visitors (Table 3.3).

Table 3.2: Characteristics of Visitors to the Ningaloo Coastal Region

Gender	**Count**	**Percent**	**Visitor Origin**	**Count**	**Percent**
Female	781	51%	West Australian	809	53%
Male	746	49%	International	386	25%
			Interstate	333	22%
Total Response	*1527*		*Total Response*	*1528*	
Age of respondents			**Length of Stay (days)**		
18-29	361	24%	1-3	244	18%
30-44	426	28%	4-7	447	34%
45-59	360	24%	8-27	471	35%
60+	381	25%	28+	174	13%
Total Response	*1528*		*Total Response*	*1336*	
Who are you travelling with?			**Yearly household income (AUD)**		
Partner	732	47%	$0-$19,999	204	15%
Friends	334	22%	$20,000-$29,999	162	12%
Family	293	19%	$30,000-$39,999	113	8%
Alone	130	8%	$40,000-$49,999	151	11%
club / tour group	55	4%	$50,000-$99,000	409	29%
			$100,000+	367	26%
Total Response	*1544*		*Total Response*	*1406*	
Information Sources					
Tourism WA	84	6%	Advertisement	443	30%
Local tourism office	111	8%	Guide books	253	17%
Internet site	261	18%	Friends / word of mouth	865	58%
Documentary	320	22%	Other	221	15%
			Total Response	*1487*	

Remoteness is a factor in the length of stay (Table 3.2). The average length of visitor stay is 9.92 days. However, 52% of visitors stay for under eight days, with longer-staying, older visitors influencing the average. There are almost no day trippers to the region, although visitors in one subregion do visit attractions in other subregions without staying overnight. There is a

spread of age groups visiting the region, with the majority of visitors travelling with a partner (47%) or with friends (22%). Families are also a sizable travel group (20%). While relatively small numbers of visitors travel with tour groups, tour groups are important to the region as they provide regular bookings and run all year long.

Table 3.3: International Visitors to the Ningaloo Coastal Region

Country of Origin	Count	Percent
UK	115	30%
Germany	86	22%
Rest of Europe	67	17%
Ireland	31	8%
Switzerland	24	6%
North America	23	6%
Netherlands	18	5%
Other	15	4%
Asia	10	3%
Total Response	*389*	

Word of mouth is the most important pre-visit information source for visitors to the region (see Table 3.1). This emphasises the importance of ensuring that visitors enjoy their time on the Ningaloo Coast. Other significant sources of pre-visit information include advertisements, documentaries, the internet and guidebooks.

Not surprisingly given their abundance in the region, camping and caravan parks were the most popular accommodation types (Table 3.4). Caravan parks in the region have compensated for the small number of hotel beds by providing a range of accommodation types including chalets and backpacker-style accommodation. The 'other' accommodation type refers generally to people who stay with friends in the region.

Table 3.4: Accommodation in the Ningaloo Coastal Region

Accommodation Type	Count	Percent
Caravan Park	763	53%
Campsite	620	43%
Backpackers	156	11%
Hotel / motel	149	10%
Other	97	7%
Rental home / unit / apt	39	3%
Total Response	*1447*	

3.4.2 Activities and Trip Elements

Visitor activities are summarised in Table 3.5. The three activities most commonly undertaken by visitors were snorkelling (69%), sunbathing/laying on the beach (65%) and sightseeing (65%). We also asked visitors to rate the importance of their activities using a five point Likert

scale from not at all important to very important (Table 3.6). Snorkelling was considered by visitors as the most important activity (61%) followed by sightseeing (47%). Sunbathing was rated as important or very important by 29% of respondents. Fishing from the shore was rated as important or very important by 27% and fishing from a boat by 21%. While surfing/windsurfing was only rated as important or very important by 7% of respondents, it received the highest mean score (4.47), indicating that it was very important to the group that undertook this activity. Of the more popular activities, snorkelling rated the highest (4.10), followed by sightseeing (3.94).

Table 3.5: Activities in the Ningaloo Coastal Region

Activities Undertaken	Count	Percent
Snorkelling	1036	69%
Sunbathing / laying on beach	973	65%
Sightseeing	970	65%
Shopping	851	57%
Eating out	770	51%
Fishing from shore	732	49%
Fishing from boat	597	40%
Safari tours / coral viewing	435	29%
Scuba diving	310	21%
Other	273	18%
Swimming with whale sharks	266	18%
Surfing / Windsurfing	132	9%
Total Response	*1505*	

Table 3.6: Activities Rated as Important or Very Important in the Ningaloo Coastal Region

Activities rated as important or very important	Count	Percent
Snorkelling	836	61%
Sightseeing	651	47%
Sun bathing/Laying on beach	404	29%
Fishing from shore	369	27%
Fishing from boat	293	21%
Eating out	242	18%
Safari tours/coral viewing tours	225	16%
Shopping	200	15%
Other	196	14%
Swimming with whale sharks	162	12%
Scuba diving	121	9%
Surfing/windsurfing	95	7%
Total Response	*1376*	

3.4.3 Differences within the survey sample

The survey sample was analysed using Pearson Chi Squared tests to identify differences within the groups that visited the Ningaloo Coastal Region. Three statistically significant differences are examined here (shown in Tables 3.7, 3.8, and 3.9), with information from the statistical test provided in Appendix B). First, there are important distinctions between the activity patterns of international, interstate and Western Australian (WA) visitors (Table 3.7). International visitors place a much higher importance on snorkelling that Australian visitors and a much lower importance on fishing. They also place a higher importance on tours and scuba diving. Interstate visitors place a high priority on sightseeing and WA visitors were more likely to rate fishing as important, although this was still lower than the importance of snorkelling or sightseeing.

Table 3.7: Visitor Activities Rated as Important or Very Important by Visitor Origin

Activity		Visitor Origin		
		West Australian	Interstate	International
Snorkelling	Count	409	165	251
	Percent	57%	54%	75%
Sightseeing	Count	311	188	141
	Percent	44%	62%	42.1%
Fishing from shore	Count	246	93	21
	Percent	35%	31%	6.3%
Fishing from boat	Count	222	51	13
	Percent	31%	17%	3.9%
Sun bathing/Laying on beach	Count	208	72	119
	Percent	29%	24%	35.5%
Eating out	Count	133	42	64
	Percent	19%	14%	19.1%
Safari tours/coral viewing tours	Count	110	46	69
	Percent	15%	15%	21%
Other	Count	108	41	42
	Percent	15%	14%	13%
Shopping	Count	107	57	31
	Percent	15%	19%	9%
Swimming with whale sharks	Count	70	36	55
	Percent	10%	12%	16%
Surfing/windsurfing	Count	67	16	12
	Percent	9%	5%	4%
Scuba diving	Count	42	22	55
	Percent	6%	7%	16%

* A Pearson Chi Squared test was carried out for this table and found to be significant ($p<0.001$). The results are included in Appendix B

Second, age is an important factor in determining visitor's length of stay in the region (Table 3.8). Visitors over 60 years old have an average length of stay more than double that of 18-29 year olds. International visitors tend to be younger, which influences their length of stay, while older visitors tend to be from interstate (36 % of interstate visitors are over 60) or from WA. The largest category for WA visitors was the 30-44 age group. Only 12% of WA visitors were between the ages of 18 and 29. Visitors under 18 years of age were excluded from the survey.

Table 3.8: Age of Respondents by Visitor Origin*

Visitor Origin		Age of respondents				Total
		18-29	30-44	45-59	60+	
West Australian	Count	93	273	207	216	789
	Percent	12%	35%	26%	27%	100%
Interstate	Count	48	63	100	119	330
	Percent	15%	19%	30%	36%	100%
International	Count	216	87	46	36	385
	Percent	56%	23%	12%	9%	100%
Total	Count	357	423	353	371	1504
	Percent	24%	28%	24%	25%	100%

* A Pearson Chi Squared test was carried out for this table and found to be significant ($p<0.001$). The results are included in Appendix B

A final feature of the region was the differences in travel patterns based on visitor origin, which is closely connected to weather patterns. WA visitors make up a larger proportion of visitors from April through the peak season, and can constitute up to 60% of all visitors during school holidays, as indicated in Table 3.10. WA visitors leave the region in September and tend not to travel to the area during the hotter summer months; they constituted only 35% of respondents to our October survey. This shift in visitation corresponds to winds and heat picking up in September in Ningaloo, just as warmer weather returns to southern WA. While also avoiding the hotter time of the year, interstate visitors tend to arrive later (after April) and stay longer, often into October (28 % of the respondents for our October survey were from interstate). They often time their trips around Australia so they can be back in Eastern Australia by Christmas. An October visit to Exmouth allows enough time to see the southern parts of WA before returning to the southern or eastern seaboards. In contrast, European visitors, in particular Germans, tend to travel to the region during the hottest times of the year in order to escape the European winter. They constitute a much larger portion of the market in the offseason.

Table 3.9: Selected Statistics for Nights in the Region by Visitor Origin*

Visitor Origin		Length of Stay (nights)				Total
		1-3	4-7	8-27	28+	
West Australian	Count	61	224	301	112	698
	Percent	9%	32%	43%	164%	100%
Interstate	Count	60	97	101	39	297
	Percent	20%	33%	34%	13%	100%
International	Count	119	120	57	19	315
	Percent	38%	38%	18%	6%	100%
	Count	240	441	459	170	1310
	Percent	18%	34%	35%	13%	100%

* A Pearson Chi Squared test was carried out for this table and found to be significant ($p<0.001$). The results are included in Appendix B

Table 3.10: Origin by Time of Survey

		West Australian	Interstate	International
July School Holidays	Count	171	50	19
	Percent	71%	21%	8%
October School Term	Count	96	77	98
	Percent	35%	28%	36%
February School Term	Count	15	9	68
	Percent	16%	10%	74%
April School Holidays	Count	192	58	101
	Percent	55%	17%	29%
June School Term	Count	161	72	39
	Percent	59%	27%	14%
September School Holidays	Count	174	67	61
	Percent	58%	22%	20%
Total	Count	809	333	386

3.4.4 Visitor Expenditure to the Ningaloo Coastal Region

Visitor expenditure by category is shown in Table 3.11. The average per person per night expenditure is $79.46. Calculation of the total annual expenditure for the region requires a figure for annual visitation to the region and an average length of stay. Given the timing of the survey, the most appropriate time frame to calculate the number of visitors is a four year average ending in September 2008. Using data from the National Visitor Survey and the International Visitor Survey from Tourism Research Australia, this figure was 179,352 visitors. Using a sample of 1254 responses and with a small standard error (0.2412), the average length of stay is 9.92 nights.

Thus, total expenditure in the region was:

Total annual visitor expenditure = $79.46 x 9.92 nights x 179,352 visitors

= $141,358,391

Table 3.11: Visitor Expenditure by Category

Item	n	Mean expenditure per trip per person (AUD)	Mean expenditure per night per person (AUD)	Standard Error
Travel	718	100.84	10.17	7.51
Accommodation	814	198.68	20.03	9.87
Activities	791	138.67	13.98	7.70
Equipment	713	150.50	15.17	10.33
Food and Restaurants	770	136.67	13.78	6.99
Other Expenditure	573	62.80	6.33	11.09
Total		**$788.16**	**$79.46**	

Comparison with Previous Calculations

The only previous calculation of visitor expenditure for this region is Carlson and Wood's (2004) study using 2003 data. They estimated expenditure to be $127 million, from a daily average expenditure of $81.30 based on 188,700 visitors staying an average of 9.0 days in the region.

3.5 Discussion: Understanding Tourism on the Ningaloo Coast

The keys to understanding the current characteristics of tourism to the Ningaloo Coastal Region as a whole are remoteness and weather. Remoteness has preserved the natural attributes of the region and now forms an important part of visitors' experiences in the region. The semi-arid weather conditions and extremely hot summers limited agricultural production in much of the region (excluding Carnarvon due to the Gascoyne River) and kept the population to a minimum until the establishment of Exmouth in 1967. Now, the weather conditions create a peak season during the cooler months of the year that coincide with the southern winter, and keep most visitors away during the hotter months between October and March.

The Ningaloo Coastal Region attracts a large proportion of interstate and international visitors despite its remote location. The primary attraction is the unique natural environment, which provides the natural resources that support tourism to the region (Carlsen & Wood, 2004). The Ningaloo Reef is particularly important and is the region's major drawcard. Snorkelling is the most important activity in the region. While fishing lags behind snorkelling and sightseeing, it remains a popular activity and its adherents often spend long hours fishing. The region itself is primarily visited by self-drive visitors seeking nature-based experiences, and looking to escape the cold and get away from it all. The remoteness is a key factor in both ensuring that the

environment retains the values attractive to visitors and in creating a place where people feel that they can escape. Planned tourism developments in Exmouth will markedly increase the three and four star hotel accommodation while caravan park bed numbers will remain the same. These plans will have an impact on the northern part of the region, affecting all activities, particularly sightseeing and beach activities (including snorkelling). Specifically, the Exmouth region needs to ensure that the township attracts visitors for the new accommodation, while retaining the atmosphere and features that draw the caravans and campers still constituting the largest segment its tourism market. People who stay at caravan parks and campgrounds do more fishing than people staying in other forms of accommodation. However, 30% of people who stay in hotels/motels, and 37% of people who stay in rental accommodation, also spend time fishing from a boat (an indicator of committed fishers), meaning growth in hotel style accommodation will add to fishing pressure in the region. As such, fishing needs to be regulated in a way that takes into account potential increases in fishing pressure resulting from new three star accommodation and holiday rentals in the Exmouth marina development.

Significant differences between visitors from WA, interstate and overseas provide an insight into the structure of tourism in the region. International visitors stay for shorter periods, and have a much younger age profile than Australian visitors, reflecting the attraction of the Ningaloo Coast to a younger market travelling along the West Australian coast. They also place a higher importance on non-extractive activities (such as snorkelling, scuba-diving, and going to the beach), and a lower importance on fishing than Australian visitors. The attraction of international visitors is that they contribute economically while putting less pressure on fish stocks. While it should be remembered that all visitors place a high importance on beach activities, short-stay international visitors have an even greater attraction to these activities. Thus, increasing international visitor numbers could potentially add to pressures such as beach crowding, infrastructure, safety and beach management.

The older age profiles of interstate visitors reflect the presence of retirees and people on long service leave using their time to travel around Australia. While they have no clear trends in the length of time they spend in the region, their greater emphasis on sightseeing is indicates a desire to explore the region through experiences provided by local and state governments, such as lookouts, heritage trails, and national parks.

Western Australians are the most likely group to stay for long periods in the region, reflecting the presence of older visitors who stay for long lengths of time over the winter on the pastoral stations and in the caravan parks, and of surfers who spend lengthy periods on the southern stations. The low numbers of Western Australians under 30 reflects the importance of older visitors and family groups to the Ningaloo Coast. Western Australians have a greater preference for extractive activities, particularly fishing from a boat, and for surfing or windsurfing. Thus, increasing visitation by Western Australians could potentially add to pressure on fish stocks, and contribute to crowding in popular surfing and windsurfing locations.

Total annual direct visitor expenditure in the region for the year ending September 2008 was estimated to be $141 million, with 179,352 visitors staying for an average of 9.92 nights. Average nightly expenditure per person was $79.46. The main expenditure item was accommodation, which is generally the pattern for tourism (Stynes & White, 2006). By comparison, an estimate of visitor expenditure for 2003 (Carlsen & Wood, 2004) was $127 million, from a daily average expenditure of $81.30 based on 188,700 visitors staying an

average of 9.0 days in the region. Visitor numbers were smaller for this current valuation compared with Carlson and Wood's (2004) study. This was due to strong visitation in 2002 and 2003, followed by a quieter period. However, 2008 was a strong year, particularly for Exmouth. The primary difference between the two calculations is length of stay, which was calculated to be 0.9 days longer in this report. The relatively small change in expenditure and length of stay since the 2003 study is likely because there has been little change in the accommodation mix or visitation patterns in the intervening period, with the exception of the building of the Novotel Hotel in Exmouth. Accommodation costs have increased by approximately $2 a night on average. This may have been a result of influence from the Novotel on overall accommodation expenditure. However, the vast majority of visitors surveyed were still staying in caravan parks and campgrounds.

Average expenditure per person in the region could increase with the addition of hotel-style accommodation in Exmouth, given the common association between higher priced accommodation and higher expenditure. However, when compared to other areas, the Ningaloo region may have a weaker correlation in this regard, as backpackers, who are prepared to pay for expensive activities such as whale shark tours, prefer caravan parks and the national park to hotels. As such, increasing hotel accommodation along the Ningaloo Coast may not increase average expenditure per person as much as it does in other regions.

3.6 Acknowledgements

The survey work was based on STCRC research by David Wood and Jack Carlsen. The surveys were undertaken by Tod Jones, Michael Hughes, Zac Whitely, Philippa Chandler and Anna Lewis. Tod Jones and Michael Hughes drafted a STCRC report that provides the visitor statistics with an additional breakdown into six subregions. The report is available for free download from the STCRC bookshop (http://www.crctourism.com.au/BookShop/BookDetail.aspx?d=672).

3.7 References

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4. THREE DISTINCT COMMUNITIES: RESIDENT PERCEPTION SURVEYS OF TOURISM IMPACTS ON THE NINGALOO COAST

4.1 Summary

Tourism can transform host communities. It can also create anxiety as it can have negative as well as positive effects. Negative community perceptions of tourism can also impact on the experience of tourists if host communities are perceived to be unwelcoming. Using an instrument developed by Liz Fredline and Marg Deery through STCRC research, the NDM team surveyed 287 residents in Carnarvon, Exmouth and Coral Bay using face-to-face interviews (Exmouth and Coral Bay) and phone interviews (Carnarvon) to assess their perceptions of tourism impacts. Key science findings are that:

- Residents perceived the two most positive impacts of tourism on their communities to be economic benefit and showcasing the region, while the most negative impacts were perceived to be environmental impacts and delinquent behaviour.
- Two characteristics influenced respondents' perceptions: financial benefit and home ownership. Residents who directly benefited from tourism and residents who owned their home generally had positive perceptions. Residents who were renting were more likely to have negative perceptions.
- While residents from all three communities rated the impact of tourism positively, cluster analysis of the results provided insights into differences between the towns. Coral Bay residents were more likely to be in the positive cluster, probably due to the community's high reliance on the tourism industry.
- While the overall perception of respondents from Exmouth was positive, when compared to other surveyed locations in Australia, Exmouth tended to have a larger proportion of respondents in the negative cluster. Exmouth also differed in that residents rated housing dislocation as the most negative impact.
- Carnarvon respondents were most likely to be in the cluster that was unconcerned about tourism; the town is large enough for tourists to have little impact on residents' lifestyle, and tourism is perceived to bring community benefits.

Implications for management are:

- Managing the environmental impacts of tourists is important to all communities. Management decisions might be better received if they are linked to mitigating tourism's impacts.
- Results indicate housing is becoming a serious concern in Exmouth. Affordable housing is an important ingredient in ensuring the community remains positive about future tourism initiatives.
- From a social impacts perspective, Carnarvon appears to be the well suited to high-impact development as it is large enough to absorb tourist numbers without generating negative perceptions of impacts, and community members are well disposed to tourism.

4.2 Introduction

Planners and decision makers encourage tourism because they commonly perceive that it brings economic benefits to the community and for a number of years it was assumed that economic benefits would bring positive social benefits. However, realisation that tourism can have negative as well as positive impacts have focused attention on measuring the social and environmental impacts of tourism on communities. Monitoring tourism impacts can help to protect community wellbeing, and ensure tourism's long term viability, particularly if it is reliant on a natural area (Faulkner & Tideswell, 1997). The community, as hosts to the tourists, are vital to the visitor experience and may affect tourism development by their willingness—or otherwise—to be involved in tourism development (Pearce, 1998). Research suggests that it would be impossible to sustain tourism to a destination without the support of the local people (Ahn *et al.*, 2002). Community impacts are therefore an important element of any assessment or modelling of tourism developments.

To identify the tourism impacts perceived to be most relevant to communities of the Ningaloo Reef region, researchers surveyed the households of permanent residents in the towns of Exmouth, Coral Bay and Carnarvon. Owing to the small community size, researchers were able to ask a high proportion of households in each of the three towns to participate in the survey. In total, 287 completed questionnaires were collected with 122 coming from Exmouth (pop. 2063), 26 from Coral Bay (pop. 120), and 139 from Carnarvon (pop.5682). Because Coral Bay has such a small population, Exmouth and Carnarvon make up the bulk of the sample (43 percent and 48 percent respectively). The survey data were analysed separately for each location. This was due to the distinctly different relationships that each community has with tourism. Carnarvon is an older agricultural town with a low ratio of tourists to residents. Coral Bay is a resort town that at times attracts more than 2000 tourists. Exmouth began as a military defence town and is transitioning to a tourist town, with more tourists than residents staying in the town during the April and July school holiday periods.

4.3 Materials and methods

4.3.1 Instrument Design

The instrument used in this study was developed based on previous assessments of host community perceptions of tourism impacts on the Gold Coast, Queensland (Fredline, 2002) and in Byron Bay, New South Wales (Fredline *et al.*, 2005). In these two studies, a longer impact scale was used. For this current study however, the aim was to test a reduced scale with the objective of developing a quicker and easier to administer indicator of social impacts of tourism on the host community. Thus, the items used in previous research were summarised with the aid of principal components analysis, and a reduced 16-item scale was produced. Principal components analysis is a statistical method of reducing a large number of variables to a more manageable set, using correlations between variables. This analysis has the benefit of reducing the length of the questionnaire while retaining the original properties of the scale.

4.3.2 Questionnaire Format

The instrument comprised six sections as summarised below.

A – Overall impression of tourism in the community
B – Level of contact with tourists and tourism
C – Personal and community impact statements
D – Preferences for future tourism development
E – Demographic variables

An example of Section C questions is:

<table>
<tr><td rowspan="4">1a. Because of the tourism, there are more interesting things to do</td><td></td><td>Decreased →</td><td rowspan="2">1b. How has this affected your personal life?</td><td rowspan="2">-3 -2 -1 0 +1 +2 +3</td></tr>
<tr><td></td><td>Increased →</td></tr>
<tr><td></td><td>No change go to 2a ↓</td><td rowspan="2">1c. How has this affected the community as a whole?</td><td rowspan="2">-3 -2 -1 0 +1 +2 +3</td></tr>
<tr><td></td><td>Don’t know go to 2a ↓</td></tr>
</table>

4.3.3 Administration

The survey was administered in Exmouth and Coral Bay using face-to-face intercept interviews in conjunction with providing households with surveys if respondents agreed to complete the survey at a later time. All ‘dropped-off’ surveys were picked up by survey administrators the following day, or returned by respondents using a self-addressed envelope. Carnarvon was surveyed using phone interviews.

4.3.4 Data Analysis

Prior to analysis, the data file was inspected for data entry errors and illogical responses. The complex design of the question on specific impacts, the multi-item dependant variable scale, appeared to confuse a small percentage of respondents resulting in responses such as agreement with a positive statement but a negative rating on quality of life, and vice versa. Where such responses were observed, they were deleted.

4.3.5 Sampling

Three communities were surveyed: Exmouth, Coral Bay and Carnarvon, all in the North West of Western Australia. The population was defined as all permanent residents in these three communities. In the case of Exmouth, a high number of households were contacted using Curtin University of Technology planning students, who were provided with a half-day of training and given a small quota of households to survey. The entire town was surveyed in two afternoons. In Carnarvon, the phone survey included households with publicly listed telephone numbers until 150 surveys had been completed. .

4.4 Results

Carnarvon is the largest and most established town in the region. It has a variety of industries and is therefore less reliant on tourism than the other two communities. Historically, Exmouth has had a greater variety of employment opportunities, most notably associated with the Harold Holt Naval base, but since the base's closure in 1992, tourism has become increasingly important. Coral Bay is a very small (120 residents) tourist resort reliant on tourism to maintain its population. Table 4.1 shows the characteristics of the sample in the three towns based on survey responses.

Table 4.1: Characteristics of the sample

Variable	Levels	Exmouth	Coral Bay	Carnarvon
Gender	Male	44.8%	26.9%	55.7%
	Female	55.2%	73.1%	44.3%
Age groups	18-39 years	50.0%	53.8%	21.6%
	40-59 years	41.5%	30.8%	46.0%
	60 years plus	8.5%	15.4%	32.4%
Average age		41.2 years	39.5 years	52.7 years
Years of residence	Less than 1 year	14.4%	26.9%	3.6%
	1-2 years	12.0%	19.2%	7.1%
	2-5 years	24.0%	23.1%	5.7%
	6-10 years	14.4%	7.7%	16.4%
	More than 10 years	34.4%	19.2%	57.9%
	All my life	0.8%	3.8%	9.3%
Living arrangement	Own home, live there permanently	41.1%	8.3%	63.6%
	Own home, live there permanently	41.1%	8.3%	63.6%
	Rent home in region	41.9%	62.5%	31.4%
	Own holiday home in region	5.6%	0.0%	1.4%
	Other	11.3%	29.2%	3.6%
Place of birth *(in Carnarvon the question was parents place of birth)*	Within 50km of region	0.8%	0.0%	*10.0*%
	Elsewhere in Western Australia	50.4%	53.8%	*43.6*%
	Elsewhere in Australia	29.6%	38.5%	*25.7*%
	In another country	19.2%	7.7%	*20.7*%
Education	No formal qualifications	1.6%	0%	6.6%
	Completed year 10	19.7%	28.0%	27.0%
	Completed year 12	19.7%	24.0%	20.4%
	Trade qualification	14.8%	4.0%	11.7%
	Technical college/TAFE	17.2%	24.0%	10.2%
	Undergraduate degree	15.6%	8.0%	7.3%
	Post graduate	9.0%	12.0%	16.8%
	Other	2.5%	0.0%	0.0%
Household Income	$0-9999	1.1%	4.3%	4.8%
	$10000-19999	5.4%	26.1%	14.5%
	$20000-34999	18.3%	21.7%	16.1%
	$35000-49999	11.8%	8.7%	10.5%
	$50000-64999	1.1%	13.0%	9.7%
	$65000-79999	20.4%	21.7%	10.5%
	$80000-99999	16.1%	4.3%	12.9%
	$100000 plus	25.8%	0.0%	21.0%

Variable	Levels	Exmouth	Coral Bay	Carnarvon
Benefit from tourism	Personal benefit	29.5%	84.6%	27.9%
	Family benefit	10.7%	0.0%	7.1%
	No benefit	59.8%	15.4%	65.0%
Employment Status	Full time	59.0%	61.5%	46.8%
	Part time	13.1%	0.0%	1.5%
	Casual	13.1%	38.5%	9.4%
	Not employed	14.8%	0.0%	27.3%
Move to region for work	Yes	91.9%	53.8%	95.7%
	No	8.1%	46.2%	4.3%

4.4.1 Impact Ratings

Residents were initially asked about the overall impact of tourism on their personal quality of life (Table 4.2). The scale was a seven point Likert type scale ranging from -3 to +3 with the mid-point (0) indicating no impact. In all three communities an overall positive mean score was observed with the most positive rating coming from Coral Bay residents. This rating is significantly higher than that in the other two communities. It is also notable that in Coral Bay more than one quarter of respondents gave personal impact of tourism the highest rating.

Table 4.2: Personal Tourism Impact Rating for three communities

	-3	-2	-1	0	1	2	3	Mean
A: Exmouth N=122	4.9%	3.3%	9.0%	36.9%	16.4%	16.4%	13.1%	0.58 $_{b}$
B: Coral Bay N= 26	0%	0%	15.4%	11.5%	23.1%	23.1%	26.9%	1.35 $_{ac}$
C: Carnarvon N=139	5.7%	1.4%	3.6%	47.1%	12.1%	16.4%	13.6%	0.62 $_{b}$

Table 4.3 shows how residents rated the impact of tourism on the community. Respondents were asked the question “what impact does tourism have on the community as a whole?” Again the Coral Bay rating is the highest with over 60% of respondents selecting the highest possible score, but in this case, the Carnarvon rating is also high. Both are significantly higher than the Exmouth rating, although this community still registered a reasonably high mean of 1.59.

Table 4.3: Community Tourism Impact Rating for three communities

	-3	-2	-1	0	1	2	3	Mean
A: Exmouth N=122	0.8%	4.9%	7.4%	1.6%	19.7%	37.7%	27.9%	1.59 $_{bc}$
B: Coral Bay N= 26	0%	0%	0%	0%	11.5%	26.9%	61.5%	2.50 $_{a}$
C: Carnarvon N=139	1.4%	1.4%	2.9%	2.9%	12.9%	38.8%	39.6%	1.99 $_{a}$

Residents were then asked to select a statement which best described their feelings toward tourists. The options and results are shown below in Table 4.4. In Exmouth and Coral Bay, the majority of respondents selected the statement “I tolerate tourists”; however, in Carnarvon,

nearly half of all respondent selected “I love tourists”. The response pattern amongst Exmouth residents was significantly more negative than in the other two communities.

Table 4.4: Community feelings about tourists

	Exmouth	Coral Bay	Carnarvon
I love tourists	21.8%	42.3%	49.6%
I tolerate tourists	59.7%	53.8%	47.5%
I adjust my lifestyle	16.9%	3.8%	2.9%
I stay away	0%	0%	0%

This result is probably at least partially explained by the fact that Exmouth residents are less likely to have made friends with tourists than those in the other two regions (Table 4.5).

Table 4.5: Level of contact with tourists

	Exmouth	Coral Bay	Carnarvon
No contact	3.2%	0%	0%
See them but don't speak to them	12.8%	3.8%	8.7%
Interact as part of job	13.6%	7.7%	1.4%
Meet and talk to tourists	16.8%	3.8%	13.8%
Have made temporary friends	27.2%	65.4%	59.4%
Have made lasting friends	26.4%	19.2%	16.7%

Residents were then asked about their preferences regarding future development of tourism in their region. As shown in Table 4.6, the majority of Carnarvon respondents (64.7%) indicated that they are happy with continued growth. Among Exmouth respondents, 42.3% indicated they were happy with continued growth, whereas 35% indicated they were happy but wanted no more growth. Coral Bay respondents were evenly divided (42.3% respectively) between wanting continued growth and wanting no more growth.

Table 4.6: Preferred development options

	Exmouth	Coral Bay	Carnarvon
Happy with continued growth	42.3%	42.3%	64.7%
Happy but no more growth	35.0%	42.3%	10.8%
Want less tourism	8.9%	0%	2.2%
More growth different direction	13.8%	15.4%	22.3%

Residents were then asked about specific personal and community impacts associated with tourism development in their region, again using a seven point scale ranging from -3 to +3, with 0 indicating no impact. As shown at the bottom of Table 4.7, the averaged ratings were lowest for Exmouth, at 0 and 0.1 for personal and community impact respectively, which is consistent with Exmouth’s overall impact scores (Tables 4.2 and 4.3) , which were also lowest for the three towns. The averaged ratings were highest for Carnarvon (0.4 and 0.7), followed by Coral

Bay (0.3 and 0.5). The full responses for each town, including the percentage of residents who agreed and disagreed with each impact are contained in Appendix C.

Table 4.7: Personal and Community impact ratings for specific impacts

	Personal impact rating			Community impact rating		
	Exmouth	**Coral Bay**	**Carnarvon**	**Exmouth**	**Coral Bay**	**Carnarvon**
Interesting things to do	0.8	1.5	0.5	1.2	2.0	1.0
Public money	-0.4	-0.1	0.0	-0.4	-0.1	0.0
Facilities	1.0	1.5	0.7	1.2	1.8	1.0
Disruption	-0.6	-0.6	-0.1	-0.7	-0.7	-0.1
Prices	-1.0	-0.5	0.1	-1.1	-0.3	0.3
Economic benefit	0.9	1.8	1.0	1.7	2.4	1.9
Justice	-0.4	-0.1	-0.1	-0.4	0.0	-0.2
Maintenance	0.5	0.9	0.8	0.8	1.3	1.4
Environment	-0.8	-1.3	-0.1	-1.1	-1.8	-0.3
Character of region	0.0	0.0	0.3	0.2	0.3	0.8
Pride	0.5	0.9	0.8	0.9	1.0	1.5
Overcrowding	-0.6	-0.6	0.0	-0.8	-0.6	-0.1
Showcase	0.8	1.0	0.9	1.5	1.7	1.7
Dislocation	-1.3	-0.2	-0.1	-2.0	-0.2	0.0
Different cultures	0.8	1.3	0.8	1.1	1.3	1.5
Unites	0.4	0.8	0.6	0.7	1.0	1.4
Delinquent behaviour	-0.7	-1.0	-0.1	-1.1	-1.4	-0.2
Average of all impact statements	**0.0**	**0.3**	**0.4**	**0.1**	**0.5**	**0.7**

The five most positive community impacts identified by residents for each region are summarised in Table 4.8. In all cases the most positively perceived impact was economic benefit. In contrast, Table 4.9 shows the five most negative community impacts identified for each region. Environmental impacts and delinquent behaviour were perceived as the most negative impacts for Coral Bay and Carnarvon, and the second and third most negative for Exmouth. Exmouth respondents rated dislocation as the most negative impact. Interviews in Exmouth indicated that rising rental prices had recently caused residents to leave the town and that rental prices were considered inflated due to the holiday rental market.

Table 4.8: Top 5 positive community impacts for each region

Exmouth		Coral Bay		Carnarvon	
Economic benefit	1.7	Economic benefit	2.4	Economic benefit	1.9
Showcase	1.5	Interesting things to do	2.0	Showcase	1.7
Interesting things to do	1.2	Facilities	1.8	Pride	1.5
Facilities	1.2	Showcase	1.7	Different cultures	1.5
Different cultures	1.1	Different cultures	1.3	Unites	1.4

Table 4.9: Top 5 negative community impacts for each region

Exmouth		Coral Bay		Carnarvon	
Dislocation	-2.0	Environment	-1.8	Environment	-0.3
Delinquent behaviour	-1.1	Delinquent behaviour	-1.4	Delinquent behaviour	-0.2
Environment	-1.1	Disruption	-0.7	Justice	-0.2
Prices	-1.1	Overcrowding	-0.6	Disruption	-0.1
Overcrowding	-0.8	Prices	-0.3	Overcrowding	-0.1

Respondents were then asked how they expected tourism impacts would change if tourism was to increase (Table 4.10). Two scenarios were provided, the first involved a 20% increase in tourism and the second involved a 50% increase. Exmouth and Coral Bay respondents felt that positive impacts would be seen most in "facilities" followed by "interesting things to do", whereas Carnarvon gave highest scores to "pride" and "interesting things to do". All three communities felt that greatest negative impact would be on "environment", followed by "prices" for Exmouth, and "disruption" for Coral Bay and Carnarvon.

Table 4.10: Expected impacts of tourism assuming increases of 20% and 50%

	Exmouth		Coral Bay		Carnarvon	
	20%	50%	20%	50%	20%	50%
Interesting things to do	0.6	0.5	0.7	0.6	0.9	1.1
Facilities	0.6	0.7	1.0	1.0	0.8	0.8
Disruption	-1.2	-1.8	-1.3	-2.3	-0.5	-1.0
Prices	-1.4	-1.8	-1.1	-1.9	-0.2	-0.5
Maintenance	0.3	0.5	0.4	0.6	0.8	0.7
Environment	-1.5	-2.1	-1.4	-2.5	-0.7	-1.3
Character	-0.3	-0.3	-0.5	-0.9	0.7	0.5
Pride	0.0	0.0	0.1	0.0	1.0	1.0
Dislocation	-1.6	-2.0	-0.6	-1.1	-0.3	-0.7
Different cultures	0.7	0.8	0.6	0.7	0.9	0.7
Delinquent behaviour	-1.0	-1.4	-1.2	-1.8	-0.5	-0.8

Respondents were also asked to rate the expected overall impacts of specific tourist types (Table 4.10). The three towns gave all tourist groups positive scores on average, with the exception of tourists on fishing trips, who were given a neutral score by Exmouth respondents. Overall, scores given by Carnarvon respondents were significantly higher than those given by respondents in Exmouth and Coral Bay.

Exmouth respondents scored families the highest, then older international tourists; they gave their lowest scores to tourists on fishing trips and retirees who stay for over two months. In contrast, Coral Bay and Carnarvon, while also giving families high scores, also viewed retirees as desirable visitors. Coral Bay's lowest ratings were for Western Australian and interstate tourists, whereas Carnarvon's lowest ratings were for surfers/windsurfers, followed by tourists on fishing trips.

Table 4.10: Expected overall impacts from different tourist groups

	Exmouth	Coral Bay	Carnarvon
Tourists from Western Australia	0.6	0.2	1.9
Interstate Australian Tourists	0.6	0.2	1.7
Commercial Tour Groups	0.4	0.6	1.5
Younger International Tourists (under 35)	0.7	0.5	1.6
Older International Tourists (over 35)	0.8	0.6	1.8
Families	1.0	0.8	1.9
Retirees who stay for short periods	0.3	0.6	1.7
Retirees who stay for over two months	0.2	0.8	2.0
Business Travellers	0.4	0.5	1.5
People visiting friends and relatives	0.7	0.7	1.6
Campers and Caravaners	0.4	0.8	1.6
Tourists on fishing trips	0.0	0.6	1.3
Surfers/Windsurfers	0.4	0.4	1.2
Other Adventure Tourists	0.5	0.5	1.5
Backpackers	0.6	0.3	1.5
Tourists Who Stay in Hotels	0.7	0.7	1.6

4.4.2 Variation in impact perception

To better understand the variation in impact perception between respondents in the three towns, a cluster analysis was undertaken on residents' 'personal impacts of tourism' ratings. The three clusters that emerged from the analysis can be summarised as "negative", "unconcerned" and "positive" (Table 4.11).

Respondents in the negative cluster are primarily concerned about social dislocation, price increases associated with tourism (-1.5) and damage to the environment (-1.2). They do not totally discount the benefits of tourism, notably its economic benefits; however their rating for economic benefit (0.5) is still far below respondents in the positive cluster (1.8). This group comprises 22% of the total sample.

Those in the unconcerned cluster generally give neutral rankings, with their highest rating being 0.6 for facility development and their lowest -1.0 for disruption. This group contains 35% of the sample.

Respondents in the positive cluster are generally enthusiastic about the benefits of tourism, giving high scores for economic benefits (1.8), the showcase effect (1.6), opportunity to meet different cultures (1.5) and facility development (1.5). However, they also acknowledge negative impacts, showing some concern about damage to environment (-0.6) and delinquent behaviour (-0.5). This is the largest of the three clusters, comprising 43% of the sample.

Table 4.11: Cluster ratings of personal impact

	negatives	unconcerned	positives
	22%	35%	43%
interesting things to do	0.2	0.4	1.3
public money	-0.6	0.0	-0.1
Facilities	0.2	0.6	1.5
Disruption	-0.9	-0.1	-0.4
Prices	-1.5	0.1	-0.3
economic benefit	0.5	0.4	1.8
Justice	-0.6	-0.0	-0.1
maintenance	0.1	0.2	1.3
environment	-1.2	-0.1	-0.6
character of region	-0.7	0.1	0.7
Pride	0.1	0.2	1.4
overcrowding	-0.8	-0.0	-0.4
Showcase	0.3	0.4	1.6
Dislocation	-1.9	-0.1	-0.4
different cultures	0.2	0.3	1.5
Unites	0.1	0.1	1.2
delinquent behaviour	-0.9	-0.1	-0.5
Average of all statements	**-0.4**	**0.1**	**0.6**

4.5 Discussion

No significant relationship was found between cluster membership and gender, age, years of residence, place of birth, education, household income or ATSI status. However, a number of variables were found to be related to cluster membership as shown in Table 4.12 below. People who rent their homes are more likely to be in the negative cluster, probably because tourism-driven housing demand has an impact on the cost of renting. Understandably, people who perceive some benefit from tourism are much more likely to be in the positive group. In terms of employment, those who are not employed (including retirees) are more likely to be in the unconcerned cluster. Interestingly casual workers are likely to fall into the negative cluster, whereas part time workers are more likely to be in the positive. People who moved to the region for work and those who own a tourism business tend to fall into the positive cluster.

Table 4.12: Cluster membership by demographic variables

Variable	Levels	Negative	Unconcerned	Positive
Living arrangement	Own home, live there permanently	29%	64%	50%
	Rent home in region	60%	29%	37%
	Own holiday home in region	2%	4%	3%
	Other	10%	3%	10%
Benefit from tourism	Personal benefit	16%	23%	52%
	Family benefit	11%	10%	5%
	No benefit	73%	67%	43%
Employment Status	Full time	57%	47%	57%
	Part time	6%	13%	17%
	Casual	21%	11%	12%
	Not employed	16%	28%	14%
Move to region for work	Yes	5%	4%	17%
	No	95%	96%	83%
Own a tourism business	Yes	2%	2%	12%
	No	98%	98%	88%

Relationships were also found between cluster membership and attitudes toward tourists and tourism. As shown in Table 4.13, those in the positive cluster were more likely to report that they “love tourists”, whereas those in the negative cluster were more likely to report having to “adjust their lifestyle”. Negative cluster members were less happy with continued growth and more likely to want less tourism.

Table 4.13: Cluster membership by attitudes to tourism

Variable	Levels	Negative	Unconcerned	Positive
Feelings about tourists	I love tourists	11%	37%	50%
	I tolerate tourists	65%	59%	45%
	I adjust my lifestyle	24%	4%	6%
Contact	I never come into contact with tourists as far as I am aware	3%	0%	2%
	I see tourists around but don't usually speak to them unless they ask for direction etc.	11%	14%	7%
	I often interact with tourists as part of my job	16%	4%	6%
	I often meet tourists around town and talk to them	19%	15%	12%
	I have made friends with tourists during their stay, but have not kept in contact	48%	58%	57%
	I have made friends with tourists and kept in contact after they have left	3%	9%	17%
Development preferences	happy with continued growth	29%	59%	60%
	happy but no more growth	47%	17%	19%
	want less tourism	15%	4%	1%
	more growth different direction	10%	21%	21%

Finally, cluster membership was found to be highly related to region (Table 4.14). Exmouth residents were more likely to be negative, and less likely to be unconcerned. Coral Bay residents were more likely to positive and less likely to be unconcerned. Carnarvon residents were more likely to be unconcerned and less likely to be negative.

Table 4.14: Cluster membership by region

Levels	Exmouth	Coral Bay	Carnarvon
Negative	40%	12%	8%
Unconcerned	22%	12%	50%
Positive	38%	77%	42%

In general, respondents rate personal impacts more negatively than community impacts (Tables 4.2 and 4.3), as they appreciate the benefits that tourism brings through jobs, the community's perception of itself, and leisure activities. The positive impacts were quite similar across the three townships, with economic benefits and showcasing the region being the two most positive impacts. The negative impacts differ slightly. Exmouth rated dislocation as the most negative impact, which reflects high rental prices in Exmouth and confirms anecdotal reports that families had left the region due to increasing housing costs. Environmental impacts have consistently been identified in a number of planning processes as the greatest concern for residents, so it is not surprising that this would be the case for tourism. Delinquent behaviour is also a concern, although interviews with the police in Exmouth and accommodation providers and operators across the region did not identify crimes committed by tourists as major issues. However, resident interviews did identify disturbance from short term holiday rental accommodation (which is often located in residential areas) as a specific concern.

A problem with the survey was that it did not capture the housing issues at Coral Bay. While there is not an issue with dislocation as employers locate accommodation for all employees, the accommodation is substandard, and many residents have lost faith in the state's process for building workers' accommodation. This issue falls through the cracks in the survey as it is not perceived to be an issue caused by tourism, but by poor planning and inaction by the responsible authorities. Future surveys should include a question on whether respondents think tourism growth has caused substandard services and/or living conditions due to regulatory failings. Such a question would be relevant to regional areas where tourism growth has been unregulated, including shack settlements.

The results of the cluster analysis are in keeping with the differing characteristics of the region, and also reflect the histories of the towns. Carnarvon is a larger and older town (established in 1883), and has the size to absorb the number of tourists it attracts without disturbing local residents. Because it has other industries, Carnarvon is less reliant on tourism than the other towns, and its residents are happy to have the benefits from tourism as long as their lifestyles are not impacted.

Exmouth was a defence forces town for thirty years, until the US Navy left in 1992. Although tourism's relative importance to the town's economy has since grown, many residents do not work in tourism and do not necessarily view their place as a tourist town (as opposed to the case in Coral Bay). Exmouth has half the resident population of Carnarvon but attracts more visitors (visitors can outnumber residents during peak season), giving it a very high tourist to resident

ratio (approximately 120 residents to 1918 tourists; Allerding Burgess, 2006). This helps explain why Exmouth residents are more likely to report negative impacts and less likely to report positive impacts. Negative attitudes could be exacerbated with respect to housing dislocation if the resource sector puts more pressure on Exmouth accommodation.

Coral Bay began as a pub and a caravan park in the early 1970s. It owes its existence solely to tourism, with most residents working in tourism and therefore receiving direct benefits from the sector. Consequently—and despite the problems caused by unregulated growth—Coral Bay has one of the most positive attitudes towards tourists that we have encountered while using this survey instrument. Indeed, 84% of Coral Bay respondents reported that they have personally benefited from tourism (Table 4.1).

4.6 Acknowledgements

The survey instrument was designed by Liz Fredline, Lecturer (Griffith University) and Marg Deery (Victoria University), who also analysed the results. The survey distribution was managed by Tod Jones in all three towns, and together with Pippa Chandler in Coral Bay and Exmouth. Planning Students from Curtin University administered the survey in Exmouth. AMR Interactive administered the phone survey in Carnarvon. Liz Fredline, Marg Deery, Tod Jones and Michael Hughes collaborated in drafting this chapter.

4.7 References

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5. REGIONAL PLANNING AND RESILIENT TOURISM DESTINATIONS: DESTINATION MODELLING FOR SUSTAINABLE TOURISM PLANNING

5.1 Summary

This chapter serves two purposes. First, it describes the processes of developing the model. Second, this chapter locates the Ningaloo Destination Model (NDM) project in the domain of land use management, or more specifically, regional planning. Key science findings in the process are:

- The tools used to develop the NDM were scenario development, conceptual modelling, and numerical modelling. These tools were supported by ongoing formal and informal meetings and data collection and dissemination, thereby engaging stakeholders in the model development. The scenarios ensured that the model was relevant to stakeholder concerns, and the conceptual modelling identified important feedback loops and linkages.
- Destination modelling can strengthen the *coordination* and *commitment* elements of a regional planning process: coordination through strengthening social networks and fostering group learning about links between the economic, social and environmental elements of a tourism system; and commitment through identifying areas of shared concern and mutual dependence, and reinforcing the importance of coordination.
- The processes of both developing and using a destination model foster collaborative learning and coordination between institutions, key elements for building institutional capacity to undertake and implement regional planning, and for increasing regional resilience. Local responses to the model have included experimentation with fishing regulations, housing strategies, and different types of tourism development.

The implications for management are:

- The process of putting together a destination model has the capacity to build regional resilience, particularly in a regional planning context. Specifically, the process can support collaborative learning and build links between institutions.
- Using the model can focus planning on management of social-ecological systems, including balancing economic impacts with social and ecological outcomes. The model draws attention to cumulative impacts and thresholds that can be overlooked in planning processes, and provides a wide range of indicators stakeholders can use to assess different plans and management strategies.
- A modelling project can help managers and stakeholder groups cope with uncertainty both through the modelling results, and through the collaborative processes of model development and use.

5.2 Introduction

The Ningaloo Destination Model (NDM) was designed to produce a sustainability model that augmented earlier work on economic values by including social, environmental and ecological components. The model enables examination of future land-use planning scenarios and their influence on the marine environments of Ningaloo. This is particularly important in a region where development is controlled by a very prescriptive regional plan; the *Ningaloo Coast Regional Strategy Carnarvon to Exmouth* (Western Australian Planning Commission, 2004), which was given statutory power through a Statement of Planning Policy and an Interim Development Order. The model would provide a lens through which to view the impacts of slow, planned development in comparison to large scale developments outside a rational planning framework, such as that proposed for Maud's Landing during the 1990s, the very development proposal that led to the preparation of the *Ningaloo Coast Regional Strategy*. The link to land-use ties the NDM project closely to regional planning, which integrates a number of fields of knowledge and focuses on future development. In its better moments, regional planning engages a variety of groups to undertake sustainable development, making it a good partner for integrative research projects that employ modelling. Having a regional scale is important –the NDM study area includes the Ningaloo Reef and Ningaloo Marine Park, plus 300km of adjacent coastline stretching across two local government areas and a variety of land tenures. Past research indicates that the regional level is a particularly appropriate scale for territorial integration of natural and socio-economic systems (Jenkins *et al.*, 2003; Roberts, 2006; Yorque *et al.*, 2002).

Regional planning is sometimes seen as an unwelcome intruder between local and national planning levels (and the state level in Australia). Without the legitimising power of an underpinning government body, regional planning can be strongly influenced by dominant stakeholders –such as major landowners, tourism operators and mineral resource developers. Remote natural areas may have many valuable resources—landscape, biodiversity, geology and cultural heritage. As such they are often at the forefront of the battle for sustainable development, with many examples of damaging trade-offs between competing interests such as tourism, fishing, mineral development and conservation. Regional planning exercises in such contested environments are in danger of being bypassed by powerful stakeholders (Wood & Glasson, 2006). Regional planning may also have problems delivering outcomes—moving from 'plan formulation' to 'plan implementation'—producing instead more reports that sit on top shelves gathering dust. Suggested key ingredients for an effective regional planning process include: *continuity*, of both the process and the responsible agency; *co-ordination* of disparate stakeholders, including various levels of government agencies, private sector, voluntary sector etc (i.e. breaking down silos); improved *control*, through financial resources and democratic legitimacy, for example; and *commitment*, in terms engaging stakeholders and garnering their commitment to the plan and the planning process (Glasson *et al.*, 1997).

The subject of this chapter is to provide an overview of the NDM approach to participatory modelling and explore how modelling research can help stakeholders deliver more resilient regional futures. The next section provides a brief introduction to regional planning, resilience and managing complexity. This is followed by an introduction to modelling methods for integrating regional planning and regional resilience, followed by a discussion of the Ningaloo Destination Model (NDM). Additional sections address planning issues associated with Ningaloo's contested environment, and developing and using models as a means of improving

stakeholder participation and building regional resilience to cope with future disturbances. The concluding section assesses the potential costs and benefits of such an approach.

5.3 Regional planning, resilience and managing regional complexity

The NDM project should be understood in the context of contemporary approaches to regional planning, and the importance of managing regional complexity to deliver regional resilience. Contemporary regional planning is influenced by shifting attitudes to politics and legitimacy, which raise crucial issues of consultation, participation and interactions with a wide array of stakeholders (Glasson & Marshall, 2007). Co-ordination of stakeholders is a major challenge, both vertically (especially between levels of government) and horizontally, (for example, between regional planning bodies, government, pressure groups and sectoral agencies) (McKenzie, 2003). The management of this co-ordination has been theorised in various ways. 'Strategic choice' (Friend *et al.*, 1974) argues that planners should be 'reticulists', reducing uncertainty in the process by bringing together all the relevant actors with influence and resources. Alternatively, Rhodes (1997) stresses that regional planners should be networkers, working with networks to cover a wide range of interests. Of particular interest to our arguments is the work of Healey (1997) and others, which focuses on themes of collaboration and communication. These works argue for the careful construction of arenas for dialogue. From these arenas concerted storylines can emerge, forming the basis of durable shared strategies. Yet all such approaches have limitations in practice; for example, achieving consensus through a fair and open process often involves confronting deep-seated vested interests (e.g. between householders wanting to build on the edges of settlements, and environmentalists wishing to preserve open space/bushland).

Our approach to managing complexity draws on a history of ecological writings. Beginning in the 1970s, most notably with the book *Adaptive Environmental Assessment and Management* (Holling, 1978), ecological researchers began to critique management systems that reduced the natural variation in ecological systems, causing such systems to become less resilient to external change (Holling & Meffe, 1996). Social-ecological system (SES) principles and concepts have since been applied beyond ecosystem management to the ecological and socio-economic elements of sustainable development (Adger, 2000; Folke *et al.*, 2002; Perrings, 2006), governance (Lebel *et al.*, 2006), and public policy (Holling, 2004; Holling & Meffe, 1996). Ecological research links changes in SESs to their *resilience*—defined as the magnitude of disturbance that can be absorbed before the system alters its structure by changing the variables and processes that determine its behaviour (Holling & Gunderson, 2002).[6] Applying the concept of resilience focuses policy decisions on managing the capacity of SESs to cope with, adapt to and shape change (Folke *et al.*, 2002). Socio-economic resilience is "the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change" (Adger, 2000). In other words, it is the ability to learn and adapt to change. Given that SESs are complex adaptive systems that are by nature dynamic and unpredictable (therefore always changing), simply setting rigid sustainability targets will not achieve resilience. Sustainability is better conceived as a learning process about a particular

[6] In this article we focus on the resilience of SES related to tourism and use the literature from this field (for instance, the work of the Resilience Alliance (www.resalliance.org) and in *Ecology and Society*). Elements of this theory are present in economic geography (Martin & Sunley, 2007), but this has focussed more on the application of such principles to social systems than on modelling and managing complexity in SES.

SES, through a continual process of experimentation, monitoring, and refinement of understanding and adaptation to new and changing circumstances (Farrell & Twining-Ward, 2005; Meppem & Gill, 1998). Resilience research has therefore focused on regional arrangements that facilitate *group learning* and build trust between different groups.

Institutions, broadly interpreted here to include both public and private organisations, affect a region's ability to avoid unwanted outcomes, protect important resources, and contribute to regional resilience in several ways. First, institutions are important caches of knowledge that contribute to the adaptive capacity and robustness of regions. The extent to which institutions understand the dynamics of a system (Perrings, 2006), and are involved in monitoring and planning, will have important implications for a region's resilience. Second, strong relationships between institutions increases resilience by providing the trust, social networks and leadership necessary for responding to disturbances cooperatively and effectively (Lebel *et al.*, 2006). Third, institutions (either separately or as a network) can experiment with creative and improved methods to manage ecosystems (Holling, 2004). There is also agreement in SES literature that regions are the most appropriate scale for improving ecological and social resilience, with Yorque *et al.* (2002) define regions as "the scale at which ecosystems and people are tightly connected". The issue is how to equip and work with the relevant groups to make informed decisions about regional socio-economic and environmental resilience within a regional planning framework.

5.4 Modelling to integrate regional planning and resilience

For the purposes of this paper, modelling refers to system dynamics modelling (a version of numerical modelling). This is a computer based methodology to support decision making by simulating the dynamics of complex systems through quantifying the effects of a system's interconnections and time delays (Schianetz *et al.*, 2007; van den Belt, 2004). The main value of this modelling is not its capacity to predict the future (Holling, 1978), but rather it is its capacity to generate institutional learning. The delivery of a fully-fledged model, no matter how accurate, without local involvement in its development and use, will not facilitate experimentation and institutional learning. This requires building relationships and trust with groups who are expected to use the model. In short, modelling needs to contribute to the resilience of the organisation or group for whom it has been constructed.

While concepts from adaptive management and organisational learning (Morecroft & Sterman, 1994; Senge, 1990) have been applied at a number of different scales, applying these concepts to tourism planning requires careful consideration because of the diversity of groups affected by tourism, the changing organisational requirements of a destination over time, the high rate of transition of a large proportion of workers in a location, and the wide range of disparate areas on which it impacts. Modelling techniques similar to the NDM have been used in other locations to assist tourism destination planning, with varying degrees of success (for an extensive appraisal, see (Schianetz *et al.*, 2007)). Modelling projects that have been most successful in achieving sustained change through planning processes have focused on participation and consensus building (Moser & Moser, 1986; Walker *et al.*, 1999).

A framework that analyses the challenges of using modelling in tourism destination planning is Schianetz *et al.*'s Learning Tourism Destination concept (2007). In their review of model use in tourism destination planning, Schianetz *et al.* indicate that modelling has the potential to be a

valuable tool as long it is incorporated into a framework that addresses learning at the individual, group and inter-organisational (regional) level. They identify four ways modelling can contribute to destination planning. First, it can underlie an information system, which is essential to the tourism field where a broad number of groups and individuals are affected. A model provides a way for different groups to test and refine their understandings of the tourism system, and a focus for information gathering and dissemination. Modelling also focuses stakeholder attention on thresholds and cumulative impacts (van den Belt, 2004) that might otherwise be overlooked in the planning process. Second, building a model can contribute to cooperation and collaboration between disparate groups. The modelling process is avenue through which people and groups can express their views of how tourism functions, then test that view in a setting with other groups. Third, if it is used for ongoing planning and evaluation, modelling can contribute to continuous learning; it has the potential to integrate a wide variety of research through a process that addresses the concerns and priorities of a wide variety of stakeholders (Jones & Wood, 2008). Fourth, modelling contributes to adaptive management by assisting in the articulation of assumptions and the perceived levels and types of uncertainties (Schreiber *et al.*, 2004).

While providing a valuable framework for assessing the effectiveness and defining the purpose of modelling in tourism planning, Schianetz *et al.* (2007) do not discuss how modelling can be initiated and implemented to enhance resilience or to help create the learning framework central to the Learning Tourism Destination (LTD) concept. In a 2009 article, however, Schianetz *et al.* explore the application of modelling in the LTD framework by examining the early stages of the NDM project. (Schianetz *et al.*, 2009) looks at how stakeholders were engaged in the initial development and application of the Ningaloo Destination Model (NDM), and analyses how this stakeholder-based approach to modelling could advance regional planning through building regional resilience. The stages of the NDM project listed in Table 5.1 fall into two broad categories: the process of model development (Stage 1), and the application and ongoing use of the model (Stage 2). The two stages are discussed separately, following a brief outline of the regional context of the NDM project.

Table 5.1: Stages of the Ningaloo Destination Modelling (NDM) Project.

Stage	Description
1.1	Stakeholder assessment
1.2	Stakeholder modelling workshops
1.3	Formal and informal meetings and communications with stakeholders
1.4	Data collection and dissemination
1.5	Model development
2.1	Learning about the tourism system through model use
2.2	Model use and integration with regional planning

5.5 Recapping the Regional Context

While the history and features of the Ningaloo Coast are covered in detail in the introduction, it is worthwhile revisiting its characteristics here as it relates to regional planning. The region relies on its natural attractions for tourism, primarily the Ningaloo Reef, which is located in the Ningaloo Marine Park. This region is sparsely populated with approximately 8000 residents,

and its economy is based on tourism, fishing, mining, horticulture and livestock. Tourist numbers have varied between 170 000 and 210 000 visitors between 2000 and 2009.

Planning in the region has been an issue of state and national interest, particularly since the mid-1990s with the advent of a proposal for a large marina development at Maud's Landing in the middle of the reef, just north of Coral Bay (Pforr *et al.*, 2007). The proposal evoked widespread protest in Western Australia through the 'Save Ningaloo' campaign and contributed to a change in government in Western Australia in 2001. The new Labour Government rejected the marina proposal in 2003 and began preparation of the *Ningaloo Coast Regional Strategy Carnarvon to Exmouth* (the *Regional Strategy*). This strategy was overseen by the Ningaloo Sustainable Development Office (NSDO), a regionally based office of the Western Australian Department of Planning and Infrastructure.[7] The *Regional Strategy* provides a comprehensive framework for tourism development in the region, limiting the construction of high impact developments, such as marinas and canals, to the towns of Carnarvon and Exmouth. While this plan covers the coastal strip, the region is subject to a variety of planning processes that are largely uncoordinated. The Department of Environment and Conservation (DEC) has separate management plans for Ningaloo Marine Park (CALM, 2005b) and Cape Range National Park (CALM, 2005a), and the Shire of Exmouth is undertaking a Structure Plan and Local Tourism Planning Strategy to assist coordination of a new marina development and future town growth. While the existence of multiple plans suggests redundancy that could strengthen regional resilience, the independence of the planning processes raises concerns about the cumulative impacts of the plans, which are focussed on drawing more people to the region, or on managing the impacts of human activity without considering the potential size of future numbers.

Additionally, recent changes to the regional planning framework for Western Australia may have implications for the Ningaloo region. In 2009, following the recommendations of this report, the Western Australian Planning Commission (WAPC) resolved to establish regional planning committees for each region in the state, but it is not yet clear whether they will be supported by regional offices. In fact, the NSDO was closed in June 2009, at the time the WAPC resolved to establish the Gascoyne Regional Planning Committee, the successor of the committee overseeing the NSDO. At the time of writing, this bureaucratic decision does not bode well for a regional staff presence.

The largest risk to the region's ecology is recreational fishing catch, which, according to recent modelling work, is likely to be at least equal to and potentially over double the commercial catch in the region (Beth Fulton, pers. comm.). Recreational fishing is an important resident and tourist activity and changes to its regulation are highly political. Changes to fishing regulations will impact some tourists' decisions to visit the region, although snorkelling is consistently the most popular and most important activity for tourists, having displaced fishing in popularity since the 1990s (Wood & Dowling, 2002). Another ecological threat to tourism is coral damage in the most popular snorkelling sites, although it is unlikely to significantly impact biodiversity values when measured across the entire coast. Longer term threats are from peak oil, which threatens visitor access to the region, and from climate change, which could impact ecological systems including the existence of coral reefs. While creating development opportunities for the region, recent oil and gas initiatives to the north have also raised concerns about possible social and environmental impacts of increased industry and recreational visitation.

[7] It should be noted that one of the authors, David Wood, was Chair of the committee that oversaw the NSDO.

As such, the Ningaloo region provides an ideal context for testing the application of a modelling process as a method to increase regional resilience, particularly since the main stakeholder groups[8] expressed interest in engaging in collective learning processes. However there are some barriers to strengthening networks between stakeholders. The DEC decision to extend the sanctuary zones at Ningaloo Marine Park in 2004 was not well received by local residents (Ingram, 2008), and the nomination of Ningaloo for a World Heritage listing by the Western Australian and Federal governments caused public dissent from the Exmouth Chamber of Commerce and Industry (Smith, 2009). These issues have inhibited the development of local and state-wide social networks between institutions needed to support regional resilience.

5.6 Case Study from the NDM: developing scenarios and modelling for improved stakeholder participation

5.6.1 Stakeholder assessment – getting to know the destination

The first step in the NDM project was to identify and establish contacts with stakeholder groups and consider their interests, issues and reasons for becoming involved in the project. Through a stakeholder assessment (summarised in the table in Appendix D), a number of possible conflicts were noted that could impact on the capacity of the project to facilitate strong local networks and collaborative learning. While the largest barrier was between the protected area managers (DEC) and groups impacted by changes to fishing regulations, other issues were also identified as important. These were the regulation of the tourism industry (which causes conflicts between the regulator DEC and tourism operators) and clashes over tenure and coastal planning between planners and DEC on the one side and pastoralists on the other. World Heritage became a major issue over the course of the project as the local Chamber of Commerce, the Shire of Exmouth and community members raised concerns that World Heritage would prevent access to resources (such as gravel for roads) and alter local leisure pursuits.

Resource sector expansion was also raised consistently by stakeholders as both an opportunity, via industrial development (by the regional development commission, Chambers of Commerce and the Shires), and a threat, via oil spills, increased recreational fishing, and increased land and ocean traffic (local conservation groups, protected area managers, community members). Environmental impact has consistently been identified in community consultations as the greatest community concern. From a community and Shire perspective, a major issue is residential housing: Coral Bay has unsanitary and unsafe living conditions as they wait for staff housing to be developed, and locals are being priced out of Exmouth. Indigenous groups identified participation in tourism development as a key issue, together with environmental protection. Many of these conflicts and issues manifested themselves throughout the NDM project as issues that the model was requested to address.

5.6.2 Stakeholder modelling workshops – creating an environment for collective learning and collaboration

The stakeholder assessment fed into a series of four initial workshops that were held in each of the town centres (Exmouth, Carnarvon and Coral Bay) in June and September 2007. Groups

[8] This includes government, tourism agencies and operators, research institutions, environmental groups, residents and tourists.

were identified through the stakeholder assessment and invited to attend through phone calls and a follow-up email invitation or letter. We also distributed invitations through the visitor centres, and made general invitations through a radio interview and a newspaper article. Three of the workshops (one in each of the town centres) were aimed at introducing the modelling process, identifying the potential questions that the model should answer (expressed as scenarios for the future of tourism), discussing data availability and eliciting further involvement. Seventy-one people attended the workshops, with attendees from a broad range of backgrounds (see Appendix D). Through a series of large and small group activities described in more detail in Schianetz *et al.* (2009), participants refined a list of opportunities and concerns about tourism development into scenarios. The process of scenario development began the process of linking groups through the modelling process, by building relationships and shared understanding. The four resulting scenarios (Table 5.2) were then used to focus the model building process.

Table 5.2: The four collated scenarios and the rating of relevance for workshop participants.

Scenario	Score*
Scenario 1: A large increase in visitor numbers versus a controlled increase: This scenario addresses the impacts of growth in visitor numbers and, if you can control growth in particular market segments (for example in a particular accommodation type) and for particular activities, what will be the costs and benefits to the environment, community and economy?	4.3
Scenario 2: Changes to governance This scenario addresses questions about governance raised in particular in Exmouth and Coral Bay. If there are changes in governance over accommodation and activities, what will be the impacts on tourism? Will they be substantial or minor? Particular concerns were over tourism license tenure and land release (zoning).	4.5
Scenario 3: Varied rates and uncertainties of growth This scenario addresses a second aspect of growth. What if there are unexpected interruptions in tourism numbers? What are the best strategies for a fast recovery following an unexpected event or variations in visitor numbers to the region? The scenario also addresses the issue of capacity constraints by testing a variety of land release policies.	4.3
Scenario 4: Green technologies and development strategies This scenario addresses how adoption of green technologies could affect the capacities of the town sites to expand in the short, medium and long term, given current constraints on water, electricity and waste water, and the spatial allocation of tourists. It also addresses the costs and savings over different time periods.	4.4

* Participants were asked to rate the relevance to the region of the scenarios for all communities in the region, on a scale from 1 (not relevant) to 5 (very relevant).

The fourth workshop was a two day meeting to agree on a conceptual model for representing tourism development in Ningaloo and the process that could influence how it might evolve over the next 20-30 years. This was a smaller workshop involving key local stakeholders from the tourism industry, the shires, government agencies and researchers. The aim of the workshop was to address nine areas that were thought to capture the key elements of the tourism system (see Table 5.3). Participants collaboratively designed sub-models that identified the economic, social and environmental drivers and impacts, as well as critical feedback loops and thresholds. The conceptual modelling workshop provided an opportunity for discussion about the key elements and structure of tourism, through which diverging views of the tourism system could be resolved through debate and a broader view of the tourism system. This began the process of asking a wide variety of people to explain their understanding of the tourism system, and subsequently assessing and integrating these worldviews.

Table 5.3: The nine sub-models addressed in the conceptual modelling workshop.

Sub-model	Summary content
Visitor numbers and mix	Links the visitor cycle (numbers, mix and seasonality) to other cycles in the region (weather, cyclones, marine, European visitation, holidays).
Residents and industry	Addresses growth in regional industries and housing availability as determinants of population numbers and the activities undertaken by the resident population.
Visitor activities	Links visitor activities and experiences to tourism infrastructure, environmental quality and the characteristics of the tourism industry.
Accommodation sector	Addresses accommodation supply and demand in the context of land availability, investment returns, demand from other sectors and staffing.
Visitor spending	Uses visitor spending and economic data to calculate employment, income, value added and gross regional product.
Environmental loads	Addresses water availability in the context of climate change and water consumption, waste water generation, treatment and the implications for the region's ecology, electricity demand and supply, and the potential impacts of sustainable technologies for reducing water and electricity use.
Environmental impacts	Links the activities of visitors and residents to a range of environmental impacts, including marine and terrestrial impacts such as coral damage, fish stocks and vegetation loss, and the monitoring of these impacts.
Transport linkages/options	Addresses transport to the region and within the region, including transport constraints and shocks that could disrupt travel, and links to national trends.
Social impacts of tourism	Identifies the positive impacts (extra facilities, regional pride) and negative impacts (crowding, incidents, dislocation) to residents' quality of life.

5.6.3 Formal and informal meetings and communications with stakeholders – keeping people involved

Three more rounds of workshops were held in all three towns and in Perth. Scenarios were further refined and early prototypes of the model were demonstrated and their results commented on and discussed. While describing scenarios and recording worldviews are important steps in assisting stakeholder understanding of the viewpoints of others and how impacts occur, questions of power associated with the different levels of participation remain. In an effort to ensure that the process remained locally grounded, researchers also conducted a number of individual interviews. For example, individual meetings with a key indigenous organisation assisted in including an indigenous perspective on tourism and its potential impacts. While the shared exercises more powerfully contributed to regional resilience through collaborative learning about the dynamics of tourism and the range of issues that groups were facing, the individual meetings were also opportunities to communicate different perspectives and information.

An important element of the individual meetings was the use of conceptual diagrams to capture different understandings of different elements of the tourism system. For instance, a meeting with DEC staff and researchers produced a set of diagrams that represented the relationships between coastal camping impacts and regulations. Further meetings and research led to refinement of the diagram which neatly and elegantly captures the key elements of coastal camping and regulation (see Figure 5.1). Ongoing dialogue also clarified that changes in regulation (including the regulator, access and infrastructure), not environmental degradation, determined the kind of campers that visited a site. The clarification of important dynamics by key stakeholders assisted in developing institutional knowledge, a key component of regional resilience, as well as improving the model's accuracy.[9]

[9] Other methods of communication were a regular newsletter that provided the latest data from the project and a technical report summarising survey data collected for the project.

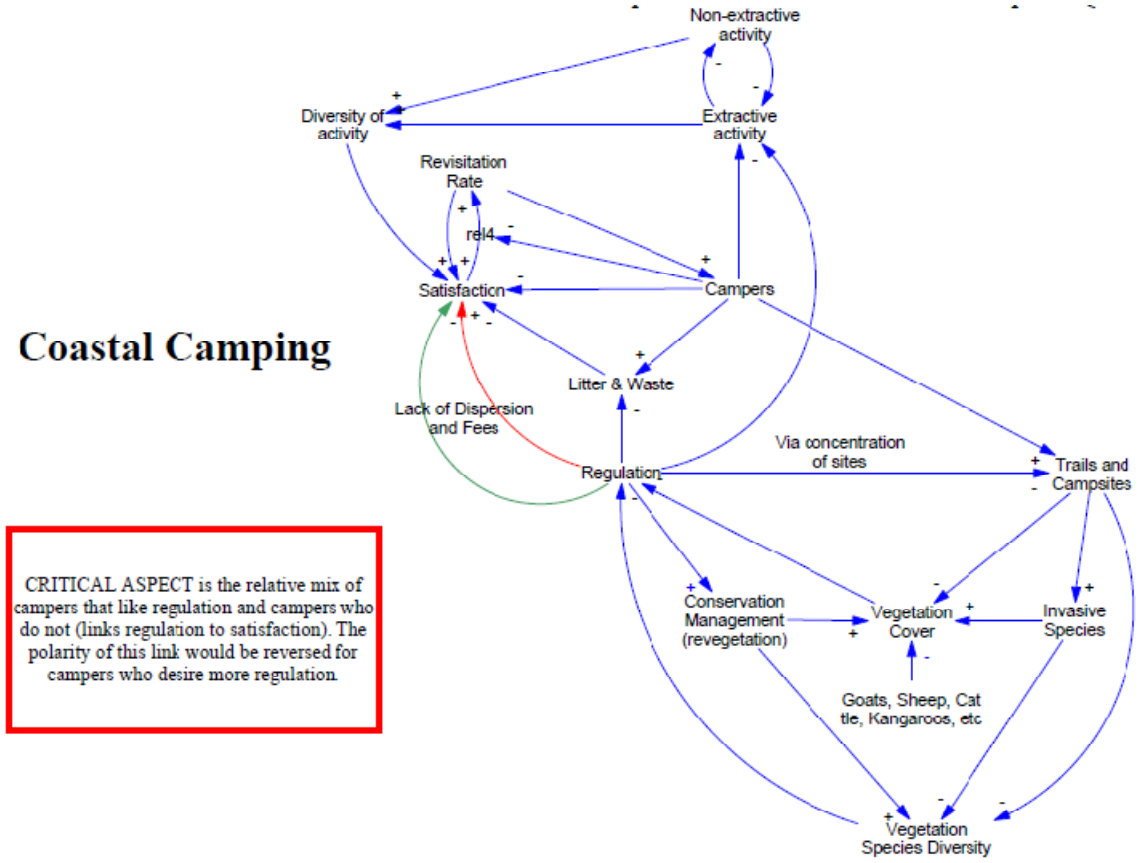

Figure 5.1: Conceptual diagram of the key variables and relationships for coastal camping impacts

5.6.4 Data collection and dissemination – learning through data collection

Data collection was an important activity for both building institutional knowledge and populating the NDM. Because there was insufficient publically available data to address the scenarios described in Table 5.2, the research team designed and implemented three surveys. The first involved the collection of 1574 visitor responses to provide detailed, geographically specific information on psychographic, visitation and activity patterns (see Chapter 3). This data informed the NDM[10] and supplemented 1999 Tourism Research Australia data. The second survey looked at residents' perceptions of tourism impacts; this was distributed to residents in Carnarvon, Coral Bay and Exmouth providing a sample of 292 responses (see Chapter 4).[11] The third survey was designed to estimate the water, electricity, waste water and waste produced by the tourist accommodation sector; this was supplemented by water and electricity use data from service providers (Water Corporation and Horizon Power). Additional information on visitation was provided by DEC and the two visitor centres in the region.

To help maintain communication channels with stakeholders a summarised version of all the data was sent out through newsletters, and the visitor statistics were made freely available

[10] For a summary, see Jones *et al.* (2009).
[11] This survey identified employment and cultural diversity to be the perceived most positive impacts, and environmental damage, delinquent behaviour, crowding and housing dislocation as the perceived most negative impacts.

through a report (Jones *et al.*, 2009). The contribution of this data to institutional knowledge is best demonstrated by how it was immediately used in planning processes underway in the region, including DEC landscape plans, local tourism planning strategies, and town planning schemes.

Another key element of this project was its close links to the CSIRO, and the data exchange between the NDM—with its emphasis on land use planning—and CSIRO's ecological modelling.

5.6.5 Model development – integrating world views and data

Two key approaches were used to develop the NDM: the first involved developing conceptual diagrams, then the second involved transforming these diagrams into a model by quantifying the relationships between variables. In an interdisciplinary project, research integration and communication between researchers can be challenging. Conceptual diagrams of different aspects of the tourism system, such as the coastal camping diagram in Figure 5.1, provided a language for ensuring that important aspects of the tourism system were being captured (Jones & Wood, 2008). While best undertaken in a group setting so collaborative learning and networking can occur, conceptual diagrams can also be developed through individual meetings, particularly when dealing with participants who are not comfortable expressing their opinions in a group. Developing conceptual diagrams also facilitated research integration by identifying linkages between different aspects of the system. A central element of this process is identifying the feedback loops and impact thresholds that determine the dynamics of the system.[12]

Transforming the conceptual diagrams into a model involved putting data behind the diagrams using Vensim modelling software. First, the conceptual diagrams were refined in Vensim to identify the key feedback loops and capture important system dynamics while remaining as simple as possible (the more complex the model, the harder it is to capture and understand its behaviour). Secondly, inputs were assessed against currently available plans for the region to help address uncertainties around future development. This was followed by model testing through sensitivity analysis, comparison against historical data, and discussions about model results with members of the tourism industry and agency managers. These discussions, held in 15 forums across the region, also helped build regional knowledge and understanding of the SES, particularly the consequences of current plans and decisions, and overlaps in areas of institutional responsibility (discussed in the next section). By improving stakeholder knowledge and social networks throughout the model building process, a platform of regional resilience was created to support use of the model by the time of its completion. We suggest that this is a more effective strategy than expecting these elements to spontaneously come together in the final stages of the project.

[12] The technique employed in the NDM project for integrating research from different disciplines is described in more detail in Jones and Wood (2008).

5.7 Case Study from the NDM: *using* scenarios and modelling for improved stakeholder participation

5.7.1 Learning about the tourism system through model use – demonstrating thresholds and feedbacks and enhancing group learning

The second stage of the NDM project contributed to regional resilience in two ways: first, through responses to engagement with the model, and second, through responses to the challenges of organising ongoing use. An important lesson learnt through the project was that models need to have a large degree of flexibility as planning priorities are constantly changing. The NDM needed the adaptability to respond to requests for information and experimentation from a wide range of collaborators. In the course of building the NDM, the range of submodels was refined and some were combined. Figure 5.2 provides a summary of the different submodels and key variables within the model and their relationship to each other.

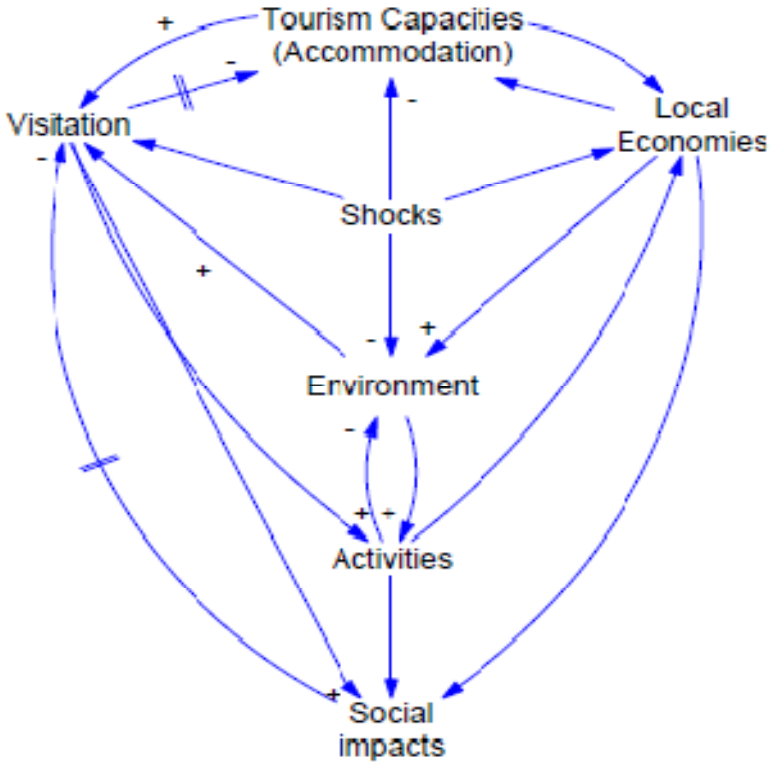

Figure 5.2: NDM Conceptual Diagram

A model scenario that we used regularly, and which is of great relevance to the region, looks at how the region might be affected in 30 years should the planned tourism nodes in the *Ningaloo Coast Regional Strategy* (the *Regional Strategy*) be fully developed. The scenario runs at the regional scale, from 2007 to 2037, and also includes planned growth in Carnarvon, Coral Bay and Exmouth. Growth in tourism numbers throughout the area was assumed to be 2% pa, with the exception of the pastoral stations, where growth was set at 4% pa. While 4% is large relative to historic growth on the stations, it is necessary to stimulate demand for the accommodation set by the *Regional Strategy* as demand for hotels and caravan parks are starting from a very low

baseline. The model adjusts these growth rates for seasonality. The model run also assumes that current regulations for recreational fishing and boating *do not* change between 2007 and 2037.

Overall, the model run shows that the pastoral stations—extending across approximately 190 kilometres of the coastline—will experience the greatest change. This is because most of the proposed tourism nodes in the *Regional Strategy* are on the stations. Figure 5.3 shows how the accommodation mix will change on pastoral stations under the *Regional Strategy* scenario, from 2007 to 2037: essentially the number of camp sites on the stations is gradually reduced over time as they are replaced by new hotel-style accommodation.

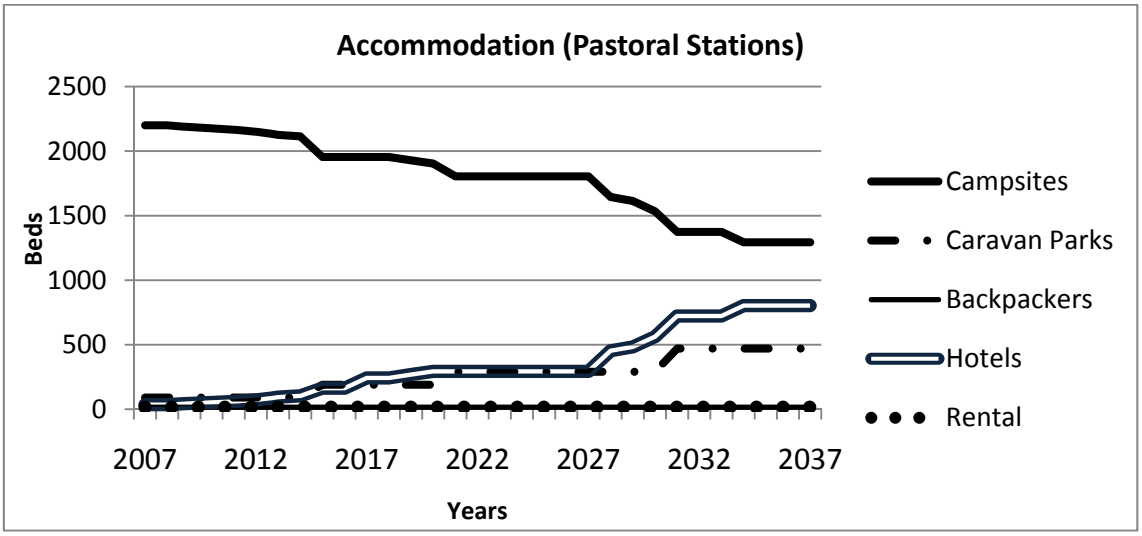

Figure 5.3: Change in accommodation mix for pastoral stations, from 2007-2037, under the *Regional Strategy* scenario.

The model results showing the potential social, economic and environmental impacts of the *Regional Strategy* scenario are summarised in Figures 5.4 to 5.8. Figure 5.4 shows visitor numbers in the region increasing 66% by 2037, which amounts to 300,000 people visiting the region by 2031. Visitation during school holidays (peak time) increases 60%, from 9,000 visitors in 2007 to 13,000 in 2037. By 2037 there is still a significant difference between visitor loads in peak and low periods, indicating that tourism is still seasonal and therefore problematic for tourism businesses. Figure 5.4 also shows visitor activities growing markedly by 2037. Fishing increases by 60% despite the reduction in campsites. Snorkelling increases by 48%, but this is concentrated in particular areas—essentially a doubling of snorkelling in Cape Range National Park.

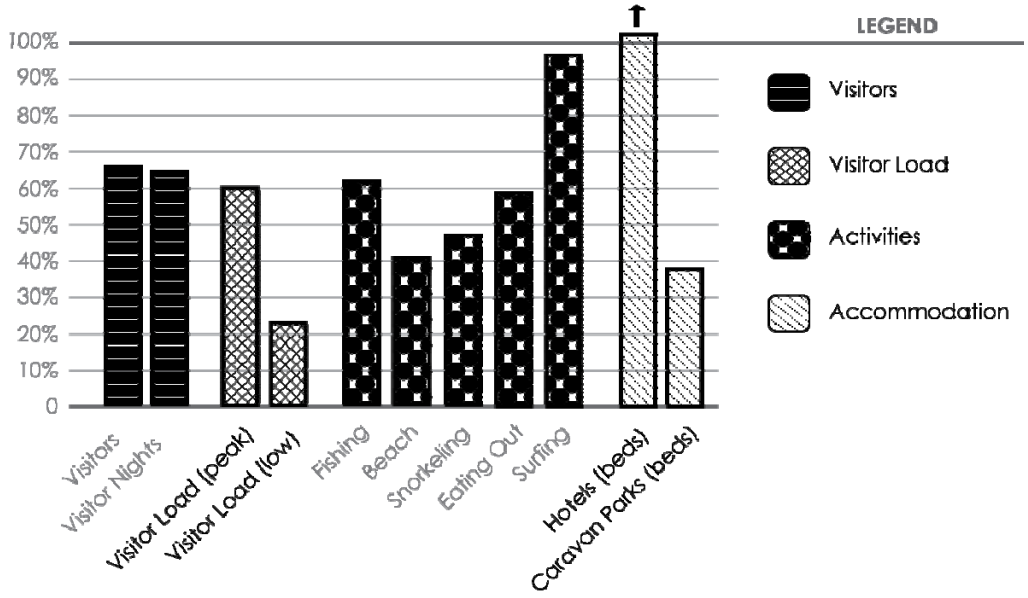

Figure 5.4: Change in visitor activity for the Ningaloo region by 2037, under the *Regional Strategy* scenario (with 2007 baseline).

The economic impacts of the *Regional Strategy* scenario are shown in Figure 5.5. Overall, expenditure increases from $95 million to $155 million, and tourism's contribution to Gross Regional Product increases from $32 million to $52 million.

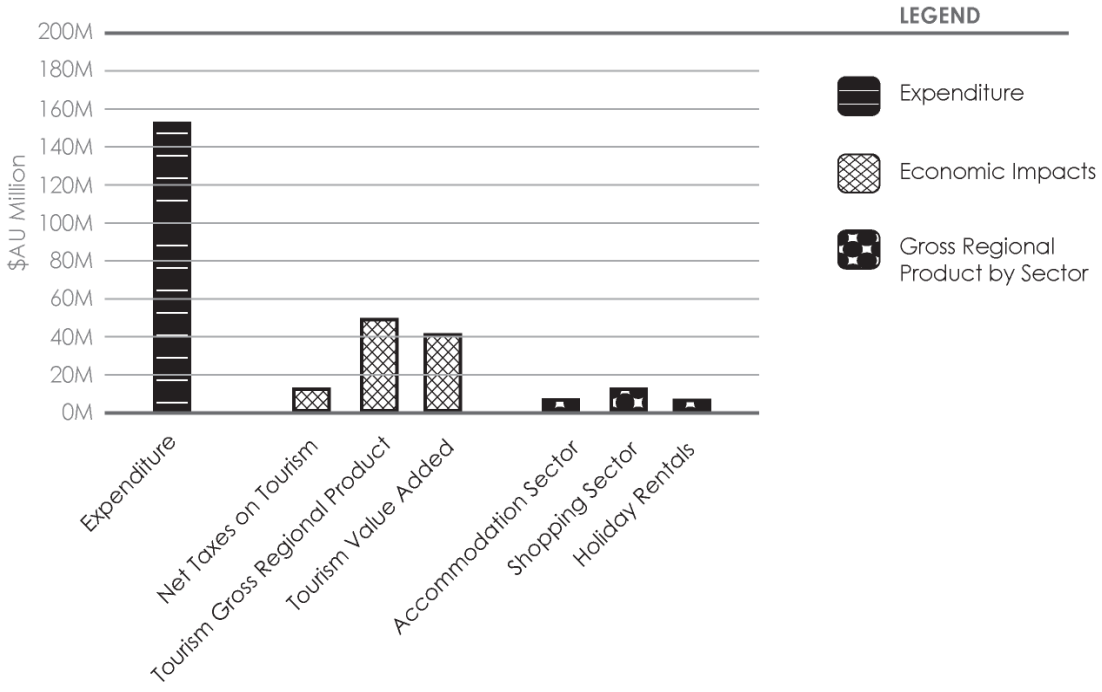

Figure 5.5: Status of economic indicators for the Ningaloo region by 2037, under the Regional Strategy scenario.

The social impacts the *Regional Strategy* scenario are summarised in Figure 5.6. Employment shows the greatest gain, with an increase of 95% by 2037. Greater numbers of people coming to the region also creates more opportunities to showcase the region, increasing community

pride by 60%. Negative social impacts are also felt by the region due to increasing environmental impact (through decreasing fish stocks and coral damage), delinquent behaviour, and housing shortages.

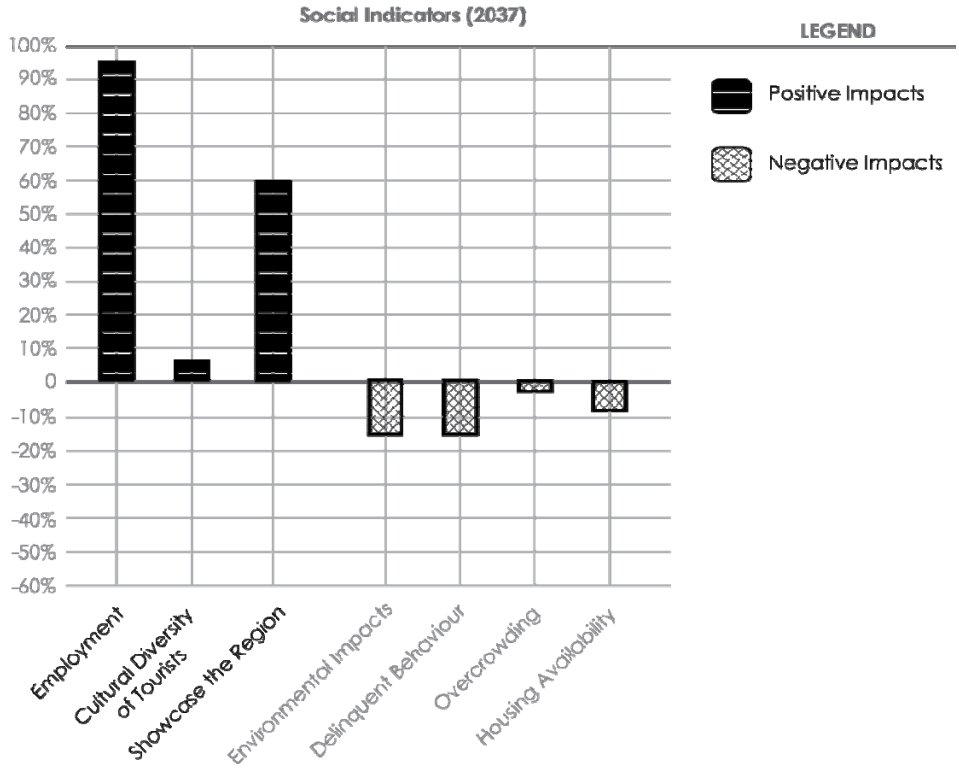

Figure 5.6: Change in Social indicators for the Ningaloo region by 2037, under the *Regional Strategy* scenario (with 2007 baseline).

Change in resource demand under the *Regional Strategy* scenario is summarised in Figure 5.7. Growth in resident and visitor numbers increase water use 20% by 2037, amounting to over 150,000 GL per annum. While not yet exceeding the limits of underground water supplies, such a demand would result in more water restrictions and more impact on the agricultural sector. Electricity demand increases by over 70%, and waste generation by about 57%. Nodal developments on the coastline would be forced to supply their own power, through generators or alternative energy sources, and their own water, and would also have to ensure that their waste water does not enter the ocean due to their proximity to the Ningaloo Reef. In this scenario, they are projected to use over 20 000 KWH and 71 GL of water in 2037. They would also need to maintain this infrastructure in a highly corrosive environment due to the proximity to the beach, wind and sun.

Ecological impacts of the *Regional Strategy* scenario were generated in the Ecopath with Ecosim model and are summarised in Figure 5.8. By 2037, overall whale shark numbers would decrease by 9% due to increased boat strikes. Although small, this reduction translates into a doubling of the likelihood of not seeing a whale shark on a tour (the sharks that are most often viewed are also those most at risk of boat strike because of the time they spend at the water surface). This will affect whale shark operators who currently

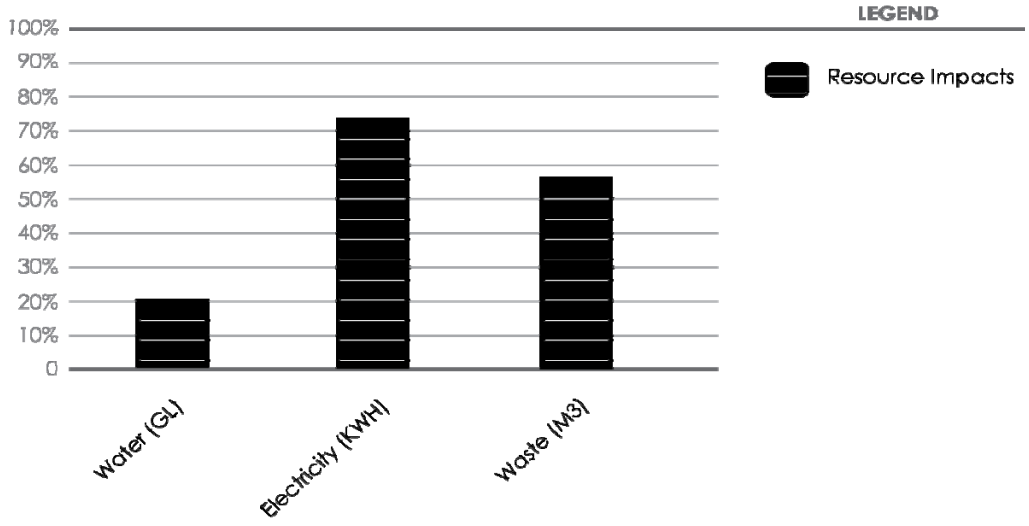

Figure 5.7: Change in resource demand for the Ningaloo region by 2037, under the *Regional Strategy* scenario (with 2007 baseline).

have a policy of a free repeat tour in the event a whale shark is not sighted. Turtle numbers drop by almost 40%, unless active fox baiting takes place, in which case they only drop 4%. Corals would decrease by 7% overall, but because the decrease would be concentrated in the areas where most people snorkel, popular coral viewing spots in Coral Bay and Turquoise Bay would be severely degraded. Increases in recreational fishing pressure result in a 20% reduction in fish stocks overall by 2037, and a 55% reduction in catch rates. Spangled Emperor, the target recreational species in the northern part of the region, is reduced by 30%. All the above results assume that current regulations for recreational fishing and boating remain unchanged.

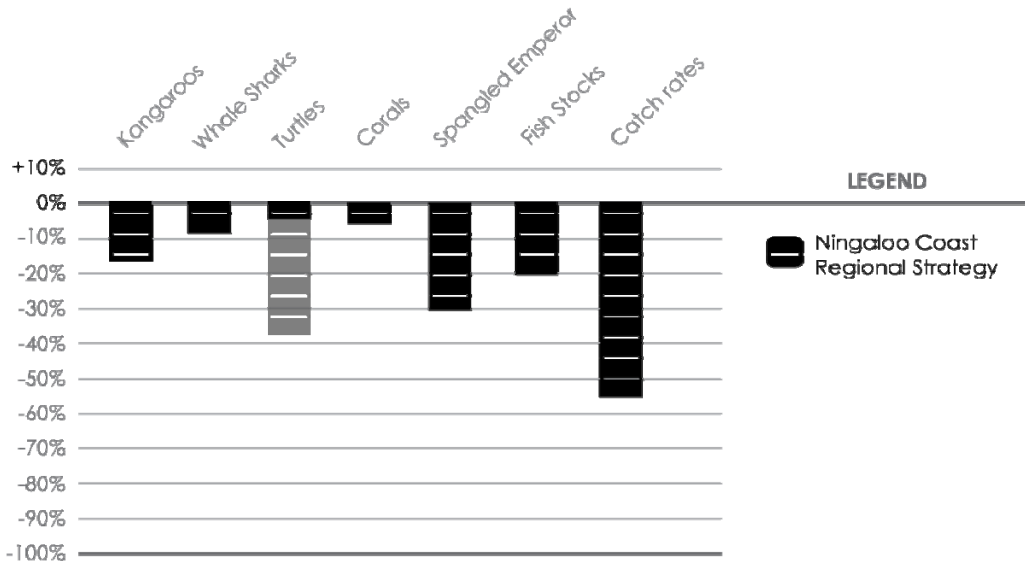

Figure 5.8: Change in ecological indicators for the Ningaloo region by 2037, under the *Regional Strategy* scenario (with 2007 baseline).

We presented the model results to both institution-specific and multi-stakeholder forums in the region and in Perth. Institutions had the opportunity to request specific model runs to deal with their priority issues, whereas a group of locals from different organisations and sectors chose

the scenarios to be presented at the multi-stakeholder forums. The requests reflected the different issues amongst different communities. Carnarvon Shire and business owners asked for a comparison of two different development strategies: Carnarvon as a gateway to different attractions versus Carnarvon as a destination in itself. They also asked for an exploration of the implications of a large surfing competition on the pastoral stations. Coral Bay residents were interested in exploring the differences between a large resort near Coral Bay versus expanding Coral Bay and the implications of further delays in building workers' accommodation. A group of Exmouth stakeholders chose to explore the cumulative impacts of growth and various regional plans on the future of Exmouth, the effects of building new resident accommodation in town, the impacts of a boat ramp upgrade, and the impacts of building new caravan park versus hotel accommodation. The Shire of Exmouth chose to examine housing issues, the impacts of a upgrading a boat ramp, and how recycling would reduce pressure on the local tip. Another frequently requested scenario was the comparison of economic and ecological impacts of a single large resort development versus the smaller scale nodal developments of the *Regional Strategy*. These requests are evidence of experimentation, where stakeholders and institutions use the models to assess upcoming plans and explore alternative outcomes.

One of the greatest potentials of the model is in the area of collaboration and learning. Linking development and infrastructure decisions to economic, social and ecological outcomes has demonstrated the importance of communication between local government and different agencies. A local reference group, with broad representation from different sectors, convened to provide researchers with advice on how to best communicate with regional stakeholders. The formation of this group led to requests for joint forums where groups had originally recommended separate meetings. The ecological impacts identified by the modelling scenarios have drawn attention to and raised concerns about potential fish stock declines in the future. These concerns led to requests for a scenario where recreational fishing regulations were changed to 'wilderness fishing' standards, specifying that fishers can only catch what they are going to eat that evening. In this case, the *Regional Strategy* scenario was run, but fishing regulations were changed to a two fish bag limit, to reflect the wilderness fishing standard. Under this revised scenario, fish stocks actually increased 13% by 2037, and catch rates increased by over 20% (and the size of fish caught also increased). This has encouraged a community response to seek change to fishing regulations. We have put locals in touch with a CSIRO researcher who is working with the Western Australian Department of Fisheries to test different recreational fishing regulations. These events show how modelling can help build social networks within and across scales (local, state and national in the case of research networks). Local networks in particular have been crucial to generating responses to the modelling results.

5.7.2 Model use and integration with regional planning – getting buy-in and ongoing learning

The major failing of modelling projects is that they often are not used by prospective recipients. Throughout the project we have attempted to address this issue via ongoing discussions with stakeholders about the project's legacy, particularly those institutions involved in land use management and planning.[13] In the forums, we presented two legacy options to stakeholders.

[13] The primary institution in the early and middle stages of the project was the NSDO as the institution with the primary responsibility for regional planning. The closure of the NSDO underlines the need for a broad base of support and involvement with planning research projects, as well as indicating the difficulties political cycles pose for long term

The first was the current plan for the project's legacy, that being to provide local and state institutions with simplified desktop models, training on the desktop models, limited access to modelling researchers for consultation, and user-pays access to the modellers to run detailed scenarios for larger projects. The second option was presented as a possibility given broad support and investment from other institutions. This option includes a Perth-based modeller to support ongoing use of the models, a region-based support person to promote regional use of the models and support users of the desktop models, an annual forum to run new scenarios and demonstrate model use, and a facilitated process using the model to help construct a community vision for Ningaloo. A number of stakeholders demonstrated their desire for the second option through letters of support to politicians and the CSIRO, requesting additional resources to ensure model uptake. To date, CSIRO has responded by extending their model uptake activities for an additional year after the models are finalised.

Training sessions scheduled for the region have the prospect of increasing regional resilience. Rather than simply providing training on how to use the desktop models, the sessions will also introduce broader adaptive management principles and show how they can be supported by the model. There is strong interest from local agencies, who have requested that the training include a wide variety of groups, including the pastoralists. Given the recent history and conflict between these groups, the desire for greater communication and collaboration is an important development. It also bodes well for increasing useful redundancy in management (a positive for regional resilience as the failure of one agency can be identified by other groups) as stakeholders will be aware of the concerns of other stakeholder groups as they undertake their monitoring and management. While there has been some interest in the possibility of an annual forum and community visioning process, stakeholder response to the training sessions will likely dictate if and when these pathways to greater resilience will be pursued.

Also pivotal to the ongoing use of the models in the region will be the hiring of a Regional Research Coordinator (funded by through the Ningaloo Research Program and the Gascoyne Development Commission), whose role will be to promote understanding and use of the research and models in the Ningaloo region over the next six months, and the building of the proposed Ningaloo Research Centre in Exmouth, which—should it be approved—will have the function of showcasing research in the region and potentially housing the models.

Despite the closure of the NSDO, the NDM now has a broad base of support in a number of different groups, agencies and industries (including tourism), who advocate use of the model in regional planning and assessment processes. While each of the stakeholder groups has identified how they can use the model to address issues specific to their own operations and interests, they have also expressed strong support for using the model to facilitate multi-stakeholder reviews of upcoming planning processes, specifically the review of the *Regional Strategy*, due to take place in the next 12 months.

5.8 Conclusion and summary assessment of the NDM approach

This paper has focussed on how increasing regional resilience strengthens the capacity of a region to successfully participate in and commit to regional planning. The modelling approach

planning.

described here should be understood as a version of a communicative approach and a contribution to regional planning knowledge. By using principles and practices from social-ecological systems research and organisational learning, modelling can help focus regional planning on building a region's capacity to manage social-ecological systems and therefore better cope with change and uncertainty. The modelling approach used in Ningaloo has highlighted the cumulative resource and ecological implications of proposed plans and developments for the region. This has led to a valuing of much in the *Regional Strategy*, but has also highlighted the need to reconsider some of the strategy's elements and their phasing and the need for mitigation. Local responses to modelling results have included further requests for tougher fishing regulations, experimentation with different model runs (e.g. looking at residential housing and recycling), and criticisms of the alternative strategy of a large resort.

The challenge for this work, and for other similar studies, is building inter-institutional decision making processes that are capable of understanding and working with variability and uncertainty. Our approach in the NDM project has concentrated on regional arrangements that build knowledge about important SES, improve relationships between institutions, and encourage experimentation in planning and management decisions. Systems dynamics modelling has many attributes that contribute to these goals, in the stages of both model development and model use. In the first stage of the NDM project, collaboratively developing tourism scenarios, sub-models and the model itself, helped to assess and integrate different stakeholder understandings of tourism systems by identifying critical feedback loops and thresholds. Collaboratively developing conceptual diagrams –which helped identify causal links and capture and test important aspects of the tourism system using a common language –kept people involved and strengthened regional information networks. The second stage, application of the NDM, illustrated how using models to explore different scenarios can enhance experimentation and relations between institutions, and build knowledge about how SES work. The example of the *Regional Strategy* scenario shows how a model can draw attention to cumulative impacts and thresholds that are often overlooked in regional planning. Additionally, the collaborative process of selecting and testing scenarios has created a pool of scenarios for stakeholders to draw from. It has also generated a range of locally relevant indicators for stakeholders to use when assessing the impacts of plans, strategies and events. These scenarios and indicators provide a starting point for stakeholder groups wishing to test their own thresholds, discuss mitigation measures, and negotiate trade-offs with other groups.

Returning to some of the key ingredients for successful regional planning noted at the beginning of this paper, modelling can be seen to have positive outcomes for regional planning when it focuses on building regional resilience. In particular, the NDM process has helped to build regional co-ordination and commitment: coordination through strengthening social networks and group learning about the SES impacted by regional planning; and commitment through acknowledging areas of shared concern and mutual dependence and the importance of coordination. Modelling has the capacity to assist collaborative regional planning and integrate it with learning about the social-ecological systems that underpin the values and resources of a region. The need for broad involvement and commitment is a fundamental challenge, as exemplified by the demise of the NSDO. Regional planning supported by modelling for regional resilience could underpin the next generation of regional planning initiatives.

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6. MODELLING TOURISM DEVELOPMENT: EXPLORING MODEL DYNAMICS THROUGH A CASE STUDY OF THE GNARALOO HOMESTEAD

6.1 Summary

This chapter explains the structure of the Ningaloo Destination Model (NDM), and explores the dynamics and outputs of the model through a case study of the Gnaraloo Station development node on the Ningaloo Coast

Key science findings from this case study are:

- Using four feedback loops (accommodation capacity, worker availability, social impacts, and visitor response to environmental regulation) together with visitor preferences, destination modelling can estimate and compare the economic, environmental and social impacts of different tourism developments.
- Destination modelling can integrate data and information from a range of disciplines to provide a broad set of indicators addressing triple bottom line objectives (economic, environmental and social).
- By addressing the specifics of visitor preferences and destination capacities, these feedback loops capture the transformative elements of the Tourism Area Life Cycle developed by Richard Butler (2006). Using feedback loops moves away from deterministic assumptions linking impacts to a "stage" of development. This reveals the range of impacts that development can bring, depending on the characteristics and capacities of a destination.

The implications for management are:

- The NDM provides a much wider set of indicators than is currently used to assess potential developments. These include electricity, water and waste demand generated by visitors, and the ecological impacts of visitor activities (in this case: fish stocks, catch rates, coral damage, turtles, and more).
- The NDM therefore provides a more comprehensive set of indicators for comparing different development scenarios and assessing their appropriateness.
- The NDM can assist with identifying and testing thresholds and assessing risks of different types and sizes of development.
- The NDM empowers users to proactively plan for and manage the capacities of a site. This can help avoid site or destination decline due to depletion of valued resources or inappropriate development.

6.2 Introduction:

Sustainable tourism planning expands the range of fields that a planning exercise needs to address (Hall, 2000), and puts an onus on planners to ensure that the planning process is collaborative in the full sense of the word (Bramwell & Lane, 1999). Planning has shifted over the past twenty years from a 'booster' approach to tourism, where the aim was to increase tourist numbers, to an expectation that it will address social, environmental and cultural impacts as well as economic impacts, and will provide a balanced and nuanced approach (Hall, 2000; Inskeep, 1991). Scale is an important element here, as the capacities, uses and connections of a place need to be considered at different scales (vertically) and across locations (horizontally), and linked to ecological and social processes specific to a location and region (Holling & Gunderson, 2002).

Tourism modelling has attempted to integrate different elements of sustainable tourism, with varying levels of success when assessed in terms of uptake (Schianetz *et al.*, 2007). The different sustainability elements are also a mixed bag, although it is interesting to note that most locations for tourism modelling projects are ecologically sensitive, requiring the models to include ecological components (Schianetz *et al.*, 2007). One of the first tourism modelling projects, in the village of Obergurgl (Moser & Moser, 1986), had a social focus with a small environmental component, while other modelling projects have had complex environmental models (Chen, 2004; Giaoutzi & Nijkamp, 1993) with few social indicators and little consideration of impacts on host communities. As discussed in the previous chapter, input from participants in regional forums provided clear indications about the range of factors that the Ningaloo Destination Model (NDM) should address. Our resident's survey suggested that economic, environmental and social issues were all of interest to local groups. Ecological impacts of tourism were the greatest concern, while economic impacts such as employment were viewed as the greatest benefit. There were differences between communities, with Exmouth, for example, citing dislocation due to rising residential accommodation costs as a major concern, whereas this issue was not a concern in Carnarvon and Coral Bay. Furthermore, locals quite clearly wanted the models to address resource use and recycling, with these elements featuring prominently in the four tourism development scenarios devised by community members in workshops around the region.

This chapter focuses on how tourism, economic, environmental and social elements were integrated in the NDM to create a sustainable tourism planning tool. While it is acknowledged that engagement is the key determinant of model uptake (Schianetz *et al.*, 2007), the process of engagement is addressed in the previous chapter, the next chapter and a separate article (Schianetz *et al.*, 2009). The previous chapter also describes the process through which a conceptual model structure was developed using local and expert knowledge, and how data was put behind this structure to create the NDM. This chapter's two objectives are focussed instead on the technical elements of the modelling: providing an explanation of the model structure, and exploring the dynamics and outcomes of the model through a case study of a development site on Gnaraloo Station.

Gnaraloo is a working pastoral station and wilderness tourism business adjacent to the Ningaloo Marine Park 150 kilometres north of Carnarvon, Western Australian. The current owner, Paul Richardson, has reduced sheep numbers considerably and has concentrated on building tourism on Gnaraloo. Richardson also owns Three Mile Camp, the most popular campground on the

coast due to its proximity to popular surf breaks such as Tombstones. In addition to surfing, windsurfing and kite-surfing, the area is also popular for snorkelling, going to the beach, and fishing. Access is along a dirt road of variable quality that is most suited to four wheel drive vehicles. The *Ningaloo Coast Regional Strategy* (Western Australian Planning Commission, 2004) has Gnaraloo station zoned as a tourism node that can cater for up to 500 overnight visitors.

Recommendation for Gnaraloo Station: Tourism node
Gnaraloo and environs is suitable for a tourism node due to the scale and configuration of land available, majestic views, and established access and infrastructure. Other benefits include proximity to an airstrip, Gnaraloo Bay, remote coastline (potentially roadless) to the north, Three Mile Camp and extraordinary surf breaks, pocket beaches and rocky coastal features.
Source: (WAPC: 59)

The tourism nodes outlined in the *Regional Strategy* have the capacity to provide a range of accommodation types and services, depending on master planning and approvals. At present Gnaraloo can accommodate a maximum of approximately 100 visitors, in chalets and bunkhouse accommodation. The *Regional Strategy* assesses the homestead to be "moderately" sensitive with low grasses and remnant native species, and pockets of significant coastal vegetation. The area has been home to grazing for over 90 years. The tourism node is separated from the coast by a mobile sand dune, but is still appealing due to the spectacular coastal views from its elevated position, and access to snorkelling and beach attractions, which are a short drive away.

The potential exists for a five-fold increase in people on the station. Although this size is not the plan of the current owner, the flexibility in the *Regional Strategy* means that such growth is a possibility. Constraints to further development include environmental impacts, infrastructure (water, waste water, electricity, sewerage) and local opposition to development near a popular local beach and surf break. The NDM can help assess different types and sizes of tourism development for Gnaraloo Homestead. In this chapter, we examine the modelling outcomes of two extremes: a caravan park development and a hotel development, both built to maximum capacity.

6.3 Methods

The methodology followed here is based on system dynamics modelling, developed from the work of Senge (1990) and Sterman (2000) using Vensim software. System dynamics has been used successfully in Australia in other locations, including the Port Douglas (Walker *et al.*, 1999) and Tapestry (Walker *et al.*, 2005) regions.[14] Modelling can facilitate problem definition and formulating and testing of potential solutions. Vensim facilitates the translation of conceptual models into numerical models. After addressing the concept of destination development, the remainder of this section addresses the dynamics of the numerical model.

The most used model in tourism research is the Tourism Area Life Cycle (TALC) model developed by Richard Butler (2006). Butler suggests that tourism destinations go through a series of development stages. His six stages are:

- Exploration, where an area is 'discovered' by explorers who are attracted by its raw

[14] Paul Walker was also involved in the NDM project, assisting with the initial workshops and providing advice at various points in model development.

beauty or culture.

- Involvement, where a growing stream of visitors begins to catalyse local initiatives to cater exclusively for visitors.
- Development, a dynamic growth period where large numbers of new visitors come to the region, and outside investment begins to the detriment of local participation and control. The region also begins to lose its attractiveness for explorers.
- Consolidation, where visitor numbers continue to increase but at a declining rate, regulation increases, and efforts increase to extend the tourism season.
- Stagnation, where visitor numbers stabilise as threshold levels are reached or exceeded, resulting in economic, social or environmental problems. Tourism has now become mass market, with lower yields.
- Decline or rejuvenation where the destination either fails to address its economic, environmental and social problems and declines, or there is a dramatic change in the resource base as the destination reinvents itself through finding a new resource (natural or cultural) to exploit.

Haywood (2006: 53) argues that TALC researchers view the destination 'through the wrong end of the telescope', where the 'details melt into amorphous blobs'. He notes that 'when viewed closely, the tourism organisations and the people could be observed making choices continuously'(2006: 53). TALC assumes particular kinds of changes as destinations grow, but does not explicitly and in detail link these changes to the preferences of different kinds of visitors and the characteristics of the region. Limits to growth, such as worker, accommodation or resource (primarily water and electricity) shortages, can slow the cycle, and decisions about different kinds of accommodation and regulation also influence the changing visitor mix, which influences patterns of activities and expenditure that flow on to cause social and environmental impacts. As such, the Ningaloo Destination Model is a response to Heywood's criticism that 'TALC research needs to become better attuned to discovering the interplay of the dominant forces that cause a destination to advance or decline, particularly in respect to capacity management' (2006: 55).

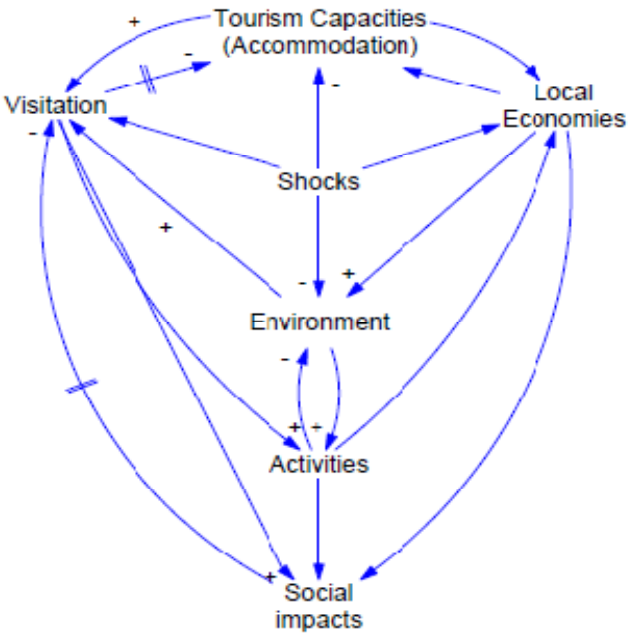

Figure 6.1: Conceptual Model

6.3.1 Tourist Accommodation

The key relationships in the NDM are identified in the conceptual model (Figure 6.1). The central element in the tourism system is the destination's capacity to accommodate tourists. This is certainly the case for the Ningaloo Coast where all of the accommodation is taken up for school holidays, and there is little spare capacity for much of the year. Before determining the number of people that can fit in the region, first we need to identify the total number of visitor nights in the region during a specific tourism season. This is represented by the equation:

$$N_t = \sum_r \left(v_{str} l_{sr} g_t \right) \qquad (1)$$

Where N_t is the visitor nights in tourist season t, r is the subregion, v is the number of visitors, s is the visitor segment, l is the length of stay and g is the visitor growth rate. On Ningaloo, there are six tourist seasons that were defined through interviews with tourism industry members and confirmed through visitor surveys. These are summarised in Table 6.1. The accommodation capacity limit on growth is not through total visitor nights, but related to accommodation preferences and the number of visitors in a subregion on a specific night. Visitor nights spent in different accommodation types are captured by:

$$N_{tra} = N_t a_{str} \qquad (2)$$

Where a_{str} is the accommodation of visitor segment s in tourism season t in subregion r. To calculate how many people are in the subregion on a given night, we calculated the average number of visitor nights per night for each of the subregions by dividing (2) by the number of nights in tourist season t (represented by n_t):

$$\overline{N}_{tra} = \frac{N_t a_{str}}{n_t} \tag{3}$$

The limiting feedback loop for accommodation can therefore be defined as:

$$\mathcal{g} = \begin{cases} 0\ ,\ \overline{N}_{tra} \le A_r \\ XYZ\ ,\ \text{otherwise} \end{cases} \tag{4}$$

Where A is the accommodation capacity in subregion r.

Table 6.1: the six tourism seasons.

	Date start	Date finish	No. of weeks	No. of days
Low	1-Nov	26-Mar	21.0	147
School Hol. (April)	27-Mar	15-Apr	2.9	20
Medium	16-Apr	3-Jul	11.3	79
School Hol. (July)	4-Jul	19-Jul	2.3	16
Peak	20-Jul	30-Sep	10.4	73
Shoulder	1-Oct	31-Oct	4.4	31

6.3.2 Economic Impacts

Economic impacts are linked to different visitor types. As the visitor mix changes, the average expenditure per visitor also shifts. This information is taken from the 1574 visitor surveys detailed in Chapter 3. Expenditure can be calculated by:

where E_{rt} is the total expenditure at time t in subregion r, N_{srt} is the visitor nights of visitor segments s at time t in subregion r, and e is the average nightly expenditure of visitor segments s.

Once we know the visitor expenditure, we can calculate indicators that better represent the true contribution of tourism activity, as tourism expenditure tends to be larger than the actual output of goods and services produced locally. This is because the region imports goods and services from outside for local use including tourism and many other sectors in the region. As the region has to pay for the imports, it is only the locally produced goods and services that generate benefits to the region through tourists' expenditure. Thus, what matters most to the households in the region is the income they bring home from working in the tourism sector and any return to capital invested in the tourism sector (value added); and, what matters to the government is the total amount of taxes paid. All in all, the sum of value added and the tax revenue is the true contribution of the tourism sector to the regional economy, and this is defined as tourism gross regional product. The economic indicators are summarised in Table 6.2.

Table 6.2: Economic Impacts in the Ningaloo Destination Model

Impact	How the data can be divided
Visitor Expenditure ($AU)	Location, Visitor Origin, Visitor Segment, Season, Expenditure Category
Employment from Tourism (jobs)	Location
Net Taxes on Tourism	Industry Sector, Origin
Tourism Value Added	Industry Sector, Origin
Tourism Gross Regional Product	Industry Sector, Origin

6.3.3 Worker Availability

A second limiting factor is worker availability, which is constrained by a lack of residential accommodation. Residential accommodation competes with holiday accommodation, particularly in Exmouth and Coral Bay, where a number of houses are rented to visitors. The key variable here is demand for new workers, D_r in subregion *r*, which is calculated through a regionally specific ratio between expenditure and workers required, *j* developed in other research (Hughes *et al.*, 2008),

$$D_{tr} = \frac{N_{srt} e_s}{j} \tag{5}$$

where *e* is average visitor expenditure per night for visitor segment *s*. Workers accommodation restricts growth when demand for workers outstrips housing availability. This can be summarised as:

$$g = \begin{cases} 0, & D_{tr} z_r + y_r \geq H_r \\ XYZ, & \text{otherwise} \end{cases} \tag{6}$$

where *z* is the dependents per tourism worker, *y* is the other residents in region *r*, and *H* is the total housing capacity.

6.3.4 Ecological Impacts and Regulation

The original conceptual models defined the relationship between visitation and ecological impacts as a limiting feedback loop due to loss of attractions and less shelter for campsites. However, a literature review of camper preferences (Daniels & Marion, 2006; Lawson & Manning, 2003; Schroeder, 1999) indicated that tourists are more responsive to changing levels of regulation than they are environmental impacts. Events at Coral Bay reinforce this finding. Bill's Bay experienced coral bleaching due to oxygen depletion during mass coral spawns and certain weather conditions in 1989 (Simpson *et al.*, 1993) and again in 2007. Following large declines in coral health, visitor numbers remained unchanged. A more likely impact on tourist numbers following ecological decline is greater regulation, particularly given the location of many campsites and popular tourist attractions in the Ningaloo Marine Park. Surveys of visitor preferences show that different visitor segments have different responses to greater regulation, with some disliking and others preferring a more regulated experience. This is captured by:

$$g = \begin{cases} g = gP_{sr}\ ,\ i_r \geq i_{rw} \\ XYZ,\ \text{otherwise} \end{cases} \quad (7)$$

where i_r is the level of ecological impact, w is the threshold set by agencies managing natural resources, particularly in relation to protected areas and recreational fishing, and P_{sr} is the degree of impact that regulation has on visitor growth due to preferences of different visitors segments for each subregion. Changing the level of regulation therefore has an impact on the visitor mix. The level of impact i is calculated through integration with the CSIRO's Ecopath with Ecosim (EwE) model developed by Beth Fulton, and relies on three key variables that connect to important visitor activities: lethrinid (emperor) biomass (recreational fishing), coral biomass (snorkelling) and whale shark biomass (whale shark tours).[15]

6.3.5 Social Impacts

Social impacts are part of a slow feedback loop. Six social impacts feed into a weighted index of resident satisfaction with tourism, which is weighted using responses to the resident survey discussed in chapter four. The three positive impacts are economic impacts (jobs), showcasing the region (indexed through the number of hours spent on activities that showcase the region's key attribute, its natural beauty), and cultural diversity (in visitors). Four negative impacts were used due to discrepancies between the three communities: environmental impacts, delinquent behaviour (presence of younger visitors and number of visitors in holiday rentals in suburban areas), overcrowding (the ratio of residents to visitors), and dislocation due to housing shortages (particularly important in Exmouth, and also a major concern in Coral Bay). Social impacts accumulate slowly and are slow to dissipate. Following events at Byron Bay, social impacts led to a cautious approach to tourism development, slowing accommodation and visitor growth. This is captured by:

$$S_r \Rightarrow A_r k \Rightarrow g_r k \Rightarrow 0 \quad (8)$$

where S_r is the social impacts index and k is the effects on accommodation and growth rate. S_r is a slow variable as it relates to impacts that change slowly, and balance each other. A list of the social indicators in the NDM is provided in Table 6.3.

Table 6.3: Social Impacts in the Ningaloo Destination Model

Impact	How the data can be divided
Employment (jobs)	Location (three towns)
Cultural Diversity	Location (three towns)
Showcase the Region	Location (three towns)
Environmental Impact	Location (three towns)
Delinquent Behaviour and Disturbances	Location (three towns)
Overcrowding	Location (three towns)
Residential Housing Available/Demand	Location (three towns)

[15] Advice from Department of Fisheries, Western Australia indicates that Lethrinids (emperors) are an appropriate indicator species for recreational fishing stocks.

6.3.6 Implications of Changing Visitor Mix

The visitor mix in the region is affected by both accommodation mix and regulatory changes, which alter the size and proportion of visitor segments. The visitor segments were identified through factor analysis of visitor preferences for different experiences on the Ningaloo Coast, explained in more detail in Appendix E and in *Ningaloo Coast Region Visitor Statistics* (2009), a STCRC report available for free download[16]. The factor analysis revealed three distinct groups with a number of significant results confirming their validity; Appendix E provides an overview of the results. The three experiences were: the comfortable visit, the nature lover, and the fishing escape.

The comfortable visit experience refers to self drive visitors making use of available facilities and experiences, but requiring a higher level of investment in infrastructure. This experience appealed disproportionately to interstate visitors. The nature lover experience focuses on non-extractive engagement with the natural environment; accessing Ningaloo Reef was very important to this experience. While infrastructure was not as important to these visitors, they did place importance on the tourism industry providing them with access (whale shark tours, safari tours, scuba diving). This experience appealed disproportionately to internationals. The fishing escape experience centres on escaping cold weather and home and going fishing. These visitors focussed on a smaller number of activities (including snorkelling) and did not tend to place importance on tours or infrastructure. While visitors seeking the fishing escape experience stayed for longer periods, they also tended to spend less per day. This experience appealed disproportionately to West Australian visitors.

Each segment has different patterns of activities and expenditure, which in turn drive the ecological and social impacts. Some groups to create impacts that lead to reduction in their own numbers. For instance, increasing numbers of fishing escapees can lead to greater regulation of fishing, which drives them away from the region. Some feedback loops are stronger than others, leading to changes in the proportions of visitor segments, and therefore patterns of activities and expenditures. Activities can take place in subregions outside of where visitors are staying. For instance, visitors to Exmouth predominantly snorkel in Cape Range National Park. Resident activities are also included through data gathered using resident surveys. Controls can be exerted on the system by changing the accommodation mix, the time and level at which regulation kicks, and the growth rate (g). The initial growth rate can be set by the NDM user, as it is difficult to predict how tourism will grow and develop, and a random growth rate leads to results that are difficult to interpret and therefore contribute less to learning. However, feedback loops will alter growth rates across model runs. The NDM indicators for tourism impacts are shown in Table 6.4.

[16] http://www.crctourism.com.au/BookShop/BookDetail.aspx?d=720

Table 6.4: Tourism Impacts in the Ningaloo Destination Model

Impact data	How the impact data can be divided
Visitors	Location, Accommodation Type, Origin, Visitor Segment, Season
Visitor Nights	Location, Accommodation Type, Origin, Visitor Segment, Season
Visitor Load*	Location, Accommodation Type, Origin, Visitor Segment, Season
Accommodation Amount (beds)	Location, Accommodation Type
Accommodation Used/Vacant (beds)	Location, Accommodation Type, Season
Activities (hours undertaken)	Location, Origin, Visitor Segment, Season, Activity Type (12 activities in model)

*Visitors present in the region at the same time.

6.3.7 Resources Use

The final set of outputs is linked to accommodation rather than to visitor segments, although visitor segments do have preferences for different accommodation types. Water and electricity data was collected directly from accommodation providers and through agreements with Horizon Power and the Water Corporation. Human waste was calculated using figures for the average waste produced by humans. With the exception of electricity use in hotels, water and electricity were calculated using the nights in a particular accommodation type:

$$O_{rt} = \sum_{r=n}^{r} (N_{ta} o_a) \tag{9}$$

where *o* represents water use, electricity use with the exception of hotels, and waste generation and *O* is total resource use for region *r* at time *t*. Data on electricity use in hotels indicates that they use largest amounts of electricity during the off-season when visitation is at its lowest due to the high temperatures in the Australian summer. Electricity demand in hotels was relative to the season *t* and the accommodation capacity *A*

$$Q_t = \sum_{r=n}^{r} (Aq_t) \tag{10}$$

where Q is total electricity used by a hotel and q is the electricity used per bedroom in season *t*. Table 6.5 shows the NDM indicators for environmental (resource and ecological) impacts.

Table 6.5: Environmental Impacts in the Ningaloo Destination Model[+]

Impact	How the data can be divided
Water (GL)	Location, User Group (Tourism Accommodation/Resident/Other Industry)
Electricity (KWH)	Location, User Group (Tourism Accommodation/Resident/Other Industry)
Landfill (M3)	Location, User Group (Tourism Accommodation/Resident/Other Industry)
Human Waste (L)	Location, User Group (Tourism Accommodation/Resident/Other Industry)
Impact of Sustainable Technologies	On water, electricity, landfill
Fish Stocks (biomass)	Whole Region, 10km Grid
Catch Rates (biomass)	Whole Region, 10km Grid
Coral (biomass)	Whole Region, 10km Grid
Spangled Emperor (biomass)	Whole Region, 10km Grid
Whale Sharks (biomass)	Whole Region, 10km Grid
Marsupials (biomass)	Whole Region, 10km Grid

*Ecological impacts span 60 indicators through the EwE model developed by Beth Fulton.

The symbols shown in the equations above are summarised in Table 6.6.

Table 6.6: Summary of symbols used in equations

Variable	Description	Unit Type
A_r	Accommodation capacity	People
a	Accommodation preferences	
D	Demand for new workers	People
E	Total visitor expenditure	$AU
e	Visitor expenditure per night	$AU
g	Visitor growth rate	Percentage
H	Capacity of housing	People
j	Ratio of expenditure to workers	
l	Length of stay	nights
i	Level of ecological impact	Biomass
N_t	Total Visitor nights for tourist season t	Visitor nights
$\overline{N}$	Average visitor nights per night for tourist season t	Visitor nights per night
O_t	Total resource use (water, electricity, human waste)	GL, KWH, L
o	Resource use (water, electricity, human waste)	GL, KWH, L per visitor night
P	Regulatory preferences of different visitor segments	
Q	Total electricity use in hotels	KWH
q_t	Electricity use in hotels per bed in season t	KWH per bed
r	Subregion	
S	Social impacts index	
s	Visitor segment	
t	Time	Tourist season
v	Visitors	People
w	Threshold of ecological impacts set by agencies	Biomass
y	Other residents	People
z	Dependents per tourism worker	People

6.4 Results:

The Ningaloo Destination Model (NDM) was run to test the differential impacts of two accommodation options at Gnaraloo Station, the first being the addition of 400 caravan park beds, and the second being the addition of 400 hotel beds. In both cases the model runs assumed the extra beds would be added in 2016 and the site would be operating at full capacity. Campgrounds were artificially capped at their 2007 level so that growth in visitors staying in campsites would not distort the specific impacts of extra caravan park and hotel beds. Growth rates were also set substantially higher for nature lovers and comfortable campers as they start from a low base in the region, and they are the groups with strong preferences for caravan parks and hotels. Growth rates for fishing escapees was set at 0.1%, since this group is already very large (see figures 6.2 and 6.3), and they dislike infrastructure such as sealed roads and toilets (as indicated through our visitor surveys; (Jones *et al.*, 2009). The results from the two model runs are discussed below. The social impacts of the NDM discussed in the previous chapter are not discussed here as they are specific to the town sites where the communities reside.

The visitor mix in the region changes substantially with the advent of new accommodation. Adding 400 new hotel beds to Gnaraloo increases the proportion of nature lovers visiting the region from 14% in 2007 to 32% in 2037, while the proportion of comfortable campers rises only slightly in the same timeframe (Figure 6.2). In contrast, adding 400 caravan park beds to

Gnaraloo switches this relationship, with the proportion of comfortable campers increasing from 17% in 2007 to 36% in 2037, and nature lovers remaining relatively steady on 18% (Figure 6.3). Because both model runs cap campsite numbers in 2007, growth in the proportion of fishing escapees is limited. This group actually shrinks in size in both scenarios because of the feedback loop which has fishing escapees avoiding areas that become more regulated in response to growing visitor numbers, and because of competition from other groups.

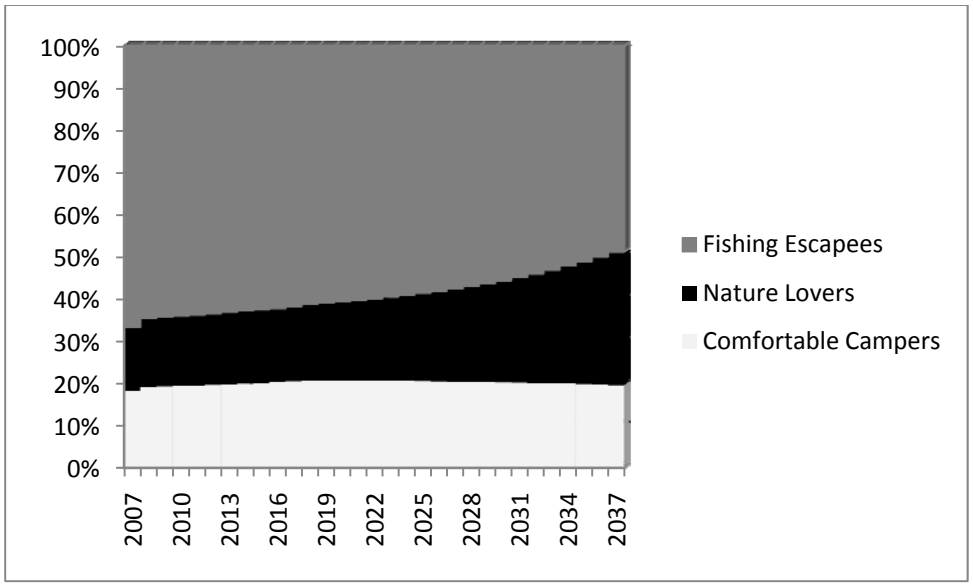

Figure 6.2: Proportional change in visitor segments in the region with the addition of 400 hotel beds at Gnaraloo Station (2007-2037).

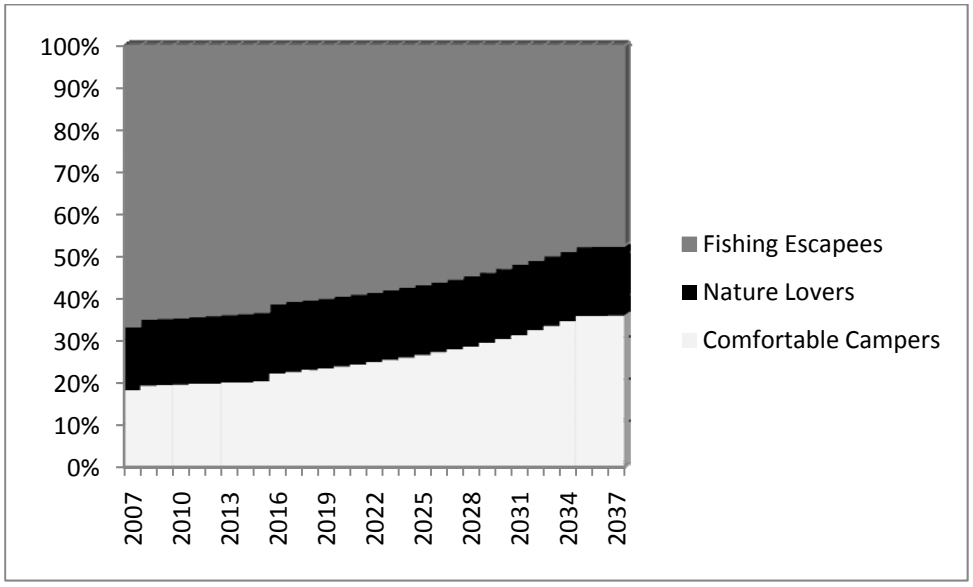

Figure 6.3: Proportional change in visitor segments in the region with the addition of 400 caravan beds at Gnaraloo Station (2007-2037).

In the NDM, the variation between visitor segments and the accommodation they stay in drives impact patterns around Gnaraloo Station. Table 6.7 compares the impacts of the two scenarios

on visitation by 2037 (t=30). The 400 hotel bed scenario generates more visitor nights than 400 caravan park beds; however, because hotel visitors on average have shorter stays in the region, a hotel requires more visitors than a caravan park to generate a comparable number of visitor nights. Thus, the difference in visitor nights between the two runs at t=30 is less than one percent.

The influence of accommodation types becomes apparent when examining the activity-effort of visitors. Figure 6.7 compares impacts of the two scenarios on visitor activities by 2037 (t=30). The hotel scenario generates more beach, snorkelling, sightseeing, and surfing activity; whereas the caravan park scenario generates more fishing activity, reflecting the greater desire of visitors who stay in caravan parks to fish compared to visitors who stay in hotels. In both runs snorkelling is the activity that increases the most (107% by 2037 for the hotel scenario, 79% for the caravan park scenario).

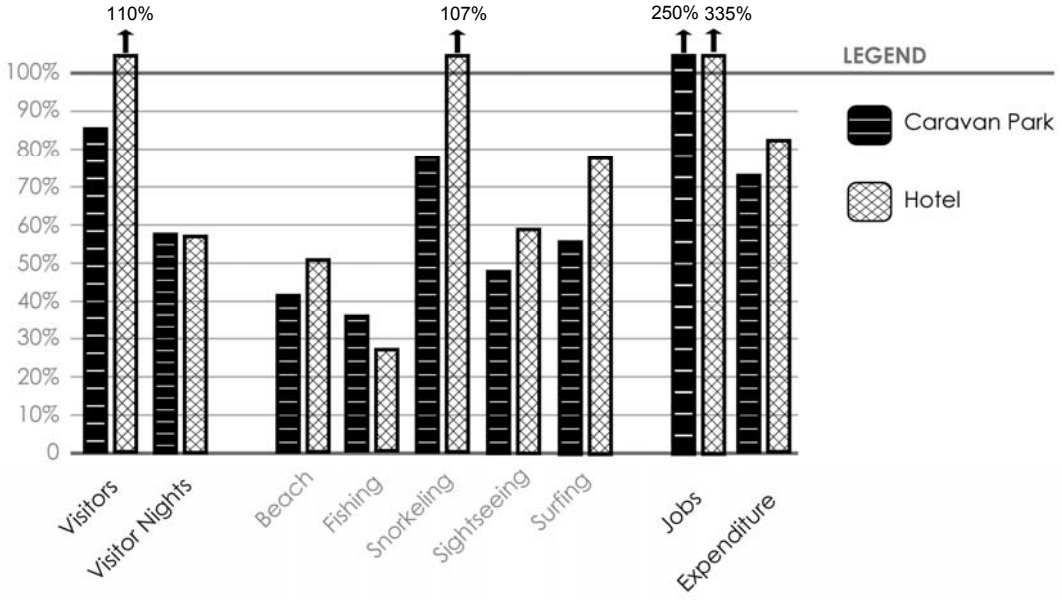

Figure 6.7: Comparison of tourism and economic impacts in the Ningaloo Region caused by adding 400 caravan park beds versus 400 hotel beds to Gnaraloo station (percent change from 2007-2037).

Figure 6.7 also compares the relative impacts of the two scenarios on jobs and visitor expenditure by 2037. Although the hotel scenario has a stronger positive impact in job generation and visitor expenditure, the difference in expenditure is not as great as would be expected in other locations. This is because some Ningaloo visitors, particularly backpackers and Australians on extended self-drive holidays, will stay in caravan parks while still spending money on activities such as whale shark tours. In both scenarios, campgrounds are displaced by the other forms of accommodation, driving up the average nightly expenditure. The hotel scenario creates the greatest increase in nightly spend: 15% to $63.75 by 2037.[17]

While the additional jobs hotel brings have positive social impacts, it also means more residents on the pastoral stations, who bring their own resource and environmental impacts and infrastructure requirements (all of which are included in the model results).

[17] It should be noted that the expenditure figures do not take CPI increases into account (in other words, they are in 2007 dollar values).

The positive impacts of the hotel scenario in terms of jobs and expenditure need to be weighed against a hotel's greater demand for resources (Figure 6.8). Water requirements of a hotel are substantially greater than a caravan park. By 2037, the hotel scenario results in a 258% increase in water demand on pastoral stations, versus a 100% increase for the caravan park scenario. However, the greatest difference is in electricity demand, with a hotel driving an electricity use up 400% over 30 years. It should be noted that the figures used in these model runs are based on existing practices. It is possible that future developments could be required or encouraged to reduce their power and water demand, thereby reducing the size of their impact.

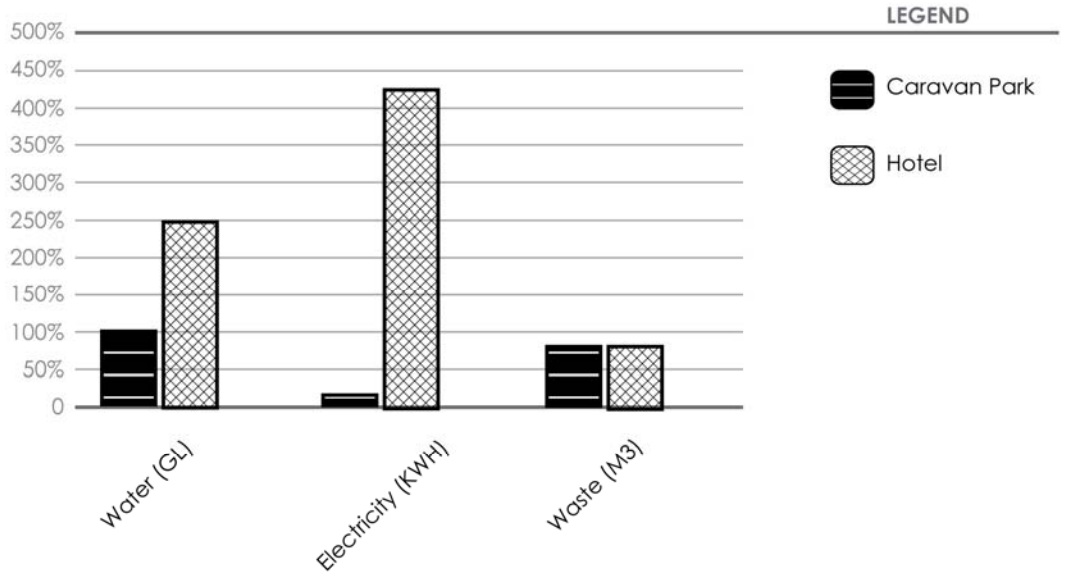

Figure 6.8: Comparison of resource impacts on Ningaloo pastoral stations, caused by adding 400 caravan park beds versus 400 hotel beds to Gnaraloo station (percent change from 2007-2037).

Ecological impacts for the two scenarios (Figure 6.9) were generated using the CSIRO's Ningaloo-Exmouth Ecopath, with Ecosim model.[18] In both scenarios, there are substantial reductions in fish stocks and catch rates. However, most of the fishing effort can be attributed to visitors staying in campsites, who, by 2037, still amount to over 69% of total visitors in both development scenarios. Nonetheless, the caravan park scenario has a distinctly greater impact on catch rates and fish stocks when compared to the hotel, with a respective 23% versus 17% reduction in emperor (Lethrinid) stocks by 2037. This is due to greater fishing effort on the part of people who stay in caravan parks. Coral impacts are similar under both scenarios. Snorkelling is the most popular activity for all visitor segments, and therefore increases substantially with any type of accommodation expansion. Although snorkelling effort increases by a larger amount under the hotel scenario, this effect is buffered somewhat by the fact that hotels attract a greater proportion of nature lovers, who are more likely than other visitor segments to self regulate their snorkelling to minimise coral damage.

[18] Ecopath with Ecosim is freely available from the University of British Columbia at www.ecopath.org.

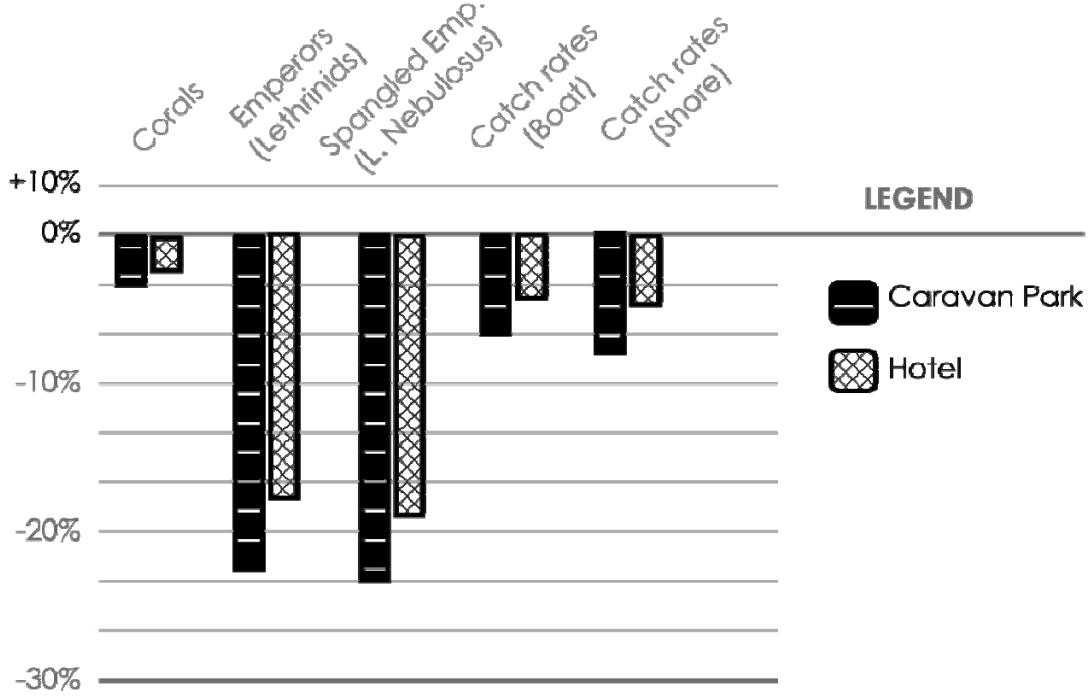

Figure 6.9: Comparison of ecological impacts on the Ningaloo region, caused by adding 400 caravan park beds versus 400 hotel beds to Gnaraloo station (percent change from 2007-2037).

Table 6.10: Outputs from the Ningaloo Destination Model and the CSIRO EwE Model.

		2007*	2037		% Change (2007-37)		Units
			CP	Hotel	Caravan Park	Hotel	
Visitors		18438	34186	38783	85.4%	110.3%	People
Visitor Nights		252048	397071	400646	57.5%	59.0%	Visitor Nights
Visitor Activities	Going to Beach	110263	155825	166258	41.3%	50.8%	Hours of Effort
	Fishing	280983	382825	357569	36.2%	27.3%	Hours of Effort
	Snorkeling	37595	67191	77771	78.7%	106.9%	Hours of Effort
	Sightseeing	36774	54574	58718	48.4%	59.7%	Hours of Effort
	Surfing	69108	107452	123073	55.5%	78.1%	Hours of Effort
Jobs		19	67	84	248.6%	336.7%	People
Expenditure		14.03	24.30	25.54	73.2%	82.1%	$AU mil.
Average Expenditure/ night		55.65	61.21	63.75	10.0%	14.6%	$AU
Water		15053	30170	53918	100.4%	258.2%	Gigalitres
Electricity		2272739	2645592	11886676	16.4%	423.0%	Kilowatt Hours
Landfill		2078	3825	3824	84.0%	84.0%	Metres[3]
Catch Rates (Rec.)		1.9845	1.8599	1.9129	-6.3%	-3.6%	CPUE
Catch Rates (Shore)		0.0463	0.0428	0.0441	-7.7%	-4.8%	CPUE
Lethrinids[1]		0.2623	0.2041	0.2134	-22.2%	-18.6%	Biomass
L.nebulosus[2]		0.2807	0.2163	0.2275	-23.0%	-19.0%	Biomass
Coral		2.2500	2.1844	2.1917	-2.9%	-2.6%	Biomass

*As the starting point, 2007 is the same for both model runs

[1] Lethrinids (emperors) are the most popular target species at the central and northern parts of the reef.

[2] L. nebulosus (spangled emperors) are an indicator species for the health of recreational fishing stocks.

6.5 Discussion and Conclusion

There are tradeoffs in three primary areas when comparing a hotel and a caravan park in an environmentally sensitive and remote location like Gnaraloo Bay. First, the ecology of the area is better served by a hotel as its temporary residents are less disposed to extractive activities like recreational fishing. It would be possible, and probably more effective, to mitigate recreational fishing impacts through more restrictive fishing regulations, but these are politically unpopular and difficult to enforce. Additionally, hotel residents tend to take greater care around coral when snorkelling, although educational programs could improve self-regulation of snorkelling among caravan park guests.

Second, hotels generate more tourist expenditure, driving growth in jobs and gross regional product. However, the expenditure difference between hotels and caravan parks is less marked in Ningaloo than other locations, due to the kinds of experiences that tourists are seeking in the region and the way that a lack of hotel beds across the region has pushed tourists into chalet and cabin accommodation in caravan parks.

Third, the resource requirements of a hotel are far greater than a caravan park, given current practices in the region. It is likely that remoteness and proximity to Ningaloo Reef will result in coastal developments having to provide their own water and electricity, and have stringent measures for disposal of waste including waste water. Provision of water on the west side of Cape Range is already a vexed issue, and there is little information about the quality of the water or the implications for Ningaloo Reef.[19] Water providers have expressed concerns over water provision in conversations with the research team. Electricity is also an issue, with the most likely scenario being either diesel (current practice), or a mix of diesel as base load and renewable energy sources. Thus reductions in water, energy and waste requirements are important in these circumstances. Planning conditions for future accommodation could require limits on electricity use, water use and waste generated per visitor night. Developers could also be required to demonstrate how they would meet and monitor these conditions. Another option would be to reduce the size of development nodes, or experiment with the accommodation mix.

The purpose of the NDM is to provide a starting point for discussions about tradeoffs and negotiations to set long term growth limits over a broad range of indicators. The NDM can also put this in the context of other developments, such as changes to the accommodation mix on the pastoral stations (as has already been mentioned, campsites were artificially capped in this scenario so that the specific impacts of the hotel and caravan park could be identified). The NDM results outlined in this chapter provide a starting point for discussions between planners, developers, community groups, agencies and other parties about current development plans and their appropriateness within the context of the *Ningaloo Coast Regional Strategy*. Using the NDM to examine the potential impacts of different development scenarios on Ningaloo pastoral stations may change opinions about the preferred direction of development. The range of potential uses of the NDM are discussed further in the next chapter.

The dynamics of the NDM are determined by the choices of tourists within the model and the capacity constraints set by the model users. As such, the NDM moves away from the deterministic assumption that the dynamics of the TALC model will automatically apply to Ningaloo, while capturing important aspects identified by Butler. The visitor mix is central to the dynamics of both the NDM and TALC as visitor preferences drive changes in both. The NDM uses visitor preferences and the region's capacities to determine the dynamics of change. It is therefore possible, by choosing different levels and types of accommodation, to avoid the tourism "life cycle", which could be enhanced further through targeted marketing and regulatory changes. Capacities should not refer only to the site and its immediate surrounds in a tourism context; they should also address the tourists' activities, which drive both the positive and negative impacts on communities and the attractions that draw tourists to the region, and the tourists' resource use. It is important to focus on the capacities that slow and alter regional tourism changes, such as: visitor accommodation, stricter regulatory regimes, residential accommodation, employee availability and social impacts. In particular, the NDM goes beyond TALC with regard to regulation, which protects the resource, but also drives changes in the visitor mix. In short it is not enough to assume that tourism "life cycle" will occur, particularly when it is possible to explore how capacity management can exert control over the future of a tourism destination.

[19] Recent research by Lindsay Collins (Curtin University) has confirmed the connection between the Cape Range aquifer and the distribution of habitats in the Ningaloo reef.

6.6 Acknowledgements

This chapter utilised data from the Ningaloo Destination Model and the CSIRO's Ecopath with Ecosim model implemented by Beth Fulton. Tod Jones drafted this chapter and implemented the Ningaloo Destination Model with contributions to the model dynamics from Jean-Paul Orsini.

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7. MODELLERS CAN HELP THEIR RESEARCH MAKE A DIFFERENCE

7.1 Summary

This chapter looks at how modelling researchers can serve as change agents. In particular, it looks at how they can facilitate emerging and adaptive behaviours in organisational systems, such that research and modelling has higher uptake for decision-making. First, this chapter looks at the challenges faced by modelling researchers in the Ningaloo system, and how these challenges necessitated a flexible, emergent approach to a participatory modelling process. Second, it looks at the emergence of adaptive behaviours among researchers and within the research program, and among groups and organisations in the Ningaloo region. Finally, it examines the factors that inhibited the emergence of these new behaviours.

Key findings related to this discussion are:

- While acknowledging the complexity and adaptive nature of the system being modelled, the methods for undertaking modelling projects are often conceived as if they were occurring in a relatively controlled environment. For instance, the researchers assume that the same group of people will be involved throughout the course of a modelling project, that priorities remain constant, and that the people who are involved will influence policy decisions. These are not realistic expectations in a turbulent system which is characterised by constant change, high staff turnover, and low connectivity between groups.
- Because tourism and other extractive industries are part of complex social-ecological systems, they tend to be turbulent (dynamic and unpredictable) and suffer from 'wicked' problems, and therefore resist planned or controlled changes.
- Researchers can create introduce new perspectives (diversity) and increase connectivity among the people (agents) in the system under study by iteratively conversing with a range of stakeholders in the process of developing models and promoting model uptake. In the Ningaloo case, as researchers and research administrators intensified their interaction with stakeholders, they became more responsive to stakeholder needs and concerns (i.e. they became more adaptive).
- This behaviour on the part of researchers then triggered emergent behaviours among some groups and organisations in the Ningaloo region. Local individuals and groups began to have more interest in using the modelling research for decision-making, and began to self-organise in ways that facilitated the transfer of modelling knowledge and capacity.
- As these new patterns of behaviour emerged, they were countered to a degree by a number of inhibiting factors, including anxiety among some researchers, slow response times to emerging local behaviours, no regional representatives on the research management committees, and the transient nature of research programs, connected to research funding cycles.

The implications for management are:

- An adaptive modelling project, where modellers act as change agents and projects are structured to take advantage of new emerging behaviours, requires the capacity to act quickly to encourage these behaviours, and roles for locals in research management. It also requires modellers who are well and regularly connected to enough organisations with enough diversity to begin a process of change, and who have the capacity to identify and take advantage of information systems within stakeholder groups. Modellers also need to respond quickly and effectively to factors that may inhibit emergence, and therefore model uptake.

- Emergent stakeholder engagement approaches may prove to be realistic and practical in turbulent situations where structured engagement and research uptake is frustrated by the dispersed, polarized and/or fluid nature of the stakeholder groups and the 'wicked' nature of the problems involved.

- In summary, when working in changing and uncertain (i.e. turbulent) socio-political environments (such as those characterised by high agency turnover and/or poor and volatile connections between people and organisations), researchers and managers need to intensify and expand stakeholder engagement, be flexible in their approaches, and be open and responsive to new ideas and behaviours that could potentially improve research and modelling uptake. This process can be assisted by deploying a knowledge broker in the study area for an extended period.

7.2 Introduction

When modelling projects are ineffective, it is generally because they have failed to sufficiently engage with affected groups. Dray *et al.* (2006) note that the early stages of participatory modelling approaches are often overlooked, where the worldviews of stakeholders and their relationships are assessed. Dray *et al.*'s criticism indicates an assumption of modelling—that a model will be culturally acceptable. In some Role Playing Game modelling, this assumption is reasonably realistic due to the efforts of researchers to understand the cultural assumptions of stakeholders (Dray *et al.*, 2006), or their care in not prescribing solutions to problems through model design (D'Aquino *et al.*, 2003). However, this is generally not the norm in modelling processes. Although a standard modelling approach would now include participatory processes, there is still a set of unstated assumptions about the implementation process, particularly that the model (or more broadly, a modelling solution) is culturally appropriate for the stakeholder group that it is trying to assist.

A guide for modelling processes with a focus on stakeholder engagement and participation is Marjan van den Belt's *Mediated Modeling* (2004). She divides the process into three stages: preparation, workshops (including qualitative and quantitative model building), and follow-up. The preparation phase is extensive, including identifying and assessing stakeholders (including champions and social networks) who will be involved in the process from start to finish, conducting a series of introductory interviews, and preparing a preliminary model as a point of reference for participants to work from, or reject completely. In the workshop phase the modelling team works extensively with the stakeholder group to develop and test the model, including specifying indicators and variables and testing the model. The van den Belt approach requires a high level of participation. This kind of process assumes that the same group of

people is involved from start to finish, that the level of engagement remains high throughout the process, and that once completed, that the involved group has the capacity to either champion cultural change following their own transformed understanding, or that behavioural change will be enforced.

Model uptake is more likely in situations that fit this set of assumptions, but these, unfortunately, are relatively rare in reality. Even in fisheries, where models are widely used, an adaptive process has been required as well as years of repeated stakeholder interactions. In Australia, for example, the willingness of fisheries stakeholders to accept model proposals and findings is due to much hard work by all parties (industry, management and modellers) and a culture of involving fishers, industry, managers and researchers in Management Advisory Committees. Although fisheries has a more clearly defined group of stakeholders than does tourism, it suffers from the same list of issues we discuss in more detail below – attitudinal inertia, high turnover rates (particularly in the regulatory bodies), communication barriers and a mismatch between the scales of industry operation and the speed with which management bodies can respond. The multi-stakeholder research assessment groups that are a feature of Australian commonwealth fisheries management of today (Smith *et al.*, 2001) are one example of how science delivery to resource management in Australia has evolved. It now has the capacity to communicate with the rest of the industry and to highlight the need for, and assist with, behavioural change when required by changing regulations. The presence of researchers in management processes also assists the long-term engagement of all parties in management. This structure (and all the effort that has gone to see the management system evolve to this point) has paved the way for ecosystems modelling to inform the management process and to assist a shift in the fisheries paradigm from single species to ecosystems (something the fishers welcome as it more intuitively matches their understanding of the system). In other fields, such as tourism, the decades of preparatory work have yet to occur, so management and communication hurdles must be faced in full force. Moreover, given the array of pressures facing socio-ecological systems today sectors such as tourism must quickly learn the lessons of fisheries while trying to avoid the crises fisheries have suffered during the evolution of their management systems.

Using projects within the Ningaloo Collaboration Cluster group of projects as a case study, this essay explores our experiences as researchers running a modelling program with a strong emphasis on engagement. We focus on the adjustments we made to our projects and approaches in response to changes in the region and dialogue with local and regional stakeholders. In particular, we examine how modellers can behave adaptively within complex, human systems that are themselves difficult to predict or control. We argue that adopting approaches that treat organisations as complex systems are conducive to model uptake. We also believe that potentially, these approaches can lead to broader systemic changes that move communities towards more sustainable resource use. In addition, we argue that these approaches are particularly useful when dealing with ‘turbulent’ organisational systems (uncertain and disordered) and so-called ‘wicked problems’ (Rittel & Webber, 1973). Wicked problems are complex socio-environmental problems that span multiple disciplines and world views. They are impossible or difficult to solve because they can’t be singularly defined, they don’t have right or wrong solutions (just better or worse as subjectively defined by involved stakeholders), they have numerous subjective causes, and their implemented ‘solutions’ have significant consequences, meaning there is no opportunity and trial and error learning (Rittel & Webber, 1973). The ideas explored here are preliminary and form part of Ms Kelly Chapman's doctorate on *A complexity-based approach to knowledge brokering and research uptake: Working to*

build adaptive institutions in Western Australia's Ningaloo Region at Edith Cowan University. We anticipate that this chapter will be revised into an article once Kelly has further developed these ideas in the context of her doctoral research.

It is worth noting that some modellers are cognisant of the impossibility of capturing the complexity of culturally determined interactions and decisions, and have grappled with how to undertake modelling that can cope with diverse stakeholder groups. For example, in addition to incorporating a diversity of stakeholder views in their models, D'Aquino *et al.* (2003) also involved stakeholders in designing and using their models. This intensive engagement creates the iterative dialogue and interaction needed among stakeholders to explore options and improve their collective decision-making capacity, i.e. it creates the necessary conditions for emergence of new behaviours. D'Aquino *et al.* (2003) argue that such 'self-designed' and empowering modelling processes are more likely to lead to better governance of resources than expert-built models generating specific resolutions for complex problems, resolutions which may or may not be taken up by decision-makers. From this perspective, the models are culturally appropriate for the stakeholder groups because the game is broad and flexible enough to encompass culturally influenced interactions and priorities. This breadth allows the *process* of developing and using the model to generate empowerment and interactions between agents in the system, from which better decision-making behaviours emerge. Although this paper deals with the interactions around model development and use, it also addresses the broader issues and opportunities around research uptake.

7.2.1 Tourism, Research and Modelling in Ningaloo

As reviewed in the first two chapters, due to the attractiveness of the Ningaloo coast's natural attributes, tourists are a major economic driver in the region. Tourism development to date, however, has been somewhat '*ad hoc'* (Wood, 2003) and the region is challenged with balancing tourism development and management of ecological resources. Additional challenges include: conflicts between pastoralists, residents, tourists, and protected area managers over land tenure and management priorities; housing issues in Exmouth and Coral Bay; and concerns over fishing restrictions and changes to residents' 'way of life'.

These concerns are being addressed by research projects in the Ningaloo Collaboration Cluster (NCC). They cross a range of disciplines with the goal of describing, understanding and modelling the processes of human interaction with Ningaloo Reef in support of sustainable management of the region. Two projects within the NCC are developing computer models to explore management scenarios that can help sustain the ecological integrity of the region (Hall, 2000): the Ningaloo Destination Modelling project (NDM) and the *In Vitro* Ningaloo model developed by the CSIRO's Marine and Atmospheric Research Division. These two projects worked together in the region to promote the models and to establish a platform for ongoing model use. It can be argued that the uptake of sustainable management options—moving from research to practice—will depend on the adaptive capacity of the institutions and organisations responsible for governing tourism activities in the Ningaloo area. Adaptive capacity in this case is the collective ability and willingness of institutions to respond to NCC's data and modelling results in their policy and decision-making processes.

The literature indicates, however, that despite careful research, modelling and planning, management recommendations in complex social and ecological systems, such as those being

proposed for tourism in Ningaloo, often fail to deliver as expected on the ground (Medema *et al.*, 2008). Walters (1997) for example, cites that of the 25 major adaptive management planning exercises he has been involved in, 23 either 'vanished' without visible product or became trapped in an endless cycle of model refinement. Similar results have been observed in businesses aiming to improve their learning and adaptive capabilities by undertaking strategic or change management initiatives; Senge *et al.* (1999) note that most business-related change management initiatives fail, citing studies that show failure rates of around 70%. This institutional inertia is related to the 'homeostatic' nature of all organisations/institutions, in which systemic forces work to preserve the status quo in the face of new changes (Senge *et al.*, 1999).

7.2.2 Emergence in organisations

While government departments and research organisations are not typically commercial entities they often share structural and behavioural characteristics with those kinds of bodies. This is particularly the case as these departments grow in size and scope. This means it is quite appropriate to apply the body of work based around treating organisations as complex adaptive systems to regulatory and research bodies. Seel (2008) provides an in-depth overview of organisations as complex adaptive systems. The homeostatic nature of organisations can be explained by one of the most important features of all complex adaptive systems: "their ability to self organize; for ordered patterns to emerge simply as a result of relationships and interactions of the constituent agents, without any external control or design" (Seel, 2008). The phenomena of large scale order, or patterns, emerging from small scale interactions between individual parts, or agents, is called *emergence*. Emergent order forms spontaneously and cannot be predicted from the properties of its constituent parts (Seel, 2008), though insight into potential emergent behaviours can be gained from looking at the co-determined effects of a system's interactions and environment on its components (Corning, 2002; Lansing, 2003). An increasing capacity to identify points of possible emergence and its potential form does not immediately translate into managerial power. Once formed, the emergent order typically resists change and cannot be controlled (Seel, 2006), though experience in fisheries and other complex adaptive systems is showing they can potentially be managed, a subtle but important distinction. This distinction helps us understand why 'managing' organisations, especially via imposing controlled or planned change, is so difficult and so often unsuccessful, and why some organisations fail to significantly adjust their policy or management practices even in the face of compelling evidence to do so (for example, via research or modelling). The successes do, however, lead us to ask how emergence of new behaviours can be fostered that make organisations more responsive to changes in their socio-economic and biophysical environment (i.e. increase their adaptive capacity)?

Answering this question should begin with considering organisations as complex adaptive systems. They are made up of a large number of separate autonomous agents, each operating in its own interest but also following a set of rules, much like birds in a flock. These rules, even when very simple, change a random assembly of agents (e.g. birds) into a cohesive functional unit (e.g. a flock), a whole which is greater than the sum of its parts. Other examples include fish shoals, ant colonies, organisms, ecosystems, the stock market, and consciousness. No-one or no-thing is in charge, and yet all the necessary co-operation between the agents occurs. Attempting to change such systems using centralized control or structure will have limited effectiveness because the systems are dynamic and unpredictable from a reductionist

perspective. Instead management rules must be folded into the context of the system and from that perspective potential means of influencing (i.e. guiding or managing) the system can be identified (Fulton *et al.*, 2010). This inclusive perspective is required because in such a complex adaptive system even a few simple rule changes modifying the interactions between the system's constituent agents have the potential to alter the behaviour of the entire system. What computer simulations show is that certain conditions do facilitate emergence of new behaviours in complex adaptive systems, including the connectivity and rate of information flow between agents in a system, and the diversity of agents in a system (Holland, 1995; Kauffman, 1996; Langton, 1986).

As such, if there is low connectivity, diversity and rates of information flow between its people, organisations are very stable and unchanging. These organisations require little energy or information flow to sustain them, however they are not really learning or adapting because existing patterns of connection have ossified (Seel, 2006). As connectivity, diversity and information flow increase, the organisation becomes 'energized'; it is less stable, but spontaneously more responsive and adaptive to its environment, without any centralized control or intervention. Some organisational management scholars are now suggesting that simple conversation between people (i.e. agents) is the currency of change in organisations, with conversation being the most effective mechanism for increasing connectivity, diversity and information flow between agents (Shaw, 2002; Stacey *et al.*, 2000). Thus by increasing conversation between individuals in a system, the system's ability to respond and adapt to change is likewise increased. An additional benefit is that such discussions also highlight alternative behavioural drivers, clarifying the context of interactions for agents in the system, and allowing for a more effective selection of management options that can help guide the system into behaviours that lead to the desired emergent outcomes (Fulton *et al.*, 2010).

Stacy *et al.* (2000) argue that it is the tension between power, conflict and cooperation inherent in the relationships between people that leads to emergence in human systems. Furthermore, Seel (2006) suggests that emergence in organisations can be facilitated through people's intention and desire to influence outcomes, and that this intention is often created as people in the system interact. However, inclusive co-management approaches are not without their potential drawbacks. For example, in applying Kaufman's (1993) work on formative causality in systems, Stacey (1996) suggests that emergence can be inhibited by extremes (too little or much) of motivation or anxiety among people in the system, or by strong power differentials. For example, emergence may not materialise if too many people in the system are apathetic or un-empowered, or it may be suppressed by powerful people with vested interests who feel threatened by change. This helps explain why rapid institutional learning and reorganisation is most often precipitated by crisis (Berkes & Turner, 2006).

As such, it can be argued that modelling researchers should be able to increase the uptake of modelling and research results for policy and decision-making in complex, human systems, by initiating conversations–both formal and informal–about doing so among a diversity of people in such systems.

By connecting people through conversation, new ideas, behaviours, and groups begin to emerge, which can become established and lead to more inclusive and effective adaptive management in the long term (e.g. multi-stakeholder groups found in Australian fisheries management structures). A measure of the success of the researcher's efforts is when explicit

nurturing of such connections by researchers is no longer critically needed. Researchers can also work to encourage emergence through "watchful anticipation"(Seel, 2006): watching for signs of new 'behaviours' in the system and, where possible, fostering facilitating factors, such as people's growing visions and desire for change, and minimising inhibiting factors, such as excessive anxiety and control exerted by powerful and threatened agents in the system. This role must be handled with care, however: the researcher must be careful not to take on an advocacy role for only a subset of the system as other stakeholders will disengage and this will ultimately undermine improvement in adaptive capacity.

7.3 Modellers as Agents of Change: The Ningaloo Coast Case Study

The purpose of this paper is not to explain or discuss the models developed for the region, or to detail the structured process of engagement and collaboration (already covered for the NDM in other chapters, and in a separate CSIRO report for the Marine and Atmospheric Research Division). The focus here is the factors that facilitate (or inhibit) the emergence of new patterns of behaviour in Ningaloo's organisational systems, particularly those behaviours which may improve the systems' adaptive capacity (in this case framed as uptake of research for decision-making).

7.3.1 Challenges faced by modelling researchers

Modelling researchers in Ningaloo faced a number of challenges that made it difficult to apply van den Belt's (2004) structured approach to stakeholder engagement. These challenges can be largely linked to tourism and other extractive industries being part of complex social-ecological systems (McKercher, 1999), and the turbulent nature of these complex adaptive systems in the Ningaloo case.

The difficulty with modelling research uptake at Ningaloo is both connected to and analogous with tourism. In particular, low connectivity between the organisations operating in the Ningaloo tourism system was one of the challenges faced by modellers. Tourism is driven by the activities and expenditure of people from outside of a region, state or country. These visitors often consume the same services and buy the same products as locals, such as using the local supermarket, fishing and generating waste, as well as purchasing leisure activities such as tours and staying in tourist accommodation. People who work in tourism are aware of this. A travel agent we interviewed in the region stated that even the funeral parlour benefits from tourism. However, outside of dedicated tourism businesses, many of the organisations that provide services to tourists do not perceive these benefits and do not see themselves as tourism organisations. This includes protected area managers and local government, organisations that generally manage the negative impacts of tourism, but receive little direct financial compensation from tourists.

Amongst businesses that provide services predominantly to tourists (booking agencies, hotels, tour operators), there are varying degrees of cooperation with few links between some businesses (for instance, a caravan park and a four star resort). This variation has led Leiper (2008) to label tourism partially industrialised, and to claim that there are many tourism industries. When this concept is extended to businesses that do not perceive themselves to be in tourism (despite influencing and being influenced by tourism), it is not surprising that there is

low connectivity between individuals and organisations across a tourism system. This connectivity is further reduced when notions of sustainability extend the boundaries of a tourism system to encompass impacts on water, waste, host communities and regional ecology. Since tourism is currently the largest economic activity and the primary generator of environmental and social impacts in the Ningaloo Coast region, it is not surprising that there are low levels of connectivity in Ningaloo's socio-ecological system, and many grey areas associated with tourism impacts and management.

Like tourism, the broader Ningaloo Coast community has many coexisting networks with differing degrees of connectivity; as such, responsibility for negative impacts can easily fall into the spaces between these networks. Furthermore, the history of conflicts over land use between pastoralists, some tourists, government agencies, local businesses and the two shires in the region exacerbates these divisions. For example, indigenous involvement in the modelling process was not straight forward due to the politics between different groups in the region. After a two year process of attempting to engage through the native title group that includes the Ningaloo Coast, the NDM project decided to work with the Baiyungu Aboriginal Corporation (BAC) while maintaining good relations with other groups. The BAC had a clear and undisputed connection to a substantial section of the coastline: they owned a coastal property close to Coral Bay, and had opportunities to be involved with tourism development at Coral Bay through native title negotiations. While not an active participant in meetings, BAC members were happy to talk at length privately; consequently their perspectives were incorporated into the CSIRO *InVitro* model. Thus the indigenous perspectives had influence through model use rather than direct discussions. Although this route to inclusion reduced the diversity of conversations held within the participatory workshops supporting the model building process, and so was not ideal under the guidelines laid out by van den Belt (2004), it is another example of how the modelling process needs to be adaptive and culturally aware. Not all cultures share information in the same way and the inclusion of the concerns and perspectives of the indigenous community (in this case in the CSIRO model) is more important than sticking to a "modelling method script".

Low connectivity between individual stakeholders was another challenging factor faced by modellers in Ningaloo. An important factor in any complex adaptive system is its initial state. The adaptive capacity of a set of organisations depends in particular on the connectedness of individual members within and across organisations, the rate of information flow, and on diversity. Circumstances can increase adaptive capacity, through crises that threaten a natural resource like a water catchment or fishery, or through the long-term engagement of a researcher with a set of organisations (as has occurred in fisheries). Unfortunately, the adaptive capacity of the Ningaloo Coast region was limited, as connectivity between individuals in different organisations was often low due to the characteristics of the industries active in the area (including tourism) and historic conflicts between different groups. Additionally, it became apparent through discussions with the tourism industry and other groups that they had few connections with the employees of agencies where information was exchanged e.g. DEC. This was reinforced by network analyses undertaken as part of the research by Peta Dzidic, Geoff Symes and Jeff Dambacher that showed that only a few well connected nodes were present in the system and that research was typically isolated from the other system members. In such a context, it is unsurprising that the early research results and modelling effort were not penetrating very far into the set of organisations that together managed tourism. Significant

efforts (described further below) have since been made to try and redress this isolation and build a more robust network of communication channels.

Sustaining effective stakeholder communication and engagement was also a challenge for modellers. The Ningaloo Destination Modelling (NDM) project was the first to initiate engagement in the region. It began very positively by following van den Belt's mediated modelling approach. Over fifty people attended a workshop in Exmouth, which closely followed a nationally televised segment on the research by a current affairs program. The workshop was successful at defining what the model should address based on the concerns and hopes of locals, and assessments indicated the workshop successfully communicated the purpose of the project. These successes point to the potential of modelling projects to build connectivity in a system. However, despite this initial broad base of support, numbers dropped considerably for subsequent workshops, even with the wide distribution of follow-up newsletters. While the aim of the project was to operate with a broad base of public support, the NDM project focussed its time and resources on engaging a smaller group of locals from the Ningaloo Sustainable Development Office (NSDO, a regional office of the Department of Planning), the Shire, DEC, the accommodation sector, the pastoralists and some of the tourism operators. Information therefore flowed predominantly to a small number of groups on a regular basis following the initial workshop. Even with these groups, communication was every 3 to 6 months, until a member of the research team moved to the region. A related issue was the style of communication, with the content of presentations gaining clarity as the project progressed. Communicating research results was identified as a major issue part way through the project, which also affected the rate of information flow amongst Ningaloo residents.

Another significant challenge was turbulence caused by staff and agency turnover in the region. Considerable amounts of time were put into cultivating relationships with key staff members in different organisations who could champion the research in their organisations, and potentially beyond to other organisations and groups. The key organisation for much of the project was the NSDO. The NSDO was the most likely custodian for the models due to their oversight of land use planning along the coastline between Carnarvon and Exmouth (a critical process in controlling tourism development), and their coordination of regional development. The NSDO had the capacity to promote model use across organisations and feed research results into planning processes; initial discussions indicated that they would be willing to take custody of the model. However, with the change in government in 2008, funding for the NSDO was discontinued and its staff left the Department of Planning. This meant that clear delivery of modelling tools to a local champion, who would use the model and communicate its results, has become problematic. This is an on-going and increasing issue for research bodies, with Ningaloo but one example. Although there is a demand for tools that support adaptive resource management, there is often little scope within busy management agencies and businesses to adopt modelling tools (some of which require specialist skills to operate). In addition, modern funding arrangements make maintenance of such tools within research bodies problematic, with staff moving on to new questions in new locations once they finish a research project. In the Ningaloo case, new, shared, arrangements for using and maintaining modelling tools are evolving, but even this is proving to be an adaptive aspect of the model delivery and uptake process.

Staff turnover in locally-based organisations was also a problem; new staff had to be lobbied about the modelling project and educated about the methods, then their perspectives had to be

incorporated in the modelling process. Staff turnover in Exmouth was very high: only one out of six original staff in the Shire's senior management team was present throughout the three year life of the project. Because these individuals were originally conceived as the key people for promoting model uptake in the region, their departure was a major impediment to information flow.

7.3.2 Emergent behaviours among researchers and the Ningaloo Research Program (NRP)

As researchers fronted the challenges associated with transferring knowledge in this turbulent environment, they began engaging a range of stakeholders to promote uptake of the modelling tools, thereby brokering increased connectivity and diversity between agents (stakeholders and researchers) operating in the region. Researchers also began fostering new behaviours in Ningaloo's organisational systems that were emerging in response to this stakeholder interaction. For example, the closure of the NSDO and staff turnover in key agencies, such as the local DEC and Shire offices, led greater promotion of the research and modelling to different organisations and stakeholder groups, both at the regional and state levels. In particular, researchers renewed one-on-one contact with stakeholders in the region (via phone calls, meetings and local forums), to inform people about the model capacities, and to garner feedback on modelling scenarios relevant to stakeholders in the region, given current concerns and planning and development activities. The NRP also responded to regional concerns and needs by assessing the impacts of past and current proposals for tourism and other development. As the engagement component of the NDM project progressed, locals indicated that they had serious concerns about changes to their lifestyles, particularly leisure activities such as fishing and surfing. Leveraging concerns over lifestyle became an important way of increasing information flow and connectivity through the system. As such, interest in using the using the models to help inform planning and decision-making in the region was generated and renewed. This was further reinforced by a series of training workshops held in the region, which introduced stakeholders to adaptive management concepts and how to use the models.

Deployment of a regionally-based knowledge broker

One of the authors of this chapter, Kelly Chapman, moved to Exmouth as part of her doctoral research on research uptake. Using an action research approach, she has taken on the role of a 'knowledge broker' between researchers and regionally-based stakeholders. Knowledge brokering involves the transfer of knowledge between researchers, practitioners and policy makers through interpersonal relationships. Kelly's work is examining whether stimulating conversations between different stakeholders and researchers leads to emergent –and potentially adaptive –behaviours in groups and organisations in operating in the Ningaloo region. She has been living in the region for a year, and has worked with modelling researchers to expand and strengthen connections/relationships between agents in the system (primarily between researchers and local people/agencies). She has also conducted 35 stakeholder interviews which explored barriers and opportunities related to the knowledge transfer process, and identified current issues that could benefit from modelling/research.

In a bid to mainstream Kelly's work into their ongoing management of the NRP, the research committee invited her to participate in monthly research committee meetings and other planning activities. This opened a new and important conduit between the region and the NRP, as Kelly

has been able to use these opportunities to channel stakeholder concerns and suggestions directly to the research committee. Kelly has also passed along stakeholder advice on how they want to be communicated with and how they want the research results formatted and delivered. Other researchers with direct contact with regional stakeholders, including the other two authors of this paper, have likewise been able to channel advice back to the NRP.

Kelly's long-term presence in the community also helped researchers tap into regional communication networks and identify potential locally-based partners for assisting with knowledge transfer in the region, most notably the Gascoyne Development Commission (GDC). The GDC is a key player in the region because they are viewed locally as relatively neutral (unlike DEC or the Shires), and because they have a strong network of relationships with all of the region's key stakeholder groups.

Improving communications

As modelling researchers engaged with local groups, they worked to improve the clarity of their presentations by using common language and easy to understand formats, and by tailoring the focus of modelling results to be relevant to the interests of specific audiences. This involved speaking and meeting with stakeholder groups (often using Kelly in her knowledge broker capacity) to identify topics of interest prior to coming to the region to present the models. Kelly's prior experience as a science communicator assisted this process greatly. This experience has also enabled the modellers guide other researchers in making their research findings more accessible to the local community, who have often complained about not seeing any return for the support they give to those conducting research in the region. Additionally, CSIRO's Communications section developed a communications strategy to help reach agencies and a broader audience. The communications strategy was also an opportunity to garner advice from regional stakeholders (via a Regional Reference Group – discussed below) on how to best engage people in the region. As the communications plan is not yet complete or implemented, the actual extent of local involvement in the strategy's development and delivery has not been fully determined.

This innovative activity on behalf of the researchers constitutes adaptive/emergent behaviour. However, as these actions are not generally perceived to be the traditional role of a research committee they did meet resistance, as predicted by the work of Seele (2008) and Senge (1999). This resistance is described in a later section.

7.3.3 Emergent behaviours among groups and organisations in the region

As the NRP engaged local stakeholders, the connectivity, information flow, and the diversity of groups engaging with the modelling research increased. This became most effective once an ongoing regional presence, via Kelly's role as knowledge broker, created or renewed connections through many local conversations. The modelling team needed to be able to make enough meaningful connections to generate new ideas, then to use regional networks to increase their penetration into the community and local organisations. As a result, a number of emergent behaviours arose among groups and organisations in the region. Although we have separated the novel behaviours emerging in the NRP and the region for the purposes of this discussion, it

should be noted that these behaviours actually evolved synergistically and in dynamic response to each other as a result of increased connectivity between the agents of both systems.

A suggestion generated through Kelly's conversations with stakeholders was for a part-time regional research coordinator, to work with stakeholders to promote research more broadly in the region and to ensure use of the models regional planning and assessment processes. This suggestion was initially funded through three NRP projects. The GDC saw an opportunity to link the coordinator position to one of its proposed projects, the Ningaloo Research Centre (a regionally-based educational research facility) and offered to sponsor and help fund the role. Importantly, this decision also created an opening for the GDC to become more formally involved in the NRP's knowledge transfer process.

Further conversations between Kelly and locals led to the formation of an informal Regional Reference Group that involved, amongst others, the Exmouth Chamber of Commerce, the local conservation group, the GDC, DEC and the Exmouth Visitors Centre Marketing Committee. This created a new set of connections across institutional boundaries.[20] The Regional Reference Group provided suggestions for regional roll-out of the NRP communications strategy, suggested content for regional communications, promoted local presentations and provided advice about the timing of events. The group also made the decision to link the research coordinator position to the reference group, by making the coordinator its chair. Information generated by the research began to circulate more broadly and more often through this group and through Kelly's activities.

Where a set of organisations are involved , as is the case for Ningaloo tourism, the modelling also needs to generate new connections between the organisations if it is to build regional capacity to effectively use the modelling tools and the research. The Regional Reference Group is an example of how this can happen. This group has the capacity to become an ongoing informal 'community of practice' (Wenger, 2005) that facilitates the interface between science and management in the region. Such an umbrella group could also potentially provide coordination across planning processes and management decisions. Running a modelling project from outside a region may be possible if there is a small committed group of locals involved and there are well-structured, regular meetings. In our case, a regional presence made a big difference to both connectivity and information flow.

As a result of these emergent behaviours, there does appear to be some preliminary uptake of modelling and research in the Ningaloo region. Rounds of meetings between researchers and stakeholders appear to be generating some interest in using the models for decision-making in the region. Discussions are underway about using the models to help inform different planning processes taking place in the region. Notably, one of the Shire's has expressed interest in using the models for a community visioning process, and some stakeholders have expressed an interest in using the models as a tool to facilitate multi-stakeholder discussions and decision-making in relation to planning and development proposals. Another consequence of broader engagement in the later regional forums was that some locals began to push for a review of the recreational fishing regulations, which would have been unlikely if broader scale engagement had not been done.

[20] It should be noted that the two Visitors Centres had been closely involved in the research, but this required re-engagement following manager turnover in Exmouth and Carnarvon.

In addition, some stakeholder groups have asked for training on how to use the models and in adaptive management. There is also a lot of interest in seeing the models housed locally, together with a locally based modelling support person (possible the Regional Research Coordinator). The GDC and the Ningaloo Research Centre have been suggested as suitable regional hosts for the models.

7.3.4 Factors that inhibited emergence

As these new behaviours began emerging among groups and organisations in the region, they were countered by a number of inhibiting factors. Some of these have been mentioned and all were largely related to the gap between the traditional composition, role and operation of a committee providing research oversight, and the kind of committee that can respond most effectively to emergence arising from research activities. Although our research committee was flexible in its approach, recognised the importance of local engagement and communication, and was prepared to invest additional resources to encourage research uptake, it is still worthwhile examining the particular structural issues that inhibited emergence.

The new set of activities that followed Kelly's entry into the region were supported by the research projects' management team, although this was not without tensions. Historical tensions between agencies and stakeholders in the region created anxieties about affiliating the NRP with a regional group consisting of polarised stakeholders. This was particularly so given the potential for conflict over negotiations for the excision of the two kilometre coastal strip from the pastoral stations (the excision itself being a 'wicked' problem). Concerns related to the make-up and purpose of the reference group, and who, if anyone, would control it. Start-up of the regional research coordinator position was also delayed due to concerns in the research committee. The first candidate who had experience in similar roles eventually chose not to take the position due to delays in the appointment process. A later candidate pulled-out, in part because of concerns about political concerns associated with the role.

Moving from research management to research uptake

Anxiety within the research committee restricted its capacity to move on emerging opportunities for knowledge transfer in the region. The composition of the research committee reflected its purpose—managing the progress of the research projects. It was comprised of senior researchers, project leaders, and later in the project communications officers and researchers with links to the local communities. Local groups were not represented, so anxieties over new activities in the region were not balanced by assurances from regional organisations on the potentials of these new opportunities. This lack of proportionate power slowed the diffusion of anxiety.

The major issue, however, was not so much the concerns noted above (although these are pertinent), but the rate at which information flowed back to the region. Once new activities began to emerge, the research committee and researchers were generally supportive, but tended to respond slowly through monthly meetings, with concerns sometimes only being raised in subsequent meetings. Research institutions tend to move slowly in response to new opportunities (i) as their role is perceived to primarily be in research oversight and (ii) because their attention is divided between that particular body of research and the many other projects and responsibilities they have. It is worth noting that these delays arose despite the research

committee's flexible approach and willingness to adapt to take advantage of new opportunities and are potentially unavoidable, given the nature of modern research bodies. Generally, the impetus for change in the region moved much more quickly than the research committee and had slowed by the time the committee came back with decisions, which were supportive of regional initiatives.

Tensions between adaptive and more staid organisational structures also arose around the development of a communications plan. Institutional protocols (designed to keep relevant regulatory and ministerial bodies informed, and avoid potentially politically embarrassing situations) mean that there is typically a high degree of "in-house" control over public relations processes. Consequently, local and researcher involvement, outside of management committees, tends to occur once the plan is fully formed, rather than through a process that occurs across the development of the communications plan. Unfortunately this can restrict connectivity, and impacts upon the potential uptake of the information, reducing the likelihood of information circulating broadly if regional stakeholders (and the community more broadly[21]) do not feel engaged.

Structural limitations of the current research model

A second point of local interest was the Ningaloo Research Centre. The proposed Research Centre was backed by the GDC and had strong local support and a board with excellent community networks. However, universities and researchers wanted little to do with the Research Centre due to concerns over the ongoing funding that buildings require, and the important concern that institutions may not have research funds to commit to an ongoing program in a single location. Institutional sensitivities are acute around liabilities associated with whether or not a body is a legal entity, and are linked to past experience where other informal bodies showed much promise, but never made it to an independent, self supporting status and collapsed (even after considerable injection of funds, effort and time). While researchers did provide advice about how to attract researchers and ongoing funding, researchers chose not to pursue the proposed Research Centre as an opportunity to promote research in the region and engage with regional organisations.

Finally, the ephemeral nature of research programs also impeded emergent behaviours in the region. Just as regional tourism and extractive industries can be conceived as complex adaptive systems, tourism and research also form a complex adaptive system, with an important control variable being the research funding cycle (a slow moving variable). The adaptive cycle of research has its own 'collapse' phase, where researchers consolidate their activities at the end of a project while looking for the next research opportunity. Unfortunately, researchers wind down their engagement with the region at the time when their research is most likely to stimulate adaptive behaviour. Based on the poor uptake of some of its previous research, CSIRO was aware that opportunities for research uptake and 'impact' can be lost in part because of the shifting focus of researchers. Consequently, CSIRO has provided additional funding to ensure that the model promotion, training and use will continue beyond the life of the project. Nonetheless, this funding has a limited lifespan and CSIRO is looking into other collaborative

[21] It is worth remembering that in small population centers, such as those in the Ningaloo region, the local community puts a good deal of weight in local representation and distrusts external influences. Thus disaffection of local representative with the engagement process can have a cascading effect across community attitudes, in a way that would seem disproportionate in larger settlements where there are many competing information networks and representational bodies.

long-term solutions. As much of the information flow in the Ningaloo system has relied on preliminary results (and needs to as stakeholders will not remain engaged if the modellers "go silent" for years as they work to final model results), the continued funding ensures ongoing connectivity and information flow until the final research results are available, and perhaps beyond.

Modellers are still absent from the region for long periods, an issue that will only be resolved if the models are located in the region where they can be accessed by locals, or a regionally based facilitator. Regional training workshops on how to use the models met with mixed success. Training in Exmouth and Perth was well received, but there was poor attendance in Carnarvon due to a variety of events occurring on the days of the training that had implications for many of the invitees, and a training event for the pastoralists in Coral Bay had poor attendance, in part due to the two floods and cyclone that occurred in the region in the three months preceding the workshop date in early February 2011. The structural limitations of research need to be viewed alongside the difficulties of engaging with potential model users who are busy and have multiple roles and demands.

7.4 Conclusion

As connectivity between regional groups and organisations and the researchers increased, new behaviours emerged in two contexts. In the region, the configuration of stakeholders in the regional reference group indicates a new attitude to engagement with each other and with researchers, as does the GDC's willingness to work with research organisations to sponsor the regional research coordinator position. The set of organisations that manage tourism in the region have now become more change ready. Emergent behaviour is also evident in the research committee, through willingness to work with the regional initiatives, and the development of a communications strategy.

Increasing the diversity of agents interacting in a system is also relevant. Modellers often use participatory modelling approaches and techniques such as Role-playing Games and Agent-based Models to collate multiple stakeholder viewpoints in their conceptual models (D'Aquino *et al.*, 2003; Dray *et al.*, 2006; van den Belt, 2004). Modelling of social ecological systems needs to bring together a diverse group of locals in order to capture impacts and conflicts that are overlooked in the current configuration of regional organisations. In some cases making these connections was relatively easy, such as demonstrating how building approvals in Exmouth impact on the national park. The Regional Reference Group was an important meeting point for diverse groups with a focus on new information and change. Bringing in diversity through involving Indigenous groups was more difficult.

The need to take advantage of emergence before the opportunity is lost is best expressed through Seele's concept of watchful anticipation (2006). The structure of most modelling projects will cause them to struggle to take advantage of emergent behaviours. Events need to be closely monitored, and responses need to be quick to encourage new behaviours. However, modelling projects and the research committees that oversee them tend to be focussed on the quality of the research and meeting milestone. As such, they struggle to move quickly when opportunities present themselves. The NCC committee was adaptive despite only having a small number of staff with limited time and funding for extension activities. Nor surprisingly, it struggled to move quickly when these opportunities arose. If modellers are to be change agents,

modelling projects need to encourage the optimum conditions for emergence and be structured to 'watchfully anticipate' new behaviours. The modeller needs to be well and regularly connected to enough organisations with enough diversity to begin the process of change. Research information needs to flow through this network, through to local networks where a broad section of the set of organisations hear and understand the results. This will only happen if the information is locally relevant, through leveraging issues of local concern.

One approach that provides modelling projects with some significant degree of responsive flexibility is to use sets of complimentary modelling tools, with varying degrees of complexity. Large complex models may remain a necessary part of modelling exercises as their inclusive form can identify system dynamics and tradeoffs missed in simpler models. However, their large size (which requires specialist interpretative skills) and slow time to delivery means that stakeholders will not remain engaged if they are the sole tool used. Complimentary simpler models are needed to maintain engagement, educate stakeholders on the role and usefulness of models and facilitate communication (which may lead to new behaviours that in turn need to be adaptively brought into the modelling process). Such a hierarchy of components is central to complex adaptive systems and highlights what the modelling process must become.

In addition to these technical approaches, connectivity can be directly increased by including stakeholder representatives on the research steering committee. This has been successfully used within the fisheries realm [e.g. for the analysis of potential management options for Australia's commonwealth fisheries (Smith *et al.*, 2007)] with the effectiveness of the body arising from the direct awareness of committee members of attitudes and issues pertinent to the broader stakeholder community, and culturally appropriate engagement strategies. There also needs to be proportionate power on the research committee, so that one set of concerns does not dominate, which would affect the representative nature of the committee, impact engagement of the other stakeholders and slow the committee's response to emergent behaviours. In addition, there must be avenues for quickly resolving anxieties among powerful agents if and when they feel their interests are threatened by emerging behaviours. Most importantly, the modeller and the research committee need to be ready for emergence, and have the capacity to respond quickly to take advantage of these opportunities. This would be a departure from most current academic oversight committees, which are quite appropriately focussed on delivering research outcomes on time and within budget. The adaptive modelling project would be constantly monitoring local change, and be watchfully anticipating emergent behaviours.

Emergent approaches, where modelling researchers serve as change agents by using conversation to 'feel' their way through stakeholder engagement, are an alternative and complimentary process to the planned and structured stakeholder engagement process outlined by van den Belt (2004). In practice the two will need to be used together. While van den Belt's approach makes sense when working with well-defined stakeholder groups with a history of working together and a clearly defined problem domain, emergent approaches may prove to be more realistic and practical in more turbulent situations where structured engagement processes may be frustrated by the dispersed, polarized and/or fluid nature of the stakeholder groups and the 'wicked' nature of the problems involved.

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8. THE APPLICATIONS OF DESTINATION MODELLING: TO NINGALOO, OTHER REGIONS AND OTHER SECTORS IN AUSTRALIA

8.1 Summary

Destination modelling can be applied to the Ningaloo coast region as well as to other regions and sectors of Australia. The Ningaloo Destination Model (NDM) has four broad applications to the Ningaloo Coast region:

- operational planning (e.g. new campsites or accommodation in Cape Range National Park or the pastoral stations),
- regional planning (e.g. assessment of the *Ningaloo Coast Regional Strategy),*
- participatory planning and collaboration (e.g. where plans have implications for a range of groups, agencies, and businesses), and
- monitoring and evaluation of plans through adaptive management processes.

The destination modelling methodology and structure is also applicable to other regions in Australia and other sectors:

- With the development of a generic modelling framework, the data exists to quickly build simple models (5–8 days) for other regions. More comprehensive models are likely to require further data collection and more time (10–15 days), although idiosyncratic destinations may require additional time. Visitor and resident surveys provide the most comprehensive data, but would take much longer (4–6 months) to organise, analyse and enter into the model.
- The extent of data collection should be determined by the intended use of the destination model. If the model is intended to be a general tool to inform a tourism planning exercise, then a quick and inexpensive approach may be acceptable. If the intention is to make use of the model to monitor and assess tourism development, then we recommend a greater investment in data collection.
- The participatory process used to develop the NDM is applicable to model development in other sectors. In particular, the NDM project provides a template for conducting community engagement, conceptual modelling, data gathering and working with an interdisciplinary research team.

8.2 Introduction

A destination model integrates a wide variety of datasets for a tourism destination, providing a triple bottom line assessment of potential plans and developments in a region. The application of the NDM to regional planning is explored in detail through the case studies in the previous

chapters. This chapter examines four overlapping applications of the NDM: operational planning, regional planning, participatory planning, and ongoing monitoring.

The broader relevance of destination modelling rests on its capacity to be applied to other regions. The key to the quick application of the model is to use existing data as much as possible and to retain a focus on stakeholder engagement. It is essential that data quality is not compromised by the requirement of rapid model development. The chapter concludes with a discussion about the potential of the destination modelling methodology for other sectors.

8.3 Destination Model Applications

8.3.1 Operational Planning and Decision Making

The NDM makes its greatest contribution to land-use planning, including the implications of tourism for communities, businesses and the environment. The model has already been used to assess operational plans in Cape Range National Park through an assessment of changes in waste, human waste, and activity patterns due to increasing the number of campsites. The model can also assess structure planning to examine residential and visitor accommodation issues and flow-on effects on recreational activities, resource use, social welfare and the environment.

The model can assess the effects of changing access, such as a new boat ramp or increasing access to a particular beach or snorkelling site. Upgrading the Tantabiddi boat ramp was assessed in the model and found to have a small impact on fish stocks. However, the addition of a boat ramp in a more southerly location was found to have a large impact on fish stocks as it increases access in an area that currently has little access for larger boats. The model can also assess the impacts of events, such as a surf competition at Gnaraloo Station or a fishing competition at Exmouth. This includes both the added expenditure by visitors and the ecological impacts of having greater numbers on the coast and increased fishing effort.

Testing of operational planning and decision making in the model should also include measures to mitigate impacts. The model allows users to adjust resource demand by increasing recycling or through introducing water or electricity saving measures. Fishing regulations can also be changed, and users can alter the visitor mix to explore how attracting different kinds of tourists impacts the region. These kinds of applications are particularly relevant for the Shires and the Department of Environment and Conservation.

An issue with operational planning and decision making is that it often assumes that the future will not be any different from today. The model can also be used to test how external changes could impact the operations of a specific organisation. For instance, growth in Exmouth has large implications for Cape Range National Park. The model can be used to calculate future levels of use of Cape Range National Park given different trajectories of growth in Exmouth. This can help inform future planning for the National Park, as well as Ningaloo Marine Park.

A powerful feature of the model is its capacity to focus on impacts at the subregional scale, and to quantify the impacts between subregions. Being able to focus on a particular subregion, such as any of the three town sites (of Carnarvon, Exmouth or Coral Bay), or Cape Range National Park or the pastoral stations, allows sub-regional operational planning and decision making to be tested in the model.

8.3.2 Regional Planning

The NDM has the capacity to assess regional plans, compare the potential impacts of different planning options, and then adjust plans to improve triple bottom line outcomes. For instance, development can be spread out in the model, or focused in one region. Accommodation development can focus on any of five different accommodation types. The *Ningaloo Coast Regional Strategy* (Western Australian Planning Commission, 2004) and the hypothetical resort development explored in the previous chapter could be compared with an expansion of Coral Bay, or a situation where camping is substantially reduced. The visitor mix can be changed to explore the benefits of focussing on a specific visitor segment.

The NDM also allows users to look at the cumulative impacts of different plans for a region. For instance, the new structure plan for Exmouth potentially expands the town well beyond the limits postulated in the *Ningaloo Coast Regional Strategy*. Additionally, the social, economic and ecological impacts of outside forces on regional tourism, such as resource expansion in the state's northwest, can also be tested and explored. The NDM can also examine the potential impacts of unexpected events (the shocks described in the previous chapter), such as cyclones or interruptions to travel, and help the user prepare strategies for responding to these contingencies. Preparing for cumulative impacts and contingencies greatly enhances the power of a regional plan and its capacity to respond to external and unexpected pressures.

Another important element of the model is its ability to explore mitigation measures when costs of a tested planning decision are viewed as too great. For example, the model allows the user to reduce resource demand (e.g. via recycling or conservation), alter the accommodation or visitor mix, or change site access to protect an area of high social or ecological value.

8.3.3 Participatory Planning and Collaborations

The NDM can also serve as a tool for addressing a variety of stakeholder concerns and connecting different agencies and groups in the region. Impact assessments often only assess the immediate area around a development (for instance, run off from a hotel, the expenditure of visitors) without considering their broader implications (e.g. the ecological impacts of additional visitors in the region, and associated increases in water, waste and electricity demand). The model, however, can examine the flow-on effects of a tourism development on the wider region (e.g. on the Ningaloo Marine Park and Cape Range National Park). This allows stakeholders (e.g. Department of Environment and Conservation) to see how they may be directly and indirectly affected by proposed developments or plans, and to provide detailed recommendations and comments on such proposals. Water and electricity use modelling can connect planning to utility providers. The model results can be a focus for collaboration between a variety of different agencies at the early stages of a project, providing information for negotiating trade-offs and flagging unexpected consequences.

The model also provides an avenue for community groups to understand a wider range of development implications. Quite often community groups do not have the opportunity to explore the full range of impacts for a proposed plan or to test their ideas. The model can provide community consultations with a detailed picture of what the future holds under different planning strategies. For example, the NDM has been used to help inform a tourism strategy for Carnarvon. The model was used to compare the two directions the strategy proposed could be

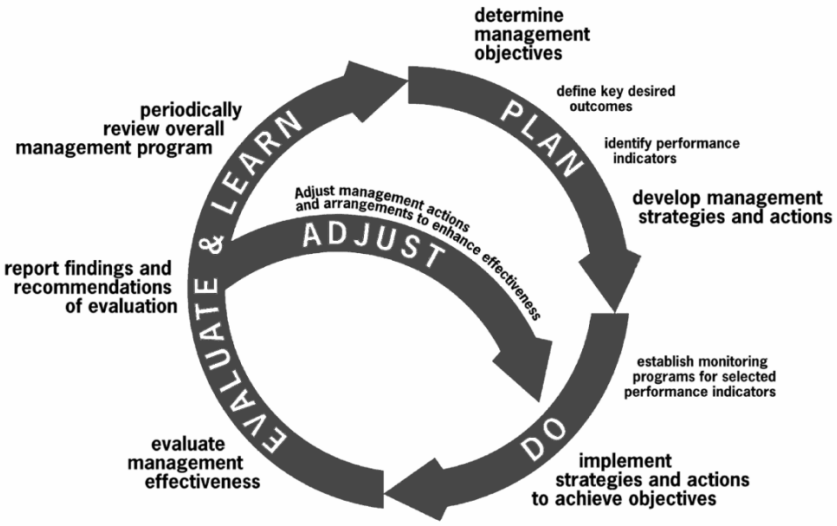
taken, allowing those present to make a more informed decision about a preferred direction. The model could also be used to inform a community visioning process on the region's future, and to test whether or not existing plans for the region are leading to a desirable future, based on the preferences of participants. The model would also provide a powerful tool for an Enquiry by Design process.

8.3.4 Monitoring and Evaluation

Modelling is most effective when incorporated into an ongoing process of planning and adaptation. Modelling can assist monitoring in the first instance by identifying what indicators need to be monitored and at what scale. However, modelling is most effective when incorporated into a process of adaptive management.

An illustration of an adaptive management cycle is provided below. The adaptive cycle was developed as a tool for managing locations or resources that are impacted by both people and natural cycles. Adaptive management can be used at the scale of a water catchment or a fishery, or be limited to a particular piece of land or type of plant or animal. The adaptive cycle enhances management through a cycle of evaluating and adjusting management strategies. Modelling allows a range of plans to be assessed before a decision to implement a management strategy is taken. Once a decision is made (based on a range of data including the modelling results), monitoring is used to both refine strategies and the models that informed the strategy. Such a process ensures that the model is kept relevant and up to date, and that decisions and evaluation are made using the best available data.

Figure 8.1: The Adaptive Management Cycle



Source: Redrawn with permission from Jones (2005).

8.3.5 Limitations of the Model

Tourism is an uncertain business. For instance, despite thousands of dollars spent on data and research, experts still struggle to predict tourist numbers. The Ningaloo Destination Model does not predict the future. It will not reveal how many people will be staying in hotels in Exmouth in 2024. What it does is provide insights into the future and its uncertainties and possibilities,

which can be used in planning today. It helps us understand what is going on today, and plan for an uncertain future, using the best data available.

The Ningaloo Destination Model does not seek to proscribe an optimal strategy or decision. Instead it seeks to provide users with the information on which to base a rational decision, given the user's objectives, preferences, and attitudes to risk. The point of the model is to learn how 'the system' responds to policy initiatives and sudden changes, rather than to give 'the answer'.

8.4 Broader Application of the model

8.4.1 Building Tourism Destination Models for Australian Destinations

The process used to develop the Ningaloo Destination Model can be replicated in other regions. The primary issue is data availability, although stakeholder engagement is also important. Many of the key relationships that inform the model are captured in the data, in particular where there are limitations on growth. In this section we discuss the data that are needed to populate the model and the options and issues surrounding this data.

The Ningaloo Destination Model used existing data, surveys and agreements with utility providers. To test the extent to which data is available for other tourism regions, we identified the types of data needed for developing a destination model. We then attempted to locate the data for the Margaret River-Augusta region of Western Australia. Margaret River-Augusta is a significant tourism destination with an emphasis on food and wine tourism and nature-based attractions including beaches and national parks. Links to data sources for destination modelling are found in Appendix F, and specific sources for the Margaret River-Augusta region are summarised in Appendix G.

The extent of data collection should be determined by the intended use of the destination model. A simple destination model would apply to one region (no subregions) only, while keeping all the core features of the tourism system and elements of the social and environmental impacts. Research techniques developed by Whitelaw and Jago for the STCRC (2008) may make it possible to inexpensively disaggregate local government area information into subregions, which increases the scope for an inexpensive multi-region model. The destination model would address three visitor segments: international, interstate and intrastate visitors and would separate these into overnight visitors and day-trippers. The model would have the capacity to calculate how changes in accommodation and visitation would impact on expenditure, activities, employment and use of resources (water, electricity and waste). Modelling of impacts on the ecology of the region would require an ecological model that could be integrated with the destination model (such as an Ecopath with Ecospace (EwE) model developed by ecological modellers). However, increased activity levels also provide an indication of ecological impact. The data would be calculated annually or quarterly, but with additional information could include a seasonal breakdown.

8.4.2 Three Categories of Data

The data can be divided into three broad categories: tourism data; water, electricity and waste data; and employment and accommodation capacity data. If an ecological component is to be included, ecological data will also be required.

Tourism Data

Tourism data is available for all local government areas through Tourism Research Australia's National Visitor Survey (NVS) and International Visitor Survey (IVS). The NVS is based on monthly phone surveys of Australian residents and the IVS is based on intercepts of departing international visitors at airports. This data can be accessed by contacting Tourism Research Australia (TRA) or by purchasing access to TRA's online database. The major issue with using this data for smaller tourism destinations is sampling error, which can be reduced by using an annual average of data from the previous four to six years. TRA does not provide data on hours of activities, providing instead number of activities in very broad categories. Hours of activities, however, may not be necessary depending on the scope of the model. TRA's data provides a reliable and consistent basis for building destination models.

Expenditure data is essential to calculating the contribution of tourism. Expenditure data from the survey was also tested against visitor expenditure from Tourism Research Australia surveys (which suffer from small sample sizes) for overall consistency and found to be consistent. While the TRA expenditure data has the same issues with sample size, reliability can be improved by averaging a number of years of data.

Water, Electricity and Waste

Detailed data for water, electricity and waste can be obtained two ways. First, academic sources and/or benchmarks from other locations can be used to estimate water and electricity use and waste generation for different accommodation types. Data on water use by local residents is available through the Australian Bureau of Statistics (ABS). Waste data is particularly difficult to obtain in regional locations, but benchmarks can be found in sources such as the Gascoyne Development Commission's Strategic Waste Management Plan (Gascoyne Development Commission, 2009). EC3 Global is a potential source for benchmarks if there is widespread interest in developing destination modelling further.

Second, water, electricity and waste data can be provided through agreements with service providers (and at times agreements with individual users such as hotels, caravan parks, etc.). This is a more time consuming method and requires convincing the providers of the research merits. However, we came to agreements with the providers that we approached and local operators were also happy to provide consent when required.

Employment and Accommodation Capacity

Employment and accommodation capacity information is available through the ABS. However, the visitor accommodation information does not include providers with less than 5 rooms, which excludes holiday rentals. As such, the ABS information needs to be supplemented with data from the region. Phone calls to the local visitor centre and a visit to local real estate agents who specialise in holiday rentals are usually enough to complete the dataset. Resident accommodation capacity is available through census data, although care needs to be taken to exclude holiday accommodation. It is also worthwhile discussing residential accommodation capacity with real estate agents and local planners. Employment information is available through satellite accounts when available, and can be estimated using multipliers and tourist expenditure data. Employment multipliers are widely available (for instance from the Federal

Department of Industry, Tourism and Resources' Tourism Impact Model, which is free to local government).

8.4.3 Time and Resource Requirements

In summary, a basic destination model that makes use of TRA and ABS data together with a series of benchmarks for other data (water, electricity, waste) could be constructed in 5–8 days, provided there is a rapid response by people with knowledge of the region and its tourism industry to data enquiries. Local visitors' centres and local government can often help access existing data sources. Setting up such rapid prototyping would be slowed, however, by the need to develop a generic modelling framework based on the Ningaloo Destination Model. Almost all of the data for a simple model can be collected from the data sources listed in Appendix F. Appendix G, which lists the data sources for the Margaret River-Augusta region, indicates the variety of places that data can be found. Local involvement, particularly local government and agencies, can help identify a broader set of data sources, which will vary between states and destinations.

A broader search for data sources specific to the region (such as commissioned reports for local government, development commissions, etc, reports by the water authority, electricity provider, etc.) would greatly enhance the reliability of the data. This would add to the time required to build the model (10–15 days, total), but would result in a more robust model.

In addition to making use of publicly available data sources, the NDM project generated a substantial amount of data through visitor and resident surveys (Carlsen & Wood, 2004; Fredline *et al.*, 2006). These surveys have been finalised and successfully applied in a number of locations (Fredline, 2002; Hughes *et al.*, 2008). With the assistance of researchers involved in this project, the surveys can be quickly administered with minimal survey development costs, greatly enhancing the data available for building a destination model. As a secondary data source, visitor surveys greatly enhance the reliability of the data. They also generate additional information, beyond that provided by publicly available data sources, including activity hours data, which serves as a broad indicator of ecological and social impacts. Survey work such as this can take as long as 4–6 months (not all of it working on the project), including data analysis. Collection of ecological data may take longer depending on if there is pre-existing research, the characteristics of the ecological system, and availability of modellers.

The extent of data collection should be determined by the intended use of the destination model. If the model is intended to be a general tool to inform a tourism planning exercise, then a quick and inexpensive approach may be acceptable. If the intention is to make use of the model to monitor and assess tourism development, then we recommend a greater investment in data collection.

8.4.4 Model Development

The structure of the Ningaloo Destination Model is applicable to other regions. Developing a destination model requires access to Vensim software, which is a modelling program, and access to a modeller with experience in using this software. Replicating the model would require the involvement of researchers from this project in order to take advantage of the existing model structure, or training in the Ningaloo Destination Model. Vensim defines the

relationships between the datasets in order to make predictions about future growth. It is possible to undertake modelling work with other software such as Stella.

8.4.5 Stakeholder Engagement

Since the biggest issue around model uptake is trust in the data, a key element of this process should be a collaborative approach to reviewing the data to ensure that groups involved with tourism planning will accept the results of the modelling. It is important to capture the collaborative aspects of the modelling approach described in Chapters 2 and 3. If the benefits of collaboration are to be reproduced in other destinations, the participation of a broad range of groups is needed to inform the destination modelling process. The process would be further enhanced by identifying one or more champions in the region who can promote local involvement and use of the model. The structure for stakeholder engagement should be integrated with the model building so that as the model develops stakeholders learn about the tourism system and how to manage it.

8.5 Modelling Other Industries

The modelling techniques used to assess tourism are flexible. They rely on access to a solid base of information and expertise in the economic, social and environmental impacts of tourism-related activities. Resident growth, resource use, and activities are already calculated as part of the NDM. Applying the model building techniques to other sectors that impact on land-use planning is possible, and model development would be faster due to the lessons learnt from the NDM project. The regional scope of the model lends itself well to mining and agricultural development, although attention would need to be paid to problems such as salinity and climate change if the event horizon keeps being reduced at the same rate with new scientific discoveries. The techniques for community engagement, conceptual modelling, data gathering and working with an interdisciplinary research team are applicable to other industries. As system dynamics modelling has been broadly applied, literature reviews of other industries are likely to identify existing model structures that can be used to inform approaches to these industries.

8.6 Conclusion

The Ningaloo Destination Model manipulates data from a variety of sources to make it relevant and easily accessible when considering future changes to a destination and future tourism impacts. It contributes to four overlapping dimensions of tourism decision making that cut across the areas of operational planning, regional planning, participatory planning, and monitoring:

- The model can assist decision makers (such as planners, managers, stakeholder groups) prepare for the future given high levels of uncertainty.
- The model can assess the cumulative impacts of decisions and developments in the region.
- The model can identify and assess mitigation for impacts deemed to be unwanted or unacceptable.

- The model can form the basis of a participatory planning process, between two or more organisations or involving a large number of stakeholders.

The structure of the model is applicable to other regions in Australia. With the development of a generic modelling framework, the data exists to quickly build simple models (5–8 days) for other regions. More comprehensive models are likely to require further data collection and more time (10–15 days). Visitor and resident surveys provide the most comprehensive data, but would take much longer (4–6 months) to organise, analyse and enter into the model. Additionally, modelling software (such as Vensim) and modelling expertise are required.

The NDM project involved a number of processes, including: community engagement, conceptual modelling, data gathering and working with an interdisciplinary research team. The lessons learnt from these processes are applicable to other sectors. The investment required for such model development depends on data availability, and the availability of expertise on issues specific to that sector.

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[22] The references include the references for Appendices, including the doctoral research in Appendix A.

APPENDIX A: DOCTORAL RESEARCH

Four doctoral students were part of the Ningaloo Destination Modelling Project research team. Three of the students worked on more specific tourism questions, and fed their data into the model. While this research did not fit with the focus of this report on Destination Modelling, their research makes new and valuable contributions to both knowledge about the region, and to the fields of tourism research in the areas of coastal camping and wildlife tourism, cultural geography and recreational ecology. A brief description of the research of each student is included at the start of their chapter. While Kelly Chapman's research was the basis of Chapter Seven, the three students whose work is included in this appendix are:

- Philippa Chandler, Curtin University, 'Adventure Before Dementia: Grey Nomads and Place Attachment at Ningaloo, Western Australia';
- Anna Lewis, Curtin University, 'Ningaloo Coast Remote Campers: a Comparison of Preferred Campsite Attributes and Activities'; and
- Dr James Catlin, Curtin University, 'Consolidation in a Wildlife Tourism Industry: the Changing Impact of Whale Shark Tourist Expenditure in the Ningaloo Coast Region'.

A1 SOCIAL NETWORKS SHAPING PLACES: GREY NOMADS AND PLACE ATTACHMENT AT NINGALOO, WESTERN AUSTRALIA

A1.1 Summary

This chapter presents an element of Philippa Chandler's doctoral research into how changes to the management of Ningaloo as a tourist destination impact on repeat-visitors and their relationships with the region's physical and cultural environments. Philippa's research uses interviews with 111 repeat visitors, who had visited the region over three times, with their first visit before 2002. This chapter examines the relationship between retired repeat visitors and the physical and cultural environments of the Ningaloo Coast region. The science findings are:

- Retired visitors who return annually to Ningaloo (referred to here as Ningaloo Grey Nomads: NGNs) differ from those who undertake extended trips to numerous locations. Their social networks are stronger and they enjoy self-organised structured interactions. Neither group seek highly organised programs nor extensive commercial infrastructure.
- NGNs value the sense of freedom they experience in the region. This freedom is supported by strong social networks that underpin NGN's decisions to undertake arduous travel to remote locations, with concomitant risks to health and safety.
- NGNs believe their travel to the region improves their health. Interviewees arranged their health care around their annual trip, for example scheduling operations for the summer months. Strong community networks formed amongst repeat visitors meant those taken ill were sometimes cared for by others in the campsite or caravan park.
- Their annual trip is more than a holiday for NGNs as it shapes the rest of their lives. The trip requires year-round preparation, and informs decisions about retirement, family relationships and finances.
- NGNs are concerned that increased development and/or management will change their experience or increase the expense beyond their means.
- Existing literature about Grey Nomads has ignored conflicts that arise in locations where retired travellers congregate. By overlooking impacts on specific locations, the Grey Nomad phenomenon has been inaccurately depicted as entirely positive.

Implications for Management are:

- The NGN experience may be linked to improved health and well-being. The strong social networks they have developed in specific campsite and caravan parks give NGNs the confidence to continue travelling as they age.
- Increased development, management or costs will discourage this group from continuing to return to Ningaloo. Socially appropriate management reforms are possible, although they are not explored in this chapter.
- NGNs are keen to conserve the coastal environment. Managers could better

acknowledge and harness their knowledge of the coast, strong social networks, attachment to place and willingness to undertake voluntary work.

- Popular grey nomad stopping places create challenges for host communities and for agencies concerned with land management. With the percentage of the Australian population aged 65 and above projected to increase by between 23 and 25 percent by 2056, managers need to prepare for mounting pressure on both tourism infrastructure and natural resources.

A1.2 Introduction

The phrase Adventure Before Dementia caught our eye when we saw it printed on the back of a caravan in remote, outback Western Australia. It highlights a predominant attitude of Australia's touring retirees who have become a recent focus of leisure and tourism research (Higgs & Quirk, 2007; Holloway, 2007; Mings, 1997; Onyx & Leonard, 2007). The slogan captures the way that a group of people in their later lives is pursuing freedom of movement and an associated lifestyle while they still have the financial and physical resources to do so. In Australia, retirees who travel in a car, caravan or camper-van are colloquially known as "Grey Nomads".

In this paper, we look at a group of Grey Nomads who return to the same destination annually. The purpose of this paper is to use a case study from a specific region to begin to address generalisations and a lack of clarity in the literature on retirees and travel. The article examines generalisations that have been made in the literature to date, in particular the way that the terms "freedom" and "adventure" have been used to characterise this group. This celebration of the possibilities of older age is why numerous researchers have held up Grey Nomads as a successful model for ageing ((Higgs & Quirk, 2007; Holloway, 2007; Mings, 1997; Onyx & Leonard, 2007). We argue that, although freedom is important to Grey Nomads, this freedom is made possible by strong social networks that have been developed over years of repeat visitation to the region.

We also aim to address the importance of 'place', which has generally been overlooked in the grey nomad literature, thus overlooking the strong community ties forged at popular grey nomad stopping places and, conversely, the challenges that this creates for host communities and for agencies concerned with land management.

Finally, we address a lack of clarity in the literature about extended periods of travel by retirees that stems from differences in research methodologies, definitions of terms, and discussions of cultural assumptions. The article compares work by the Australian research team Onyx and Leonard (2005, 2007) with that by Robert Mings. Mings is an American researcher who has published articles, often with his colleague Kevin McHugh, about America's 'Snowbirds' (McHugh & Mings, 1991, 1996; Mings, 1995). Of particular interest is Mings' (1997) article "Tracking Snowbirds in Australia" in which the American author compares Australia's Grey Nomads with America's Snowbirds.

This research is timely as the percentage of the Australian population aged 65 and above has been projected to increase by between 23 and 25 percent by (Australian Bureau of Statistics, 2008). The Australian government's report Australia to 2050: Future Challenges identifies the

ageing population, alongside climate change, as the two primary policy challenges for the next 40 years (Commonwealth of Australia, 2010). From a policy perspective, the leisure practices of this group provide both an opportunity to reduce demands on public services, and a challenge in anticipating the behaviours of retirees.

The growth of road based tourism is a notable trend amongst older Australians. Recent research by Prideaux and McClymont (2006) demonstrates that the profile of caravanning has changed since the early 1990s with older couples, in particular retirees, replacing families as the primary market.[23] These two factors - the popularity of road-based travel and Australia's ageing population - have led to a rise in the numbers of Grey Nomads. While this boom may be exciting for caravan manufacturers, it is placing pressure on both tourism infrastructure and natural resources. Increasing regulation to manage the impacts of tourists on regional services, and on the often environmentally sensitive locations to which they are attracted could lead to conflict between regulators and grey nomads and thereby could possibly restrict or alter their much-loved cultural rite of passage.

A1.3 Background and Methods

A1.3.1 Ningaloo: the Grey Nomad Perspective

Before we discuss the literature, it is important to give an overview of the Ningaloo region from the Grey Nomad perspective. The keys to understanding the current characteristics of Ningaloo Grey Nomads (NGNs) are their responses to remoteness and climate (Jones *et al.*, 2007). In 2008, of the relatively small number of tourists (176 000),[24] 29.9% of Australian visitors to the region were over 60. Members of this age group stay in the region for twice as long as do 18–29 year olds (Jones *et al.*, 2009). Grey Nomad visitation is more seasonal than other groups. The vast majority of repeat visitors and all of the NGNs interviewed here, travel to the region during the mild Australian winters and avoid the hot summers.[25]

Two television documentaries (Masters, 2006; Murphy, 2009)and other research (Jones *et al.*, 2007) have indicated that NGNs have a negative view of the Western Australian state government agencies. This may be the legacy of two planning initiatives that took place in 2003 and 2004 which aimed to manage the environmental impacts of coastal (wilderness) camping on the pastoral stations where almost all of the campsites (as distinct from caravan parks) are located.

The first initiative was an expansion of the no-take zones in the Ningaloo Marine Park in 2003 from 10 percent to 34 percent of the park, which significantly reduced opportunities for recreational fishing (Ingram, 2008). The second process was the advent of a new 30 year land use plan for the region, the *Ningaloo Coast Regional Strategy* (Western Australian Planning

[23] This is supported by recent figures. 70 percent of demand for new motor-homes and caravans is from people aged over 55 (Tourism Australia, 2005) and the 300 percent rise in 4-wheel drive vehicles between 1991 and 2000 has also been reported to be mainly due to 'middle-aged' Australians (Hoy, 2001). Registrations of caravans have grown at double digit rates since the mid-1990s (Nichols, 2004) and, between 2000 and 2003, there was a 40 percent increase in annual registrations (Prideaux & McClymont, 2006, p. 45)

[24] This figure is a four year average (due to small sample size) of statistics from Tourism Research Australia's International Visitors Survey and National Visitors Survey.

[25] The Australian Bureau of Meteorology's weather station at Learmonth near Exmouth has recorded a mean maximum January temperature of 38.0C and a mean maximum July temperature of 24.2C.

Commission, 2004). The Ningaloo Coast's recent World Heritage nomination (Department of Environment and Conservation, 2010) by the Western Australian and Federal governments is likely to increase government and tourists' attention on the region further. Jones et al's (2007) exploration of the conflicts between repeat visitors, state agencies and pastoralists notes the concerns of repeat visitors caused by the fear that their lifestyle is under threat from increased regulation, and concerns by the regulators that increasing numbers of camping visitors will cause unacceptable levels of environmental damage.

Under these circumstances, the experience of the NGNs is likely to be squeezed between increasing government intervention for the purposes of environmental management and tourism development, and pressure from repeat visitors to formalise the current arrangements for coastal camping (Jones & Selwood, In Press). Those NGNs who camp at privately-owned caravan parks are also affected because caravan spaces are being sacrificed for lucrative chalet developments. The sections that follow explore the experiences of the NGNs at a critical juncture where state agencies are attempting to respond to a variety of pressures, one of which is the desire of the NGNs for the preservation of their current and distinctive culture.

A1.3.2 Methods

While the term 'Grey Nomad' is used broadly in Australia to refer to older self-drive tourists, this article focuses on retirees who return regularly to the Ningaloo Coast, a remote destination in the northwest of Western Australia. We use the term 'Ningaloo Grey Nomads' (NGNs) to refer to this group to highlight their connection to this region, and to differentiate them from continuously travelling Grey Nomads who may visit the Ningaloo Coast as part of an extended trip, but do not regularly return to the region.

This article is based on interviews with 60 retirees who have visited the Ningaloo region three times or more, with their first visit being before 2002. Interviews lasting 30-90 minutes were conducted between February 2008 and September 2009. The majority of interviewees were recruited during five field trips to the region. Most were recruited face-to-face in caravan parks or informal camping sites, although some came from a 'snowball sample' of personal recommendations. Most interviewees were interviewed with their partner but five were interviewed on their own. Some were interviewed as part of a larger group such as a group of friends, a family group with mixed ages, a craft club or an organised morning tea.

37 percent of the 60 interviewees were wilderness camping[26], and 60 percent were staying in commercial caravan parks. One couple were based in Cape Range National Park where they volunteered as camp hosts. Of those who gave their home addresses, 20 percent were from interstate and 80 percent were from Western Australia. Of those from WA, all were from the southwest of the state. 30 percent were from the state capital Perth, 37 percent were from a rapidly urbanising region just south of Perth,[27] with the remaining 32 percent from regional towns further south. The average age of those who supplied their age was 67.7.

[26] 'Wilderness camping' refers to camping in areas without infrastructure. Campers take their own portable toilets, water, electricity generators, gas for cooking and much more. In this article, wilderness camping does not occur in national parks where water and toilets are provided at designated camping sites.

[27] This region consists of Mandurah and its surrounds. Mandurah is a rapidly expanding city 74 kilometres south of Perth to which it is well connected by commuter rail and road.

The majority of interviews were conducted at the interviewee's own campsite or in a communal area of a caravan park or campsite. Two interviews were conducted in a restaurant, four were over the phone, and one was at the interviewee's house in the 'off-season'.

One notable finding was that interviewees tended to have visited the region far more than the three times set as a minimum for this study. Most interviewees had visited the region more than five times with some recalling decades of visits. One example is Jill, 71, who first visited the region in 1973 with her husband and young son on a family holiday. They were unimpressed by the region so didn't return until 1995, when they 'absolutely loved it'. They have returned every winter since then and plan to continue returning for as long as they can.

A1.4 Literature Review

A1.4.1 American literature

The first research into retired seasonal migrants began in the Unites States in the 1950s (Hoyte, 1954) when large numbers of Americans began spending extended periods in warmer locations over the winter. Ageing and travel have since been examined from various academic perspectives in America[28] including housing research (Rose & Kingma, 1989), gerontology (Longino *et al.*, 1991; Rose & Kingma, 1989)), tourism and leisure studies (Backman *et al.*, 1999; Blazey, 1992), marketing (Shoemaker, 1989; Vincent & de los Santos, 1990) and health (Guinn, 1980).

In the 1999-2000 American winter, it was estimated that 270,000 mature seasonal migrants, known colloquially as Snowbirds, were living in Arizona alone during peak season (Happel & Hogan, 2002).[29] American Snowbirds tend to be in their mid-60s, married, have middle-incomes, moderately educated, of Anglo Celtic origin, and be attracted to their winter residence by the good weather and lifestyle (McHugh & Mings, 1991). According to Mings and McHugh (1995), three qualities characterise the Snowbird lifestyle. First, the discretionary time for recreational pursuits. Second, the importance of social interaction amongst Snowbirds, facilitated by recreational vehicle (RV) resort programs. Third, the geographic mobility of Snowbirds which permits both their annual migration, and numerous short trips from their base location.

In 1995, Mings collected survey data on 'Australian Snowbirds' in far North Queensland. While their demographic characteristics are quite similar to those of American Snowbirds (outlined above), Mings recorded major differences in lifestyle. Although both groups were attracted by the warm weather, Australian Snowbirds interacted much less with other couples and, according to Mings, placed less importance on social interaction. Mings explained this difference by highlighting the low level of formal programs, activities and recreational infrastructure provided in Australia when compared to America (1997). Australians also tended to move more often, to return to the same location less, and to travel longer distances while based in one place.

[28] On older seasonal migrants in Europe, see Gustafson (2001 and 2002), Williams (1997) and McElroy (1992).
[29] RV and mobile home parks accounted for 79 percent of 'winter Texans' in 2001 and in 2002 nearly one in twelve vehicle-owning households in the United States owned a RV (Blais, 2002).

A1.4.2 Australian literature

The last decade has seen the development of a small body of research on Australia's Grey Nomad phenomenon. In 2005, the Australian researchers Onyx and Leonard (p. 65) take Mings to task for "imposing" the snowbird paradigm on Australia's Grey Nomads. Onyx and Leonard found that Grey Nomads placed a high value on their freedom to do what (and go where) they want (2005). They also found that social networks were important to Grey Nomads for advice, help and companionship but that they avoided resorts and motels where possible, preferring sites that impinged less on their sense of and desire for 'freedom'.

These differences could be explained in a couple of ways. It could be attributed to a cultural difference between Australian Grey Nomads and American Snowbirds in that the former group place a high value on their freedom and tend to avoid commercial leisure infrastructure. However, it is possible that Mings and Onyx and Leonard were actually studying different travel phenomena. For example, Mings only recruited interviewees from caravan parks while in Australia whereas Onyx and Leonard included "free camping" sites. Those staying in "free camping" sites may be less inclined to enjoy organised activities. One presumes that America must also have a cohort of adventurous older people who avoid organised resorts, instead preferring to stay in the American equivalent of 'free camping spots', but these were not covered by Mings' research.

The group we researched at Ningaloo have more in common with the American Snowbirds than with Onyx and Leonard's "Grey Nomads" since they can hardly be termed nomadic. They return to the region on an annual basis, they escape the winter, they have strong friendship networks and are more inclined to take part in group activities. Both definitions differ from the broader popular cultural definition in Australia, in which any older person taking a road-based trip can be termed a Grey Nomad.

A1.4.3 Grey Nomads at Ningaloo

Westh (2001) highlights the 'freedom' of the Grey Nomad lifestyle, both of movement and from societal expectations, as its most attractive feature.[30] The emphasis on freedom, adventure and autonomy has led to a body of research promoting Grey Nomadism as a positive model for ageing (Higgs & Quirk, 2007; Onyx & Leonard, 2007; Westh, 1997, 2001).[31] Onyx and Leonard are the only authors who use empirical research to address this topic (2007). They link two more determinants to successful ageing. First, social networks which provide social interaction and reduce the risks associated with equipment failure, injuries and illness. The second determinant is personal growth, through travel to new, remote and beautiful locations, causing a sense of wonder and discovery (2007). This ageing literature views the Grey Nomads almost exclusively positively. Holloway (2007) is the only author writing in this field who identifies negative issues arguing that the promotion of 'positive ageing' could reinforce negative connotations of deep ageing by denying the limitations of bodily decline; and that negative stereotypes of grey nomads in host communities could indicate local conflicts.

[30] Westh (1997) popularised the term Grey Nomads in his 1997 television documentary.
[31] The context of this research is Peter Laslett's identification of the possibilities of a "third age" of life (1989) following work and preceding old age, and the way that patterns of consumption have empowered more retirees to exercise self-determination over their own lifestyles (Higgs & Quirk, 2007; Holloway, 2007).

The literature on Grey Nomads outlined above draws attention to several important points that provide the framework for this paper. First, Onyx and Leonard and Westh highlight that the Australian 'Grey Nomad' is culturally distinct from other countries' mature seasonal migrants, which has implications for the characteristics of their travel, social interactions and experiences. Second, the prioritisation of the concepts of 'freedom' and 'adventure' (in particular in the ageing literature) potentially overshadows other important elements of the Grey Nomad experience that are as important to Grey Nomads. The work of Onyx and Leonard has begun to address gaps in the literature through acknowledging the importance of considerations of health, social networks and personal growth. However, since this research is situated in the context of ageing, its focus on elements of the ageing literature overlooks other aspects of Grey Nomad travel that, we argue, are equally important.

Third, by ignoring the places that Grey Nomads visit, Onyx and Leonard also overlook the challenges that they create for host communities, giving rise to the perception that grey nomadism is a purely positive social movement. In this sense, attention to personal growth through experiencing a range of places (Onyx & Leonard, 2007), or the Australian outback more generally (White & White, 2004), ignores the conflicts and environmental impacts that become visible when Grey Nomads are considered in space (the specific locations that they visit) as well as time (the ageing trajectory and travel experiences). Repeat visitors may differ substantially from Onyx and Leonard's Grey Nomads. In particular, their relationship to places may differ substantially between groups that travel continuously (and therefore tend to engage with a place briefly and then move to the next location) and groups that return annually to the same campsite or caravan park.

NGNs are one of the most numerous, noticeable and influential groups that visit the Ningaloo region and they provide a reliable source of revenue for a remote region with few other income streams. Since this group tends to visit annually and to stay for months on end, they have developed a rich relationship with the area and each other. In a sense this group are a sub-set distinct from the continuously travelling Grey Nomads. They have developed a connection to a specific place and to a small community[32] and they have decided to return there annually.

A1.5 Results and Discussion: The Social and Cultural Characteristics of Ningaloo Retired Repeat Visitor Experiences

A1.5.1 Logistics and finance

In their article "Grey Nomads in Australia: Are They a Good Model for Successful Ageing and Health?" the Australian mental health researcher Frances Quirk and the English sociologist Paul Higgs suggest that affluence/consumption driven by capitalism has created the broader social conditions that have allowed Grey Nomadism to develop as a social movement:

> Emerging out of the growth of affluent consumer societies, the focus on differentiation and "style of life" has become important to ... the lives of those growing older and entering retirement (p254).

[32] The community at their location, rather than the larger community of Grey Nomad travellers.

However, the relationship between NGNs and the concept of lifestyles should not be discussed solely in the context of consumption as this gives the impression that their experiences can be purchased. On the basis of our research at Ningaloo, we contend that such lifestyles cannot simply be bought and consumed, but are actively created and worked for.

A holiday in the Ningaloo region takes considerable planning. For the first-time visitor, a camping trip to the region can seem like an overwhelming list of chores and purchases, especially if the trip involves any 'wilderness' camping. Some interviewees explained that they stored their van at a friend or relative's house during the 'off season' and therefore had to go and collect their van in order to get ready. Others described the maintenance work that they carried out on their vehicles before leaving. Some longer-term visitors have their mail redirected using a service provided by the post office and/or arranged for a family member to 'keep an eye' on their property. For 'old hands' at the journey, the preparations form part of an annual pattern. Gary[33] explains:

> We've got an old van that we've had for 18 years so there's always maintenance to do on that. That's been ongoing - whenever I get a chance I'm down there working on the van. We are planning what food, what materials, whether we need to upgrade our fishing gear, the outboard. Those things are happening throughout the year but come to a climax before we leave late in April.

While Gary experiences a sense of freedom while he camps in the Ningaloo region, he has neither a spontaneous nor casual approach to the trip. The trip is relaxing *because of* his hard work. The existing literature on Grey Nomads largely overlooks this element, focussing instead on motivations for travel.

Driving to the Ningaloo region is an ambitious undertaking. From Perth, the drive takes between nine and fourteen hours, depending on the specific destination, adherence to speed limit, and vehicle and towing circumstances. One interviewee described having to be removed from his caravan on a stretcher, when an existing back injury was exacerbated by the long drive. His willingness to undertake such a long drive is evidence of his commitment and attachment to the Ningaloo region.

Accessing and staying in the Ningaloo region is expensive. Fuel for a return trip can cost over $1000 as fuel prices rise with distance from Perth. Groceries cost more in this remote region and equipment costs are significant. A 4-wheel drive costs several tens of thousands of dollars and must be maintained. Some interviewees acknowledged that it could be cheaper to holiday overseas. Nonetheless, interviewees found ways to afford the trip.

For example, Mabel, 72, sells pot plants throughout the year to raise money for her fuel costs. She camps in one of the cheaper wilderness campsites, where she can afford to live on her usual pension for the duration of her stay. Another interviewee, Brian, camps at the Blowholes, about half an hour's drive from Carnarvon. To save money, he rations how often he drives into town. Joyce, 73, sees herself as retired yet works one day each week at the caravan park. Nigel, who lives in a caravan, explains how he and his wife afford to travel to the Ningaloo region annually:

[33] Pseudonyms have been used for all interviewees and we have purposefully omitted identifying information about accommodation choices to protect their anonymity.

> We find it's the cheapest way of living. When we travel, we pull up into roadside camps. Every second night we call into a roadhouse and pay two dollars and have a nice shower and do everything. Then we move on again. If we can find a nice creek we might stay there for four or five days. That's very cheap living.
>
> Pippa: Would you prefer to be in a house?
>
> Yeah, if I should shift it from Augusta to up here [laughs]. Yeah. Probably. We wouldn't be able to do what we do if we hadn't sold our house. We're living off the interest. We're adding that on to the pension. It would be nice to be able to have a house for when you get home, and relax back. But this [caravan] isn't bad.

When asked a hypothetical question about rising costs in fuel and/or accommodation, many retirees pointed to cost increases that had already happened - the trip was already expensive yet they continued to come anyway. On the other hand, some retirees said that they enjoyed their time at Ningaloo, so much that they would come regardless of the price. Obviously, this attitude is limited to wealthier retirees.

By exploring finances and logistics, we have addressed gaps in the literature about how Grey Nomads arrange and finance their travel. We have indicated that these Grey Nomads are not passively 'consuming a lifestyle', as Higgs and Quirk suggest, but are actively engaged in a process of planning and preparing and, in many cases, in producing to fund subsequent consumption.

The link between Grey Nomadism and money is therefore complex. While the suggestion that affluence and the rise of a consumer lifestyle have allowed this phenomenon to flourish may be correct, the Grey Nomads' identity is more likely to be shaped by their preparation and knowledge. In the field, we heard/were told several derogatory comments about people with 'flash' caravans - the meaning was that having an expensive rig is no substitute for being prepared, experienced, resourceful and knowing the terrain.

By using a case study of a particular place, we have been able to examine how some Grey Nomad travel forms part of an annual cycle. Such is our interviewees' commitment to place they are willing to make sacrifices (taking on casual work, living on a restrictive budget) in order to return year after year.

A1.5.2 Ageing and health

Several interviewees mentioned their health in interviews. One example is Paddy, a pensioner who lives on his own in Perth. In summer, he lives in state housing in a suburb of Perth. Every autumn, Paddy packs a caravan and heads north for warm weather. His favourite spot is the Blowholes, a remote campsite 75 kilometres from Carnarvon. Paddy says that he "feels a lot better" when he is away. He gets more exercise, loses weight and feels healthier. He also feels safer and happier.

According to health researcher Julie Byles (2007), longitudinal studies point to the importance of avoiding risk factors and "getting good nutrition, physical activity, social interaction, being productive and engaged, and maintaining a positive outlook" (p115). It is impossible to say

whether our interviewees were better nourished while in the Ningaloo region but they certainly claim to be more active, more social, engaged with their surroundings and happier while away.

The relationship between social connectedness and improved health has been the subject of much academic debate. The American political scientist Robert Putnam (1995) argues that there is a link between social connectedness and improved health (p314). Similarly, some interviewees were keen to stress that their health improved while they were away. Helen explains how the warm weather helps her feel healthier:

> Why I go up north, where its warmer, is because I've got bad arthritis. I've now got two artificial hips and an artificial wrist. In the cold, wet weather you really suffer...I can't swim down here [in the South West] because it's too cold for my artificial hip. But in the warm water up north, I can swim. It's healthy. I just seem to feel a lot healthier when I'm up there. I can do more.

It has been suggested (Tate *et al.*, 2006) that Grey Nomads are poorly prepared to travel to remote Australia because of their health levels. They suggest that this places a burden on remote health care services. While we cannot refute the idea that Grey Nomads increase the workload for remote health services, we disagree that they are poorly prepared. In the case of Ningaloo, travellers leave their homes knowing that their seasonal community will help them if required. John, a NGN at a wilderness camp describes how the community look after one another:

> There's an old guy that comes up from Albany, his name is Arthur and his lady friend is named Peggie. Arthur is 89, Peggie is 91. Peggie got very ill...and we didn't know if Peggie was going to make it. One of our fellow campers up there...is a doctor. And he was treating Peggie and we were all very anxious. We organised for her to go down to the hospital in Carnarvon. [Fellow campers] drove them down because they were stressed, stayed overnight in Carnarvon, brought Arthur back, looked after him and when Peggie was fit enough to come back after a few days somebody else went down and drove her back. That's the community...If anything goes wrong...people will rally 'round.

Ningaloo Grey Nomads do not simply hit the road looking for freedom, but create supportive communities at their destinations. While freedom is important to Grey Nomads, this freedom is made possible by these strong community ties.

In their research on Australian senior travellers, Horneman *et al.* (2002) found that 46.2% of those surveyed felt that making the most of their good health was a 'very important' motivation for travelling. While many Grey Nomads continue to visit the Ningaloo region despite/due to poor health, there comes a point at which individuals have to decide whether they can come. Mabel believes she will visit the Ningaloo region for as long as she can get a shoe on her foot - meaning that one shoe will enable her to drive her 4wd and tow her caravan. Others have suggested that they will visit Ningaloo until they are physically unable to do so.

In an article about Australian men's health, Smith, Braunack-Mayer et al (2008) suggest that Australian men self-monitor their health before deciding to seek medical help. In their article, they give the example of an Australian man who knew to seek medical help when he could no

longer push his boat into the water. There are echoes of this in Nigel's commitment to travelling for as long as he can:

> [Camping in the region is] a good life while I can still do it. I just booked in the other day for a hip replacement in November [...] While I can keep doing it I'll keep doing it. When the day comes that I can't do it anymore, we've got our names down for a retirement village in Mandurah. Its a lovely set-up. Lyn will love it there as they've got bowls and hairdressers and salons. It'll be nice there, but I don't want to go there unless I'm at the point where I've got to go there.

This relates to our arguments in several ways. The literature on Grey Nomads focuses on 'freedom' and sometimes paints Grey Nomads as ill-prepared in regards to their health. Our research indicates that health is a complex issue. Our interviewees were prepared to make an extreme journey, knowing that a community of campers at journey's end would support them if things went wrong.

Our research supports Onyx and Leonard's (2007) findings about Grey Nomads' attitudes to health. They suggest that "many are healthy but approximately half of all couples had experienced a major health scare by one partner" (p. 388) but that they continue to travel regardless. Elsewhere in their article, Onyx and Leonard have suggested that Grey Nomads support each other by providing practical help and information. But when it comes to seeking help, they write:

> The majority of interviewees had thought through what they would do in a medical emergency. For example, of those interviewed, half had some form of CB or UHF radio and knew how to get on the truckers' channel if necessary. Some made special arrangements when they went on risky adventures, informing local homesteads of their plans (p. 389).

Onyx and Leonard do not make a link between 'social networks' and health. Our research suggests even stronger links in the case of repeat visitors. In considering what to do in an emergency, Ningaloo retirees would assume that someone in their camp would be able to assist. Because Onyx and Leonard interviewed 'roaming' travellers, they did not pick up on the support networks provided by seasonal camping communities.

A1.5.3 Community ties

One debate in the Grey Nomad literature has focussed on how important socialising is to Grey Nomads. The American researcher Mings (1997) suggested that Australian Grey Nomads do not have the social opportunities that organised American RV resorts provide. While Onyx and Leonard (2005; 2007) argue that social networks are important to continuously moving Grey Nomads, our research indicates they are even more important to repeat visitors who have additional opportunities to sustain their friendships and build stronger ties.

Interviewees were keen to tell us about the friendships they formed over years of repeatedly visiting the Ningaloo region. In this way, our interviewees are different from those interviewed by previous researchers in that they have been able to develop long-standing friendships. Friendships are formed in communal areas of the holiday accommodation site. In a caravan

park, this could be the shared laundry or ablution facilities. Joyce, 73, winters in Carnarvon with her husband each year. She works one day per week at the caravan park and explains that this is how she often makes friends:

> If they're having a drink outside one of the houses or the park homes, I stop and ask them if everything is alright - if they are enjoying their holiday, ask them if they'd like anything, would they like fresh towels, etc. You get to know them. The next year they say 'oh, you're back again'. I find I get to know a lot of people that way.

Another way to socialise is by participating in Happy Hour, a daily ritual in which campers gather for a drink at the end of the day. A couple may simply sit outside their own caravan, and then invite passers-by to join them. Alternatively, a couple may go on an evening walk around the campsite to look for a group to join. Campers tend to bring their own drinks and folding chairs to Happy Hour so there is little work for the host of the gathering. All that is required is space and conversation - a scenic view and a plate of 'nibbles' are optional extras. While Happy Hour tends to be a daily occurrence, the feeling of spontaneity is important to participants. Many tell me that if they do not feel like joining in, they simply will not - but that most days they tend to. Happy Hour is not organised in advance, but unfolds as the sun goes down. Happy Hour enables people to sit down, share a 'yarn' and form strong friendships.

In his book *Bowling Alone*, Robert Putnam discusses how social capital functions:

> Sometimes, ... reciprocity is *specific*: I'll do this for you if you do that for me. Even more valuable, however, is a norm of *generalized* reciprocity: I'll do this for you without expecting anything specific back from you, in the confident expectation that someone will do something for me down the road. (Putnam, 2000 pp. 20-21)

Putnam's concept of 'generalized reciprocity' is neatly exemplified in this quotation from Gary, who camps at 14 Mile at Warroora station.

> if someone is going into town, they get things for anyone else that wants it. If they want bread or drinking water. Or something from the shops, people will get it for them. It works well that way, so people do not have to go into town all the time.

Gary went on to explain that different NGNs have expertise in various subjects - for example, Nigel can fix gas fridges whereas Helen helps others with knitting problems. Friendships are cemented through such favours and by socialising at campsites. One group of NGNs at Yardie Creek hold a party whenever someone has a birthday, plus one additional birthday party for those whose birthdays occur in the off-season. One campsite celebrates Mothers' Day with a meal in a nearby town. In 2009, twenty couples attended this.

In the field, we sometimes asked interviewees if they had any friends who might be interested in granting us an interview. We were surprised by the long list that would follow - normally a list of couples' names, where they are from, what site they camp in and how long they've been coming. It was obvious that the repeat visitors all knew quite a lot of information about each other.

We were also surprised to find that NGNs kept in touch with each other over summer by sending Christmas cards, occasionally phoning each other and sending email newsletters. Some

'dropped in' on each other while travelling around the country and one had even driven interstate to attend a birthday party for a friend they had met at Ningaloo. Many expressed a feeling of "homecoming" when they arrive in the Ningaloo region.

If community ties are important to the roaming nomads studied by Onyx and Leonard (2005; 2007) and Mings (1997) then they are far more important to those returning on an annual basis, and staying for a period of months. As we suggested earlier in this article, it is these strong community ties, and the sense of "generalized reciprocity", that give these Grey Nomads the confidence to continue travelling despite health problems.

Onyx and Leonard (2005; 2007) and Mings (1997) disagree on the level and significance of social networks to Grey Nomads and Snowbirds. Our research suggests that, when it comes to social networks, Ningaloo visitors have much more in common with America's Snowbirds. McHugh and Mings (1991) found that the average snowbird has 71 friends in the same RV park. This is echoed in Ningaloo repeat visitors - some repeat visitors could easily name 30 couples within their own campsite.

A1.5.4 Blurring home with away

The significance of the annual trip to Ningaloo extends beyond the time in the region - it shapes people's whole lives and identity. As we explained earlier, preparation for the holiday is undertaken year round. Annual budgets, decisions about retirement, family commitments and investments are structured around an annual stay in the region.

We asked interviewees whether they felt 'on holiday' in the Ningaloo region or whether they felt 'at home'. Their responses varied to this question - some described a feeling of 'homecoming' when they return to the region each year. Others felt very much 'on holiday' while many said they felt a mixture of both.

Franklin and Crang are critical of tourism research that sees the activity compartmentalised, as if tourism is separate from 'normal life';

> Studies have generally been restricted to a vision of tourism as a series of discrete, localized events, where destinations, seen as bounded localities, are subject to external forces producing impacts, where tourism is a series of discrete, enumerated occurrences of travel, arrival, activity, purchase, departure... (2001, p. 6)

To an extent, this research is guilty of restricting its study to a 'bounded locality' and analysing 'what happens at self-styled tourist sites'. However, Franklin and Crang are correct in their assertion that tourism is more than what happens within those two weeks/months of holiday but influences our *whole* lives. In this way, we have taken care to examine the role that the Ningaloo trip plays in our interviewees' whole lives - rather than simply what activities they undertake while away. While ageing research acknowledges this connection, it is limited to health outcomes.

To an extent, some retirees try to *recreate* their home lives in the Ningaloo area. Many retirees mentioned that chores play a significant role in their camping experience, including how they make friends. In this way, the drudgery of normal life seeps into holiday life. Few of the retirees

interviewed were motivated by a desire to 'go without' or 'get back to basics'. This may involve bringing the fridge, freezer, rice steamer, pressure-cooker, washing machine, television and the myriad other 'home comforts'. They happily admitted to making themselves as comfortable as they could, given the site limitations. If they could enjoy the warm weather, fishing and friendship from the comfort of their own homes, perhaps they wouldn't feel the need to come away. Eileen describes her annexe:

> We have two freezers. We like to keep them going all the time...We have our own shower in the van...I cook in the annexe, mainly. And I've got my computer set up in there, just quietly, 'cos I'm on Skype...I've got the freezer in there and all my cooking stuff. I bring up a lot of electrical things, like steamers, fry pans, turbo ovens, breadmakers...

Of course, some retirees feel a sense of separation between their two lives. For example, some retired visitors mentioned that they are less worried about domestic chores when they are away from their usual home. At their usual home, they felt that they always 'had something to do' whereas on holiday they could just do chores as they encounter them. Two single or widowed retirees mentioned that their lives were more enjoyable, social and healthy when they were away, and hinted at their social isolation in their usual lives. This is reiterated by the manager of a seniors' caravan park in the region who says that single people enjoy the camaraderie the park offers. The manager also mentioned that the park's "no children" rule lets retirees with children and grandchildren "off the hook" from having to holiday with their extended family. The desire for the comforts and experiences of home appears to be an axis of difference within NGNs, indicating that some seek to bring home with them, while others desire an experience distinct from home at Ningaloo.

By examining the blurring of home and away, we acknowledge that, while freedom is important to Grey Nomads, their 'away' lives are not totally distinct from their 'home' lives. McHugh and Mings explored attachment to place in ageing in their 2006 article, but this was set in an American, rather than an Australian, context. This blurring of home and away is more noticeable when the nomads are less nomadic –as are these people who are returning to one place and staying for a long time; it becomes more familiar and 'home-like'. This differentiates them from the roaming retirees interviewed in previous Australian research who are seeking a variety of new and challenging experiences. Our interviewees have more in common with America's Snowbirds in that their 'home' and 'away' lives are intertwined rather than one being an escape from the other.

A1.5.5 Conflict and concerns

As we mentioned earlier, visitation to the region is steadily increasing. This has made protection of the region a priority for state environmental and planning agencies. The reduction of recreational fishing opportunities in 2003 was followed, in 2004, by the publication of the Western Australian Planning Commission's 30 year land use plan for the region. Both caused tension between repeat visitors, state agencies and pastoralists, with repeat visitors concerned that their lifestyle was under threat from increased regulation (Jones *et al.*, 2007). NGNs are therefore at a critical juncture where state agencies are attempting to respond to a variety of pressures, including preservation of the NGNs' culture.

Most interviewees expressed concern about the region's future, especially in relation to increased development and visitation. Mary explains:

> It's the fear of it turning into another Gold Coast kind of place. Being retired, costs come into it and you worry that it might get too expensive. When you see the marina development and the four and five star accommodation you think will it get to the stage where they only want five star people - the ones with money - coming. The character of the place will change, it has changed in the time we've been going.

Some aired concerns about the lack of caravan parks, and about how the need to book far in advance fixes them into rigid travel schedules. Others felt that development or stricter management could change the character of their beloved wilderness camping spots. Several referred to Western Australia as being 'the last place left' in Australia where they felt they could camp with such freedom.

One concern for many Grey Nomads is the suggestion that a 28 day limit could be imposed on camping on some pastoral stations. When I asked Nigel what he thought of this idea, his reaction hints at the widespread mistrust between NGNs, government agencies and pastoralists:

> That'd be ridiculous. I wouldn't come here. And I know probably half of the regulars here wouldn't come here. And I was asking DEC [Department of Environment and Conservation] about it and they said they know nothing about it. So its either [a DEC employee] being dishonest with you, or its [a pastoralist].

The environmental impacts of wilderness camping are a hotly contested issue in the region. Almost every interviewee felt they were 'environmentally aware' although their explanations as to why this was the case varied. Most said they regularly picked up litter, and several proudly told me stories of when they'd seen a transgression (such as someone illegally fishing with a net) and had intervened. NGNs in wilderness camping areas vehemently denied they cause any detrimental environmental impacts, claiming that they care for the land. An Exmouth resident with much professional experience as an environmental manager disagrees:

> There are a lot more people coming out of the cities that don't know how to camp, they don't know to drive. They get a 4-wheel drive but they don't know how to 4-wheel drive; you know, we pull them out all the time. Either they get flooded out or they dig in, they haven't let their tyres down. They don't know how to drive in sand but they'll come up and [...] even though there are signs everywhere saying, "Don't rip out vegetation" they'll rip out the vegetation.

By examining these conflicts and concerns, we have shown that the Ningaloo Grey Nomad lifestyle is more complex than the wider literature has indicated. Such conflicts are only hinted at in other papers (Holloway, 2007; Onyx & Leonard, 2007). This may be because other studies have interviewed touring retirees in a range of locations, rather than focussing on longer term return campers/caravanners.

A1.6 Conclusion

By focussing on a group of Grey Nomads who remain in a particular geographic area we have been able to bring a new perspective to the literature. The strong community ties and the extraordinary energy that the Ningaloo Grey Nomads put into ensuring that their annual trip can go ahead are testament to their commitment to a single place. While freedom was important to our interviewees, we have attempted to demonstrate that these feelings of freedom come from years of protracted visitation, and the building of strong community links that enable Ningaloo Grey Nomads to feel comfortable in their environment.

The lifestyle and experiences of the Ningaloo Grey Nomads have two important insights for other research into the travel and lifestyles of retirees. First, it is important to carefully define the characteristics of the people being interviewed, particularly if comparisons are to be made with other research in this field. In particular when considering retirees who travel for long periods, it is important to distinguish between those visitors who regularly return to the same location from visitors on extended trips. Mings and McHugh (1995) highlight structured social interaction as an important element of Snowbird travel in the United States, which Mings (1997) described as 'limited' in Australia. Onyx and Leonard's (2005) research into more adventurous retired travellers who are on extended trips around Australia identified a group that did not want organised activities. The NGNs indicate that repeat visitors have strong social networks and provide their own well-organised activities. Repeat visitors also are likely to have even stronger social networks that underpin decisions to undertake arduous travel to remote locations, with concomitant risks to health and safety. The presence of a strong, known community of travellers differentiates this group from Onyx and Leonard's respondents. Like Mings and McHugh's American Snowbirds, they have strong social ties, but the NGNs do not desire commercial level infrastructure and programs. Australian retired repeat visitors therefore do seem to be culturally different from their American counterparts in the experiences they are seeking.

The second insight of this NGN research is the importance of attachment to place, which has been largely overlooked in the literature on retired travellers. Where there are conflicts over the travel habits of retirees, these are generally connected to place through issues like environmental impacts, management practices and tenure—in short, where visitors' connection to place conflicts with the plans and priorities of land managers. The conflicts, explored here through the concerns of retirees, need to be considered alongside the positive outcomes of this kind of travel, namely the feelings of self-sufficiency, the communities, the health benefits and the learning that such travel supports in later life.

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A2 NINGALOO COAST REMOTE CAMPERS: A COMPARISON OF PREFERRED CAMPSITE ATTRIBUTES AND ACTIVITIES

A2.1 Summary

This chapter presents an element of Anna Lewis' doctoral research into the environmental impacts of coastal camping on the Ningaloo Coast and the preferences of current coastal campers. Anna's research assesses differences between environmental impacts of campsites, environmental load (water, waste and energy) of campers, and camper preferences with regard to campsite attributes. This chapter focuses on the preferences of campers, and identified that the 'average' Ningaloo remote camper wants easy access to the beach, but doesn't like litter, high fees or crowding.

- The four most important attributes of a campsite, on average between all campers were:
    1. location of the campsite close to the beach
    2. minimal litter
    3. price
    4. distance to neighbouring campsites.
- Popular comments for all campers regarding campsite attributes also included: the importance of self-sufficiency, desire for a 'wilderness experience', and dislike of commercialisation.
- Despite these similarities, significant differences were also found between Clusters for both campsite attributes and activities. These differences include importance of toilets, sewerage dump points, generators and whether campfires and dogs are allowed.
- These findings indicate that there are two levels of campsite attribute preferences. The first are preferences common to all Clusters, which reflect the remote regions', wilderness-experience camping style. The second represent differences between Clusters, which in turn identify different groups of campers with different needs and expectations.

Using camper preferences for management purposes would require consideration of:

- The region as a whole in terms of its remote, wilderness-experience camping style preferred by all Clusters
- Area-specific considerations based on the Cluster type categories identified within this study.
- A uniform management approach for remote campsites across the entire Ningaloo region is therefore not recommended.

Other research in Anna's thesis indicates that, as different Clusters have different environmental impacts, site rehabilitation of remote camping areas be undertaken on a case-by case basis. The removal of goats from the coastal zone would reduce the impact of campsites on the environment, while the presence of year-round site caretakers should be encouraged.

A2.2 Introduction

This paper compares preferences for campsite attributes and activities among remote campers along Ningaloo Reef coast, Western Australia. The foundation of this paper is drawn from Schafer's (1969) study which argues that the 'average' camper does not exist. Consequently, this paper tests the hypothesis that preferences of campers concerning campsite attributes and activities have significant

differences between management regimes. Camper preferences with regard to activities, campsite attributes, and distance from the ocean and management regime are explored.

A2.2.1 Importance of Camper Preferences

Having a solid understanding of preferences is necessary first step to aid planning and design of campsites (Foster & Jackson, 1979). Preferences held by campers have been shown to affect both camper use patterns and campsite popularity (Choi & Dawson, 2002). Thus, it is commonplace that some campsites in given locations are heavily frequented, while others are hardly used (A Prince Consulting, 2008; Hendee, 1978). From an environmental perspective, uneven campsite distributions can result in a mismatch of use with high densities of campers residing on unsuitable fragile sites (Cole, 1987). In terms of the camper experience, campsite location choices can affect the sense of solitude of remote campers (Stankey, 1973), strongly influencing the quality of their experiences (McCool *et al.*, 1985). Through careful planning, knowledge of desirable attributes may aid in reducing conflict between conservation goals held by managers and goals of campers (McCool *et al.*, 1985). Biophysical and social indicators can also be drawn from visitor preference, to monitor those conditions considered important to the campers' experience (Moore & Polley, 2007). In summary, knowledge of visitor preferences is vital for planning and management purposes, and for promoting a positive visitor experience (1987). Current plans within the Government call for formalization of camping along the Ningaloo coast, whilst acknowledging that it is important to provide a range of camping experiences (Western Australian Planning Commission, 2004). Given that the management of camping is a very important element for future planning of the Ningaloo coast (Western Australian Planning Commission, 2004), the research outlined in this paper is timely.

A2.2.2 Campsite Attributes Considered Important

Garst (2005) observed that preference research focusing on experiences and meanings of camping has steadily declined since the United States' camping boom in the 1960's and 1970's. This early research mainly described the publics' participation in camping, and camper characteristics (Beardsley, 1967; Bury & Margolis, 1964; King, 1965, 1968; LaPage, 1967, 1968; Shafer, 1969). The research focus then shifted over time, reflecting campsite managers needs at the time (Brunson & Shelby, 1990). As a result, camper preferences relating to campsite attributes have been studied in a wide variety of settings (Clark *et al.*, 1984; Harris, 1982; Lime, 1971; Pfister, 1977).

Literature surrounding influential campsite attributes was reviewed by Choi and Dawson (2002). Key attributes influencing site selection included: distance between campsites for privacy, amount of vegetation for shade and screening, vegetative barriers, visibility of ponds, lakes and rivers from the site, accessibility to water from the site, campsite level ground, use levels and crowding, level of campground and campsite development and other factors (Brunson & Shelby, 1990; Bumgardner *et al.*, 1988; Clark *et al.*, 1971; Foster & Jackson, 1979; Heberlein & Dunwiddlie, 1979). Stankey (1973) argued that seclusion at campsites was the most important aspect for most visitors, while Lucas (1990) claims that water front sites were the most universally desirable factor for campsite selection. Additional studies (Lime, 1971; Lucas, 1970) support this, concluding that the highly used campsites were either immediately adjacent to, or within view of water bodies. Most of this camping research originated from forested Alpine camp areas in the Unites States. Few studies have been conducted on campsite preferences in an Australian setting (Moore & Polley, 2007; Morin *et al.*, 1997; Smith & Newsome, 2002 ; Winter, 2005), in a remote camping location accessed by motor vehicle (Winter, 2005), or in coastal settings.

While some authors have argued that common themes can be found between different camper studies (LaPage, 1966; Zuckert, 1980), others have strongly argued that campsite preferences are inconsistent across recreation settings. Bumgardner, *et al.* (1988) stated that inconsistencies in the camping literature

were due to variations in the natural resource characteristics, region, and desired activities that formed part of the studies. Because of this variability in research settings and results, it is argued that camper preference findings within the literature cannot be generalized and thus cannot function as a reliable guide for managers. According to Shafer (Shafer, 1969) in his article 'The average camper who doesn't exist', "there is no more use comparing preferences across regions than of comparing widgets to wombats (p.1)". It was considered that grouping camper research findings would result in a non-existent 'average' camper, which can be misleading for management. This has been exacerbated by the growth in mass-market appeal of camping for an increased range of demographic types (LaPage & Cormier, 1977; Matheusek & Mills, 1983). Consequently, common practice has focused on identification of subgroups, or 'market segments'. Knowledge of these segments is considered vital both for campsite planning, and to market management decisions to relevant camper audiences (Crompton, 1983).

A2.2.3 Campsite Attribute Preferences under Different Management Regimes

Various studies have compared preferences between different camper sub-groups, such as public to private campgrounds, and primitive to developed campgrounds. Hammitt (2006) investigated camper choice behaviours between three camp settings with different facilities, located within a three mile radius. Six of the eight user characteristics measured were found to be significantly different, indicating that the three site settings were serving distinct groups of campers. Bumgardner, *et al.* (1988) found that campers in developed campgrounds considered utilities to be most important attribute, while campers in undeveloped campgrounds favoured water body visibility, a good breeze and site privacy. McEwen and More (1986) found those in private developed and public developed campgrounds focused on both utilities and social context, while campers at primitive sites had an aversion to commercialization within the campground. In contrast, Choi and Dawson's (2002) study which compared three 'less-developed' to three 'more-developed' campgrounds, found all of the campers had similar preferences. It should be noted that the 'less-developed' sites in this study were relatively developed when compared with primitive sites in other studies.

Reasons relating to differences in site preference between sub-groups were varied. In addition to amenities and management, it was found that preferences were also based on the characteristics of camping groups such as size, activities, convenience, travel patterns, recommendations from friends and prior knowledge (Choi & Dawson, 2002; Hammitt, 2006; Heberlein & Dunwiddlie, 1979; Hendee *et al.*, 1990; Manning, 1999; Roggenbuck & Lucas, 1987; Shafer, 1969; Zuckert, 1980). Prior knowledge of a region may categorise individual campers as either familiarity seekers or novelty seekers, which in turn can affect their campsite preferences (Lucas, 1970). Improvements in camping equipment thus creating greater comfort, has created a wider demographic of campers. This has resulted in some individual campers displaying stronger social and weaker environmental orientations at developed campsites (Burch & Wenger, 1967; Etzkorn, 1964).

Winter (2005) examined the attitudes of vehicle-based campers toward site management for unregulated areas on Murray River. Campers were divided into two clusters, 'recreationalists' and 'nature-lovers', who differed significantly in their choice for toilet and shower facilities. Overall, the least popular options for facilities were barbeques and car parking, yet firewood being provided was popular. Respondents agreed that they prefer to have no rules, and that they should be free to camp where they like. They disagreed that there should be a limit to the number of campers allowed to camp, and to being told what they can and cannot do.

Whether or not camper sub-groups would substitute sites under different management regimes have also been examined. While some findings support the notion that different users want particular experiences and therefore rarely substitute sites (Hammitt, 2006; 1986), others found that despite different preferences, campers substituted sites quite often (1988). McCool (1985) noted that campers will often 'make do' with what is available at a given location, but this may not necessarily be considered

satisfactory. Perceptions of campground management are therefore a very important component of site selection for campers (McEwen, D., 1986).

A2.2.4 Camper Research along the Ningaloo Coast

Several studies have focused on remote campers along the Ningaloo coast. Geographically, study areas vary in size from one camping area to the whole coastline adjacent to the Ningaloo Marine Park, incorporating all remote camping areas. Questionnaires are commonly distributed, and to a lesser extent, interviews with campers are undertaken.

Of most relevance to this study is research relating to camper perceptions and standards, attitudes to the environment, and trip elements rated as important (Galloway & Northcote, 2008; Jones *et al.*, 2009; Moore & Polley, 2007; Polley *et al.*, 2008). These studies indicated that the natural environment, solitude and self-reliant camping rated highly among surveyed campers, while the need for facilities rated low. Another important study (Remote Research, 2002) qualitatively explored reasons for campsite selection at Cardabia, Ningaloo and the Learmonth Bombing Range. Responses included: Good fishing, scenic views, sheltered and secluded campsites, good boat moorings, meeting friends, self-reliant camping and solitude. Research indicates that clear subgroups exist between remote campers along the Ningaloo coast, differentiated through their demographic, repeat visitation and preferred activities (Davies *et al.*, 2009). However, a comparison of campsite preference attributes between Ningaloo remote campers has not yet been done.

This paper compares campsite data collected from nine remote camping areas, grouped into four Clusters categorised by campsite characteristics, along the Ningaloo Reef coast. This paper contributes to the body of knowledge surrounding campsite attribute preferences both regionally and internationally. This study is timely considering the possible excision of coastal land for greater environmental management and tourism development along the Ningaloo Marine Park in 2015, and the popularity of Ningaloo as a remote camping destination. Understanding camper preferences may help managers more effectively sustain camper satisfaction, influence campsite use distributions and reduce user-management conflicts.

A2.3 Background

Visitors using the remote coastal campsites usually camp in groups distributed along the 200km of coastline adjacent to Ningaloo Reef, and are mainly from Western Australia. Most remote coastal campers are considered ‘repeat’ (visited Ningaloo 2 to 5 times) or ‘continuous’ (visited Ningaloo more than 6 times) campers (Shafer, 1969). Remote campers stay an average of 24 days (Remote Research, 2002), while of all campers at Ningaloo (including full-facility campgrounds in Carnarvon, Coral Bay and Exmouth), the average is 9.97 days (Jones, *et al.*, 2009). Campers are required to bring their own accommodation (caravans, camper trailers and tents), power sources and chemical toilets. Campers also supply their own water, fuel and food but generally replenish their supplies at the nearest town every fortnight. Campsites are not always defined, and often consist of bare ground and a track to the beach. Depending on the locations, sites by the beach are often sandy and most access requires a four-wheel drive. Longer-term campers bring long-stay comforts such as electric kitchen appliances and satellite dishes for TV, Internet and phone connection.

A2.3.1 Outdoor Recreation Visitor Types

To predict participation in outdoor recreation, an understanding of what visitor types camp in outdoor recreation areas is important (Hendee *et al.*, 1971). It is then possible for the physical environment and infrastructure to be adjusted to minimize negative social, cultural, and environmental impacts of visitor use (Cottrell *et al.*, 2005). Studies report that outdoor recreationalists differ from the general population in age, education, and occupation (Hendee *et al.*, 1971). When compared with general population,

Hendee, *et al.* (1971) argues that outdoor recreationalists tend to be younger, better educated, more likely to have non-manual occupations and earn higher than average incomes. While many remote campers along the Ningaloo coast do not fit this mould (Jones, *et al.*, 2009), Lang and O'Leary (1997) argues that the nature traveller is also more interested in nature, travels more frequently, goes longer distances and stays longer than other groups (Lang & O'leary, 1997), which reflects the majority of Ningaloo campers more accurately. However, even within outdoor recreationalists travellers are not homogenous and exhibit differences in terms of their socio-demographics, trip-related characteristics, and travel philosophies. For this reason, investigations from one destination often cannot be applied to other areas (Lang & O'leary, 1997).

Burch (1965) developed six types of play action undertaken by recreationalists in state forests. The four of these most significant to Ningaloo campers were symbolic play, subsistence play, unstructured play and sociability. These play-types are characterized by a quest for trophies, such as fishing, fulfilling camping chores to satisfy food and shelter requirements, and interacting with both the environment and fellow campers. A follow-on study adapted by Hendee *et al.* (1971) developed a typology of outdoor recreation activity preferences, of which all activities were represented by some groups along the Ningaloo Coast. These activity typologies included appreciative-symbolic, extractive-symbolic, passive free-play, sociable learning and active-expressive. In the Australian context, Lang and O'Leary (1997) developed a typology of nature travellers into six segments based on their motivations, activity participation, and destination preferences. Many Ningaloo campers reflect three segments: 'Family Vacationers,' 'Nature Tourists,' and 'Escape & Relax Vacationers'. The only study examining Australian vehicle-based campers, Winter (2005) divided campers into two clusters, Nature-lovers and Recreationalists, based on a Natural Area Value Scale. The Scale was a questionnaire, broken down into four value-based components: Recreational, intrinsic, use, non-use. While the recreation values between the campers were similar, the non-use and intrinsic values differed. This indicates that while all campers have an interest in recreating, values and perceptions of nature differ across the two clusters.

On the Ningaloo coast, factor analyses of camper questionnaire (Jones *et al.*, 2009) revealed three distinct groups of visitors (including campers)who seek different experiences. These are 'the comfortable visit', the 'nature lover experience' and the 'fishing escape experience'. The most relative to this study are the 'fishing escape experience' who camp for longer periods, in addition to 'the comfortable visit' seekers, who tow their accommodation with them. Davies, *et al.* (2009) identifies campers through the four most visible user groups: Grey Nomads, Recreational Fishers, Surfers and Windsurfers and Four-wheel drive tourists. Grey nomads and four-wheel drive tourists are again divided into three groups each. It is acknowledged that there is a fair bit of overlap between four-wheel drive tourists and the other four categories. All groups can be found in every camping Cluster (Section 10.3.3), although the Surfer/windsurfer group camp predominantly within Cluster 3. The goal of this paper is to compare user preferences segmented by management type, not to create typologies of Ningaloo campers. While typologies outlined in the literature should be considered tentative rather than definitive (Hendee, 1978), they are an important aspect of campsite planning surrounding facilities required in the future.

A2.3.2 Campsite Definitions

As highlighted by Winter (2005), the vehicle-based market which includes caravanning, camping and four-wheel driving is growing but relatively unknown in the literature. Classifying this camping niche from previous studies can therefore be challenging. Most campsite descriptions within the literature are described as either 'dispersed' or 'primitive' (Lucas, 1990) which have no vehicle access and no or few facilities, where many campers hike in, to 'highly developed' (Garst, 2005) campgrounds with full amenities including sewerage hook-ups, electricity, showers, playgrounds, satellite reception and children's programming. Studies in the literature combining remote camping with vehicles, some with high levels of technology for long periods are rare (Winter, 2005). The most accurate classification for the nine camping areas within this study is from Clark and Stankey (1979) who classifies camp areas into

six classes. Eight of the camp areas outlined in this study, falling under Clusters 1, 2 and 3 (described below) can be considered 'semi-primitive motorised'. These areas are at least a half kilometre from state roads, natural setting with moderate alterations, low to moderate encounters with other parties and onsite management is present, but subtle (Clark & Stankey, 1979). Cluster 4 can be considered 'roaded natural', an area within 2 kilometres of state roads, natural setting with easily noticed to dominant modifications, moderate to high frequencies of encounters with other parties, onsite management is noticeable but designed to blend in with the natural environment (Clark & Stankey, 1979).

A2.3.3 Ningaloo Campsite Cluster Definitions

Camp areas along the Ningaloo coast vary with regard to level of regulation, access, cost, facilities, camper demographics and available activities. The Ningaloo Reef coast remote campers in this study have therefore been divided into four subgroups, or 'Clusters', to aid data analysis (Table 1 and Fig. 1). The Clustering method was adapted from research by Choi and Dawson (2002) and Shafer (1969). Cluster numbers were assigned on a scale of increasing management regulation. Cluster 1 has the least regulation while Cluster 4 has the most regulation type of campsite. These Clusters are different to those described by Jones, *et al.* (2009) and Davies (2009) who describe camper groups by location, demographic and activities undertaken. Other characteristics also define the Clusters within this paper as follows:

Cluster 1: Most remote and least regulated of all Clusters

Comprises the least regulated camp areas. They are located the furthest from paved roads, with access for campers only along corrugated dirt tracks. They have little to no regulation, have the lowest nightly camping fees, and have the least accessible rubbish disposal.

Cluster 2: Basic waste facilities and camp hosts.

Camp areas have more regulation than Cluster 1 including the presence of camp hosts during the peak season. The nightly camping fees are low. Waste disposal facilities are closer than those for Cluster 1 and primitive drop toilet facilities are available at Blowholes.

Fishing is very important to both Cluster 1 and 2.

Cluster 3: Some ablution facilities, strong management presence.

Sites attract campers focussed on surfing and has the youngest demographic. It has the most facilities, is the most expensive in terms of camping fees while difficulty of access is comparable to Cluster 1. A high level of management presence is felt, but there is less regulation than at Cluster 4.

Cluster 4: Most regulated, most accessible of all Clusters

Is the most regulated and is defined by the campsites within the government-managed Cape Range National Park, adjacent to the northern end of the Ningaloo Marine Park. Cluster 4 has the most international and least Western Australia campers. Drop toilets and bins are provided near campsites though the nearest sewerage dump point is 150km away in Exmouth. Activities are based on snorkelling and hiking.

For the purpose of this research, all campers within this paper will all be referred to as 'remote' campers. A campsite refers to any number of occupants camping at one clearly marked campsite for a clearly labeled site. For unlabeled sites, all occupants co-existing together underneath one shelter are considered a campsite.

A2.4 Materials and Methods

The primary mode of data collection for this research was a self-completed visitor questionnaire. The purpose of the questionnaire was to compare the importance of campsite attributes among four camping Clusters. A pilot sample of 25 Questionnaires was distributed across all Clusters in March 2009. Feedback on the questionnaires was also sought from campsite managers and colleagues. Some modifications were made to improve the content and format. The finalised questionnaires were distributed to the four Clusters of Ningaloo Marine Park over a six-week period between May and July 2009.

The survey was timed to capture a range of demographics, including long-term campers, families during school holidays and backpackers. A purposive sampling strategy was adopted, where all campers present at a site were asked to fill in a survey at the time of sampling (Lawrence, 2007). The sample comprised campers' aged 18 years and over who camped in the pre-selected remote camp areas (Table 1) for at least one night. A cross sectional sampling technique was utilised to gather data from a broad sample of campers, within the project's set time frame. The questionnaire took approximately ten to fifteen minutes to complete. For participants who preferred the survey to be read to them, the researcher recorded the answers. For respondents unable to fill out the survey or conduct an interview based on the survey at the time of request, a reply-paid envelope and a questionnaire were provided.

The questionnaire design was based on previous studies (Choi & Dawson 2002; Jones, *et al.*, 2009; Smith & Newsome 2002) then adapted to suit the context of at the study. The survey gathered data concerning activities; importance of campsite attributes; attributes which make campers not want to camp at a given campsites; satisfaction concerning campsite distance from the ocean and management-style preferences. The questionnaire was organised into four parts;

1. Campsite preferences and activities,
2. Resource use,
3. Demographic information and
4. Comments.

A combination of open ended and closed questions were used, and were designed to avoid a leading or threatening tone. A five point Likert scale was used to determine the importance of potential indicators and level of acceptance regarding certain management scenarios.

Point of nomothetic (i.e. between camper) analysis (Garst, 2005) was to explore the patterns and themes of camping meanings that extended beyond individual campers (Brooks, 2003; Patterson, 1993). The study area consisted of nine camp areas (Fig. 1) within seven different management regimes. The nine camp areas were grouped into four Clusters based on similarities in price, level of regulation, camper demographics and facilities. For two management areas, two camp areas (Quobba homestead and Red bluff within Warroora; 14 mile and the rest of Warroora; Warroora station) were derived due to differences in demographics, facilities and activities. The camp areas were grouped to ensure adequate sample sizes for statistical testing.

The survey data was entered into Excel and SPSS to be analysed. The data was tested for significant differences between campground Clusters in relation to camper preferences. Pearson's chi square and ANOVA tests were used to identity significant differences in response to variables. Pair-wise comparisons were also conducted using the Bonferroni posthoc test.

A2.5 Results

Questionnaires were distributed in person throughout the nine study sites, between May 28 and July 14, 2010. Of 790 questionnaires distributed, 712 (90.1%) were collected on site while 22 were returned by mail giving a total response of 734 surveys (86.8 %). Average results for all campers are presented, in addition to results for individual Clusters.

A2.5.1 Camper Demographics

Most (95.5%) respondents were Australian. Of these, 76.7% were from Western Australia and 18.8% were from Interstate. The Cluster that had the most Western Australians was Cluster 2 (Fig. 1) (80% WA residents), followed by Cluster 1 (79.5%), Cluster 3 (75.2%) and Cluster 4 (49.3%). The majority of International visitors camped at Cluster 4 (8.9%), the least at Cluster 1 (0.5%). Most of the international visitors were from the USA, France, Germany, UK, New Zealand, Netherlands and Thailand.

Of all respondents, 69% had camped in the Ningaloo Region before, while 31.1% were first time campers. Ratios of repeat and first time visitors were similar in all Clusters. Of all respondents, 8.71% were permanent travellers while 38.5% of all respondents were retired. Clusters 1 and 2 had the highest number of retiree campers. The average age was of respondents was 48.5 years (Std.Dev.=16). While Clusters 4 and 1 had fairly even age distributions between 25 and 66 years, the majority of campers in Cluster 3 were under 55 while most campers in Cluster 2 were over 55 years of age. Overall, respondents were primarily travelling with their partner (55.4%), friends (28.5%) or family (25.2%). Few were travelling alone (5.4%) or with a tour group (0.3%). Travel group size ranged from 1 to 17 people with an average of 3.5 people per group.

Most respondents were travelling with a caravan (40.1%) or tent (31.8%), followed by a camper trailer (16.6%) or campervan/motor home (12.7%). The category of ‘other’ for accommodation (6.7%) comprised a swag, tarp, gazebo or car. Caravans were the most popular shelter for Cluster 2, while tents were the most popular for Cluster 3. Cluster 4 used a variety of different shelters. The data indicated that 4WD (73.6% of all campers) was the most popular form of transport for all respondents. However, more respondents in Cluster 1 used 4WD vehicles than in other Clusters, while Cluster 4 campers used a greater variety of transport, likely related to higher accessibility road accessibility. Other modes of transport overall included motor home/camper trailer (11.6%), car (8.0%) and wagon/all wheel drive (6.7%).

Respondents stayed an average of 24.4 nights, while the range in response across all Clusters was between 1 and 210 nights. The most common length of stay was 14 nights (10.6%). Cluster 3 tended to have the shortest average length of stay (less than 20 nights) and Cluster 2 the longest (more than 40 nights).

A2.5.2 Visitor Preferences

Activities

For most common daily activities (Graph 1), campers could choose as many activities as they liked from a list of ten options. A Pearson Chi-square test revealed that there were significant differences between Clusters (sig=0.00, df=30). The most popular on average were: beach walking (83%), lying on beach/swimming (74%), fishing from shore (69.5%), snorkeling (62.6%), sightseeing/4WD (58%), fishing from boat (44.7%), surfing (32%), SCUBA diving (13.2%) and commercial tours (9%). For ‘other’ (10.8%), answers included kayaking/canoeing, reading, relaxing, socializing and bush walking.

When common activities for each Cluster were compared, the largest descriptive differences between Clusters were ‘snorkeling’ (38.7% for Cluster 2, and 78% for Cluster 4), ‘surfing’ (8.4% for Cluster 2

and 72.1% for Cluster 3), 'fishing from boat' (28.6% for Cluster 3 and 62.8% for Cluster 1), and 'commercial tours' (4.1% for Cluster 4 and 15.2% for Cluster 4).

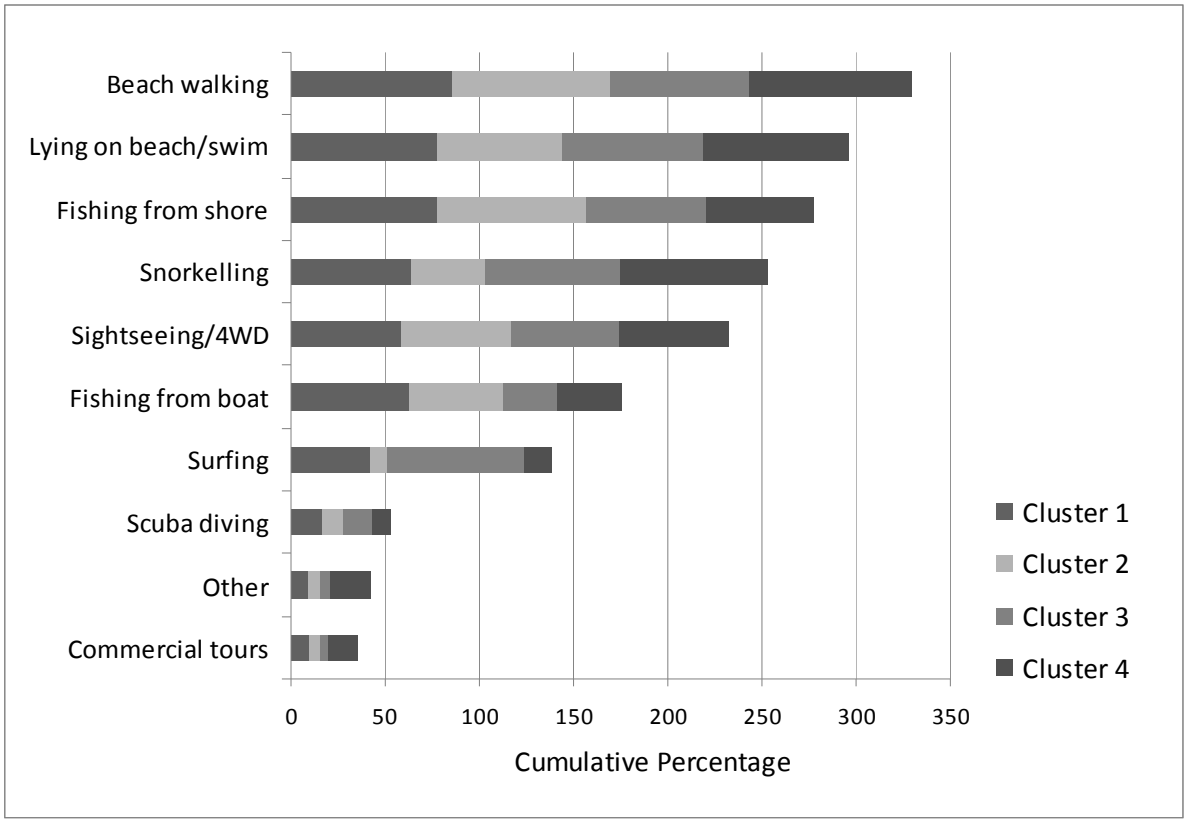


Figure 10.1: Activities undertaken by to camp Clusters

Importance of Campsite Attributes

Concerning the importance of campsite attributes (Graph 2), the top four most important campsite characteristics for all Clusters were 'campsite close to beach' (mean 4.49 out of a maximum of 5), 'minimal litter' (4.42), 'price' (3.81) and 'distance to neighbour campsite' (3.59). The attributes 'campsite close to beach' and 'minimal litter' was in the top four responses for every Cluster. This indicates that the natural coastal environment is of high importance to all remote campers at Ningaloo. Such reactions are consistent with Choi and Dawson's (2002) findings that some common themes for preferences across campsites occur with different development levels. Other attributes considered the four most important attributes for individual Clusters included 'toilets provided' (Cluster 4), 'generators allowed' (Cluster 2), 'dump point for sewerage' (Clusters 1 and 2), 'distance to neighbour campsite'(Cluster 3), and 'price' (Clusters 3 and 4).

When means of different Clusters were compared a using a one-way ANOVA post-hoc test, no significant difference (sig=0.481-1.00) was found between Clusters regarding importance of 'litter' or 'price'. For 'campsite close to beach', only Clusters 1 and 4 showed a significant difference (sig= 0.03).

The results for 'other' received a wide variety of independent responses, including 'dirt roads', 'large/soft ground/level campsite', 'quiet', 'isolated', 'less restrictions', 'well-managed', 'security', 'potable water', 'pleasant scenery', 'happy people' and 'wilderness experience'.

The four least important characteristics overall included 'fresh water showers provided' (mean 1.91), 'dogs allowed' (2.16), 'boat launch facilities/access' (2.55) and 'campsite not exposed to wind or sun' (2.65). The only attribute present in the least important four attributes of all Clusters was 'fresh water showers'. Other attributes considered the four least important attributes for individual Clusters included 'dogs allowed' (Clusters 2, 3 and 4), 'boat launch facilities/access' (Clusters 3 and 4), 'campsite not

exposed to wind/sun' (Clusters 1 and 2), 'toilets provided' (Clusters 1 and 2), 'well defined paths/ campsite areas' (Cluster 1), 'generators allowed' (Cluster 4) and 'dump point for sewerage' (Cluster 3).

When means of different Clusters were compared using a one-way ANOVA post-hoc test, only Cluster 1 was significantly different (sig<0.01) to all other Clusters for 'importance of fresh water showers provided'. For 'importance of dogs allowed' and 'campsite not exposed to wind/sun', only Cluster 4 was significantly different (sig<0.01 and sig<0.001), respectively) to all other Cluster means.

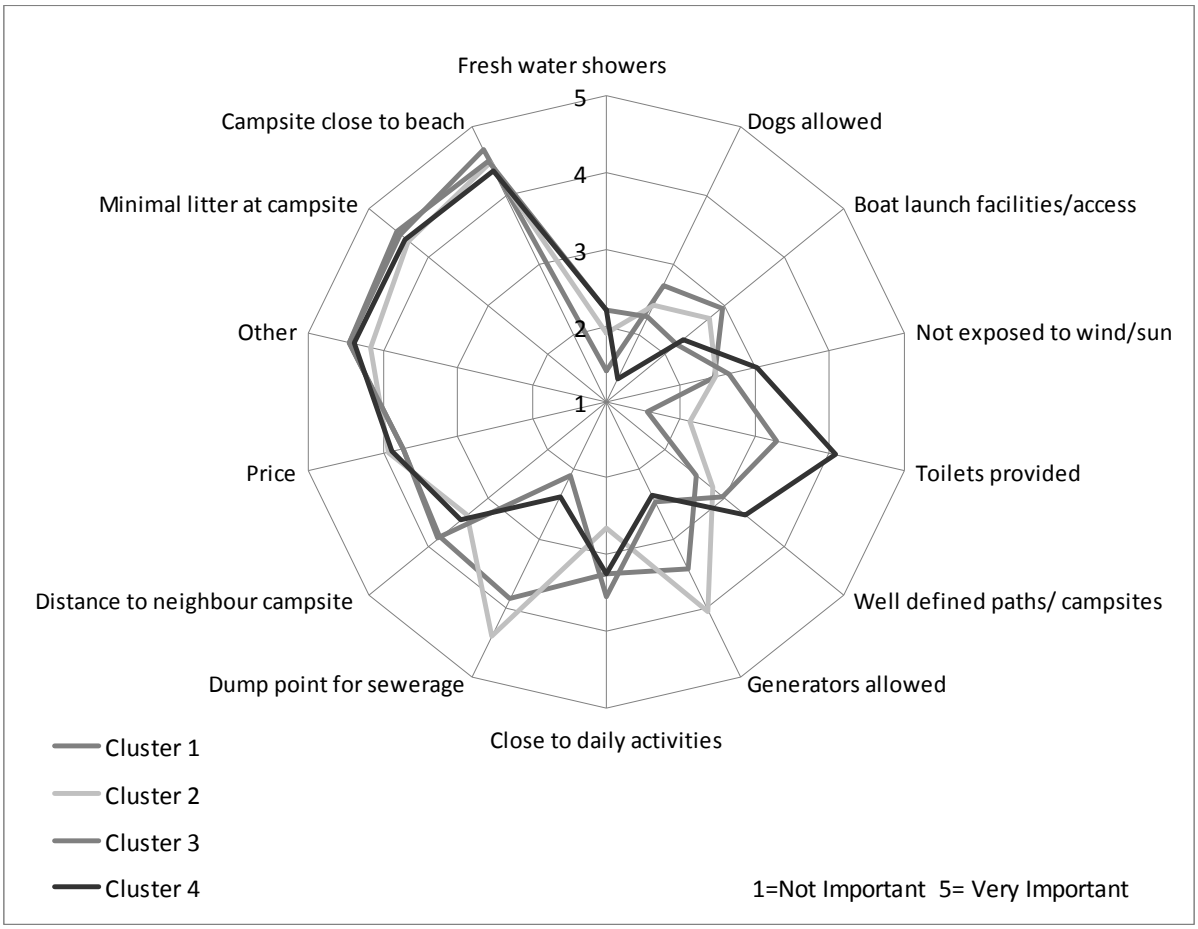


Figure 10.2: Importance of campsite attributes for different Clusters, rated as a scale from 1 (not important) to 5 (very important)

There is potential for a relationship to exist between a Cluster's level of regulation and importance rating for certain campsite attributes. As previously mentioned, Cluster 1 has the least amount of regulation while Cluster 4 has the most. The importance of some attributes increase from Cluster 1 to Cluster 4. This means that some attributes were least important for Cluster 1 and most for Cluster 4. Regulation is the only Cluster characteristic which increases with Cluster number. Regulation level affects price, level of facilities and length of stay permitted for a camper, both important factors for determining the importance of campsite attributes.

These numerical differences between Clusters were mostly descriptive (Graph 3). Increasing trends from Cluster 1 to Cluster 4 include 'Campsite close to beach', 'Well defined paths and campsite areas', 'Toilets provided', 'Campsite not exposed to wind or sun' and 'Fresh water showers provided'. Decreasing trends were also found, where an attribute is most important for Cluster 1, but least for Cluster 4. A decreasing trend exist for 'dogs allowed', and 'access to boat launch facilities/access'.

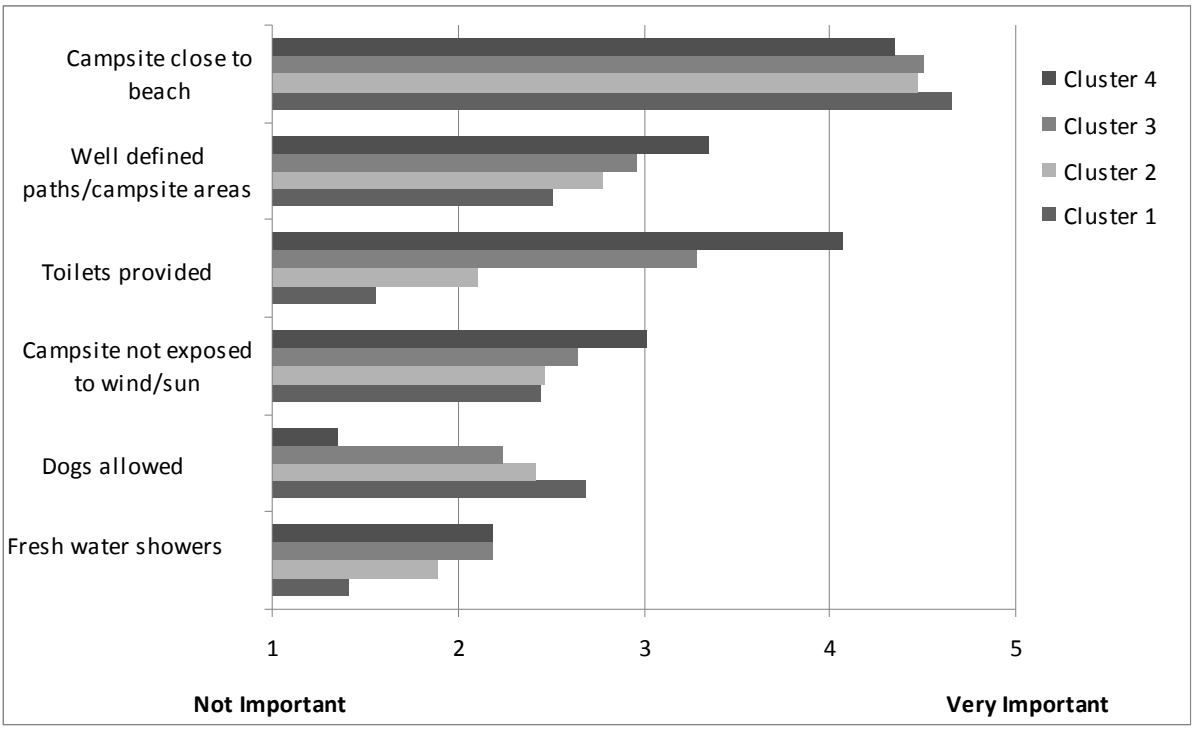


Figure 10.3: Linear trends between Clusters for rating 'importance of campsite attributes'

For the question 'What makes you NOT want to camp at a campsite' (Graph 4), 'price' was the most important overall (67.5%). Remote campsites at Ningaloo are often perceived seen as a cheap place to camp, creating a sense of freedom. High fees may be considered an impingement on this freedom. Following was 'litter present at campsite' (67.2%), 'campsites close together' (63.8%) and 'fishing not allowed' (52.8%). The four least common responses overall were 'no dogs allowed' (22.30%), 'exposed to wind and sun' (20.6%), 'no shower provided' (8.2%) and 'no power provided' (3.30%). Many of these findings mirror those from Graph 2. For example, overall, the three most important and least important attributes for Graph 4 were the same three most important and three least important attributes as in Graph 2.

The remaining average responses included 'many campsites on one area' (47.9%), 'no fire allowed' (39.7%), 'stay limited to 4 weeks' (28.8%), 'no rubbish collection' (27.70%) and 'no toilet' (27.2%) and 'other'. Responses for 'other' (12.3%) included 'noise', 'generators', 'dogs', 'overregulation', 'litter, 'unsuitable campsite' and 'unaesthetic campsite'.

A Pearson Chi-square test demonstrated that significant differences exist between Clusters for attributes that discourage campers from a given site (sig=0.00, df=42). Attributes for which all Clusters were descriptively similar were: 'No shower provided', 'many campsites in one area', 'no power provided', and 'litter present at campsite'. These findings may reflect the desire of remote campers for a 'wilderness experience'.

Those attributes with the largest descriptive differences were: 'Price too high' (58.0% Cluster 3, 82% Cluster 2), 'no fire allowed' (15.3% Cluster 4, 51.4% Cluster 1), 'many campsites in one area' (32.8% Cluster 2, 63.9% Cluster 1), 'stay limited to 4 weeks' (11.1% Cluster 4, 54% Cluster 2) and dogs not allowed, (5.8% Cluster 4, 31.7% Cluster 2).

Decreasing and increasing linear trends corresponding to Cluster number, as observed in Graph 2, were also observed for why you would NOT want to camp at a campsite. Increasing trends (least important for Cluster 1, most important for Cluster 4) can be seen for 'exposed to wind and sun', 'no toilet' and 'no rubbish collection'. Deceasing trends can be seen for 'fishing not allowed', and 'no dogs allowed'.

Interestingly, some campers' preferences were not representative of their camping location. For example, from Cluster 4, 15.3% indicated they would not camp if there was no fire, 5.8% if dogs were not allowed and 11.1 % would not want to camp at site if the maximum stay was four weeks. These preferences contradict the regulations from Cluster 4, which does not allow fire, dogs or a stay over 4 weeks. Similarly, in Cluster 2, 9% of campers would not want to camp at a campsite where no shower was provided. No showers are provided at Cluster 2.

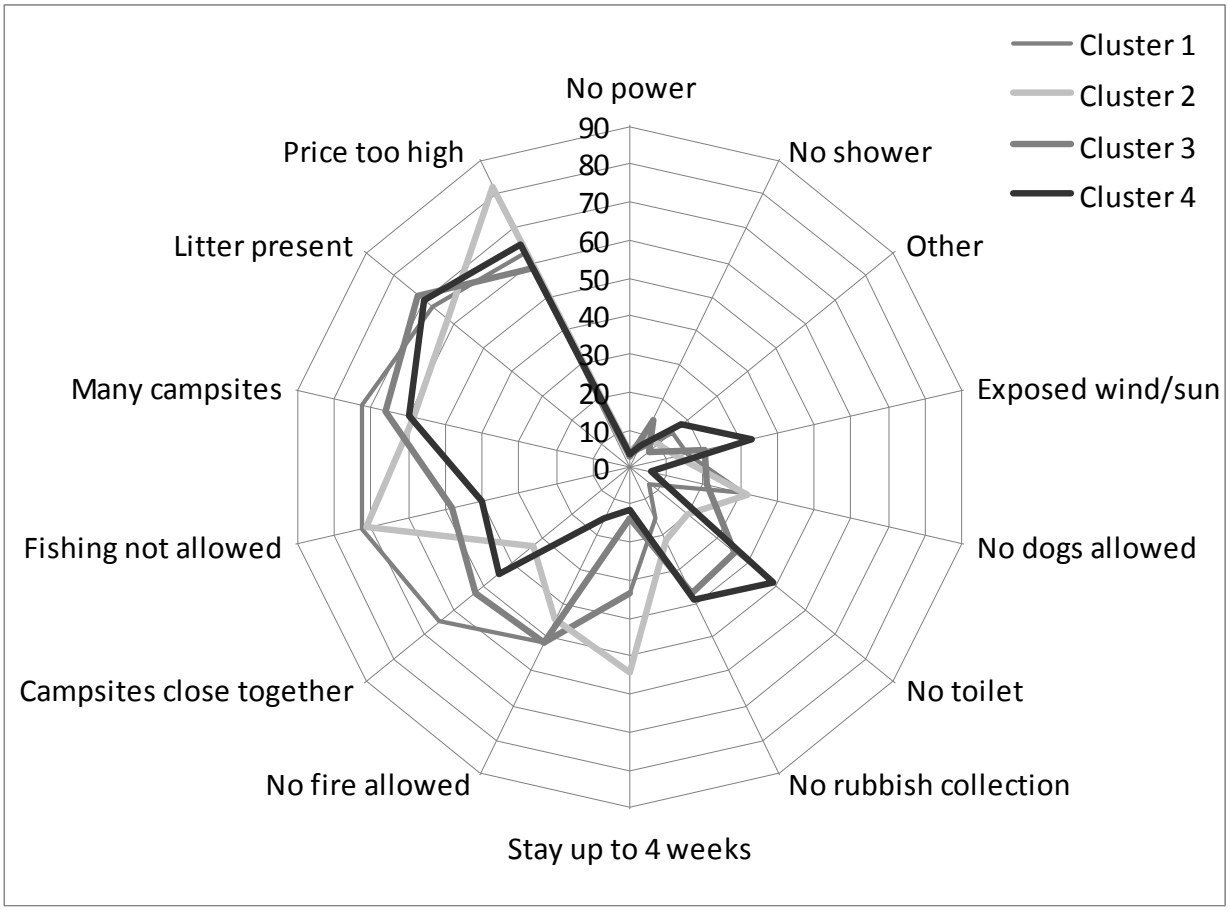


Figure 10.4: Percentage of respondents indicating 'What makes you NOT want to camp at a given site?'

Distance from the Ocean

When respondents were asked how satisfied they would be with varying campsite distance from the ocean, the average number of 'highly satisfied' campers decreased with increasing distance for all Clusters (Graphs 5, 6 and 7). Overall, 74.4% of campers would be highly satisfied camping 25 m from the ocean, which decreases linearly to 11.4% of highly satisfied campers when on a ridge 400m from shore. This supports findings within the literature (Lime, 1971; Lucas, 1970), that distance from a water body is a very important attribute to campers.

A Pearson chi-square test (sig=3.98, df=6) revealed no significant difference between Clusters for a campsite 25m from shore. For all other categories, Clusters 1 and 2 were not significantly different, and Clusters 3 and 4 were also not significantly different concerning satisfaction for campsites 50 and 100m from shore, and 200m and 400m on a ridge overlooking the ocean. This may indicate that campers at less regulated sites (Cluster 1 and Cluster 2) place more importance on camping close to the water than those in more regulated (Cluster 3 and Cluster 4) areas. This finding mirrors the increasing Cluster trend (Graph 3) for importance of 'campsites being near to water'.

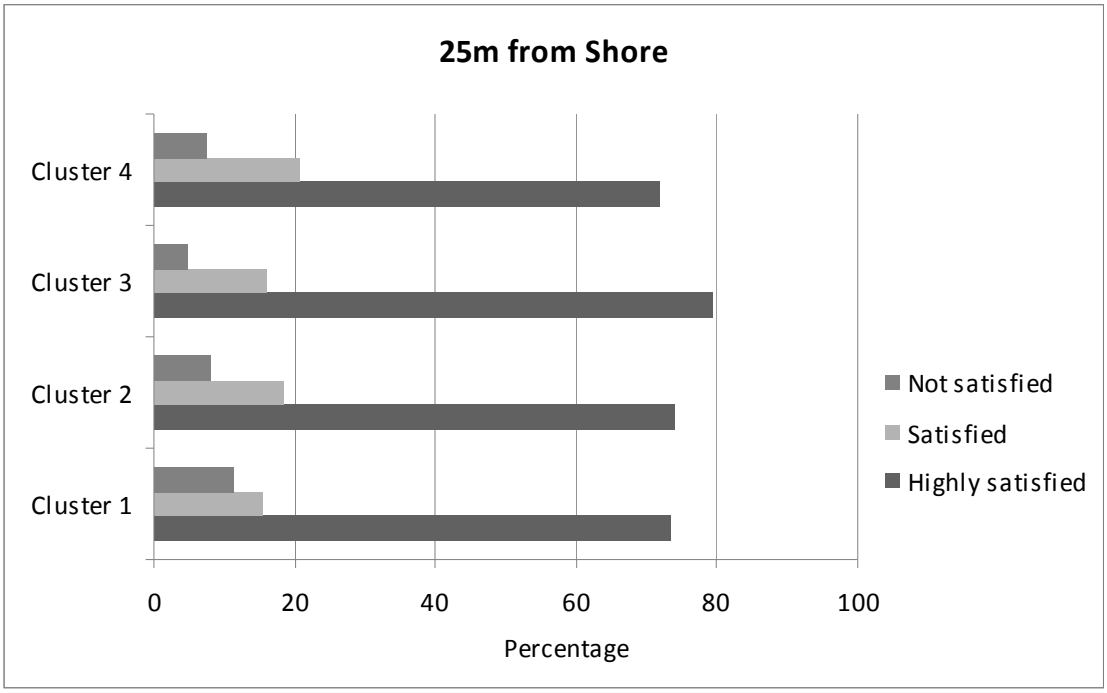


Figure 10.5: Satisfaction of having a campsite 25m from shore

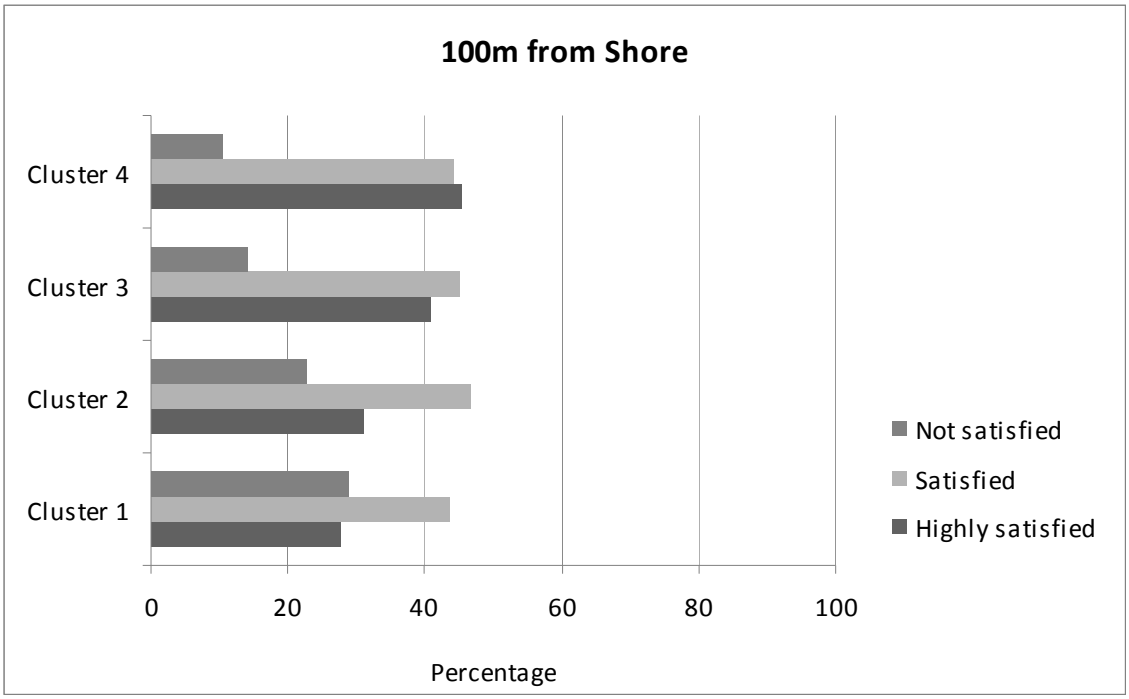


Figure 10.6: Satisfaction of having a campsite 100m from shore

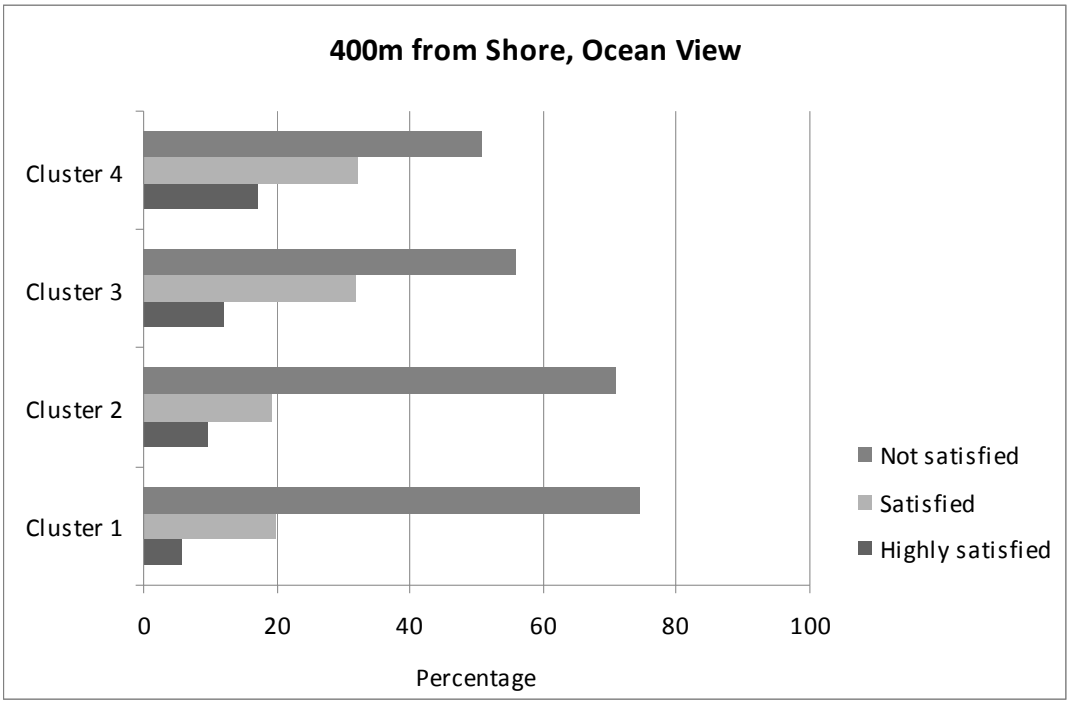
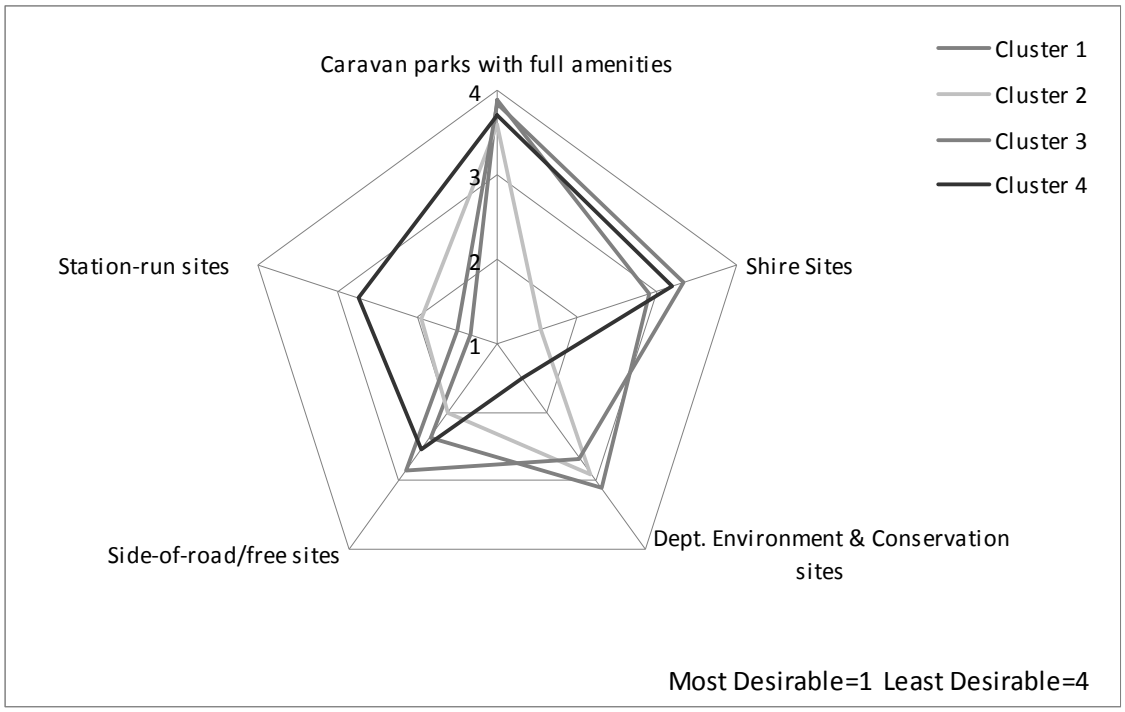


Figure 10.7: Satisfaction of having a campsite on a ridge overlooking the ocean 400m from shore

Management Preference

Respondents were requested to rank campsite style preferences from 1 to 4 (1 being most important) between Department of Environmental and Conservation sites, side of road/free campsites, station-run sites, and caravan parks with full amenities (Graph 8). Overall, station-run campsites were most preferred (score of 1.93), followed by side of road/free campsites (2.42), DEC run campsites (2.49), Shire sites (2.93). Least popular was Caravan Parks with full amenities (3.74). The preference for station camping may be due to the large number of campers surveyed from stations. Only Blowholes (Shire-run) (Cluster 2) and Cape Range National Park (Cluster 4) were not station managed.

There was a significant difference (sig =0.00) between Cluster 4 (which is managed by DEC) and all other Clusters after completing a post-hoc Bonferroni test for 'DEC run sites'. No significant difference (sig=0.61 to 1.00) existed between Clusters for 'caravan parks with full amenities', which was the least popular for all Clusters. For side of the road/free campsites, Cluster 2 was significantly different to all Clusters (sig=0.00 to 0.035). For station-run campsites, only Cardabia and Gnaraloo were not significantly different (sig-0.83).



Graph 8: Management preference of all campers

A2.6 Discussion

Significant differences were found between Clusters regarding site preferences and activities, thereby proving the hypothesis on which this paper was based. However, similarities between Clusters also exist. Therefore, two different levels of preferences for the Ningaloo region for both campsite preferences and activities were found. The first are common preferences across all Clusters that relate to the character of the region as a remote coastal camping destination. The 'average camper' (Shafer, 1969) at Ningaloo wants a 'wilderness experience' with easy access to the beach, but doesn't like litter, high fees or crowding. These commonalities may be because all campers were attracted to the same remote region (Bumgardner *et al.*, 1988). Campers may have similar expectations with regard to nature and seclusion. A second level of preferences was found between Clusters, which differ in relation to a sites' level of regulation, access, cost, facilities, camper demographics and activities. These two levels of preferences were also found in Winter's (2005) study, in which both her camping clusters have an interest in recreating, but differ in their values and perceptions of nature.

A2.6.1 Similarities between Clusters: The 'average' Ningaloo Camper

The literature suggests that modern campers with high levels of comfort and technology are often less environmentally concerned and more socially focused, desiring highly developed camp areas with full facilities (Clark, 1971). However, results within this study disprove Clark's (1971) theory. Remote campers at Ningaloo indicated they dislike litter and crowding and preferred a 'wilderness experience'. Also, despite many remote campers acquiring high levels of comfort, the least popular camp-style option for all Clusters at Ningaloo was 'developed campsites with full facilities'. While conflicts between campers and managers often result in more developed parks because of a campers' shift away from the values of traditional camping, campers at Ningaloo have still maintained these traditional camping values (Clark *et al.*, 1971). These values were also found for visitors to Litchfield National Park in the Northern Territory, who had a strong desire to limit commercial activities within the park (Ryan & Sterling, 2001). However, with growing number of campers and limited infrastructure, concerns surrounding environmental damage have been raised (Western Australian Planning Commission, 2004), which should also be considered.

Another important similarity between campers is that all Clusters enjoyed the activities Beach/swim, Beach walking, Sightseeing/4WD, and Fishing from shore to the same extent. This is understandable considering Shafer (Shafer, 1969) argues that often preferences are given to the dominant physical landscape feature of the camp area. Additionally, all management regimes grant beach access for pedestrians. It can therefore be said that these activities are important to the region as a whole in terms of what attracts campers, and is thus considered of high value to campers. Given all campers find beach activities very important, it would be advantageous to have sites within walking distance to the beach to minimise vehicle use for beach activities. It is apparent that if a small proportion of campsites are close to the beach, they will be heavily used, resulting in impacts such as erosion due to overcrowding. In order to distribute campers evenly, both beach access and campsite privacy are recommended for as many campsites as possible. Even the perception of privacy through vegetation screening can be used effectively, to evoke a sense of isolation and solitude (Garst, 2005)

A2.6.2 Differences and Sub-Groups found between Clusters

Significant differences were found between Clusters for both a variety of campsite attributes (toilets provided, dogs allowed, fire allowed, well defined paths and campsite area, generators allowed and dump point for sewerage) and activities (snorkelling, surfing, fishing from boat and commercial tours). These differences likely occur because different campsite attributes and activities apply to specific sites and management regimes chosen within the broader region. For example, if you want a campfire and have a dog, you could not stay at Cluster 4 due to regulation. If you do not have a four-wheel drive, Cluster 4 has a paved road. Cluster 3 is the only Cluster that offers numerous surf breaks. These differences suggest that while remote campers at Ningaloo do have some similar opinions, Clusters also contain camper subgroups outlined by previous research (Davies *et al.*, 2009; Jones *et al.*, 2009). However, findings within this report (Section 4.2.2) suggest that some campers are also staying in campsites which do not reflect their preferences. When considering campsite preferences at Ningaloo, it is recommended that attributes favoured by all Clusters, which represent the region as a whole be considered, in addition to area specific considerations based on the Cluster type categories.

Preference differences between Clusters for campsite management style (Graph 8) were also found at Ningaloo. This indicates that campers rarely move between sites with different management regimes, and that low site substitution may occur. Because of this, some campers may be inadvertently displaced through management changes. Schreyer and Knopf (1984) explored displacement and social succession in recreation planning and suggested that those with high recreation specialisation, such as repeat visitors (Clusters 1 and 2), have narrower margins for an acceptable experience. Additionally, campers who have a higher involvement with a location and its associated activities are likely to evaluate the setting more positively, inducing place attachment (Mowen *et al.*, 1997). Repeat visitors therefore have potential to become stewards of the environment if given the right level of support (Remote Research, 2002). Managers should be aware of these groups so as not to displace them in the campsite planning process. It is recommended further consultation with user groups, an appropriate education program and phased modification approach be used before changing use patterns of implementing restrictions, as outlined by the *Ningaloo Coast Regional Strategy* (Western Australian Planning Commission, 2004).

A2.6.3 Comparisons of Results with Previous Studies

Within the literature, it is argued that camper preference studies cannot be compared or applied to different regions due to strong inconsistencies. However, both campsite and activity preferences within this study mirror previous findings from Ningaloo studies (Jones *et al.*, 2009; Remote Research, 2002) that wilderness values are of higher importance than facilities. Additionally, preferences found to be important within this study (litter, price, seclusion, distance from water) were consistent with the international literature (Choi & Dawson, 2002; McEwen, D., 1986). Despite these similarities however, relying on international preference literature to aid management at Ningaloo would likely result in

inaccuracies due to Ningaloo's unique remote camping situation, specifically length of stay, remoteness and use of technology. Many remote campers at Ningaloo utilise technology (such as 4WD, caravan, power, satellite TV) for 'comfort and convenience' (Garst, 2005) in a remote setting for long periods (average 24.4-45 nights). The fact that many remote campers at Ningaloo have high technology, particularly Clusters 1 and 2, supports Garst's (2005) observation that technology allows campers to be away for long periods of time yet remain comfortable. This explains their preference for campsite attributes such as generators and dump points. Without their technologies, it is unlikely Ningaloo campers would camp for the lengthy periods of time noted in this study. In the absence of such technology, many campers would likely need advanced facilities, such as those found at Cluster 3.

A2.6.4 Management Regimes at Ningaloo with regard to Camping

Within the literature it is argued that preferences are affected by a users' region, activities and natural resource characteristics of the camp area (1988). While this theory is supported by findings within this paper, results from this study suggest additional factors contribute to subgroups within Ningaloo. These factors included management type (which contributes to camper experience through price, facilities and length of permissible stay), type of vehicle, accommodation comfort/technology and access road quality. Managers do not have control over the level of technology that campers have access to, or the natural scenic beauty of an area. However, managers and planners can influence activities offered (i.e. where visitors can fish, boat launch facilities, hiking trails), facilities (which would mean less technology was required, making a campsite more suitable for different accommodation types), access road quality and regulation (fires, dogs, stay time limit, price). These factors may be considered opportunities that managers can utilise to aid even camper distribution. This may prevent environmental degradation and conflict between different user groups. Changes to these campsite attributes may however result in a change of camper demographics at that site.

It is important to still maintain sense of 'wilderness' along the whole Ningaloo coast, shown to be important to the 'average' Ningaloo camper. The perception of an unmediated experience with the region's natural environment is the reason current campers choose Ningaloo over alternative camping locations. To create an abundance of infrastructure would mean a shift of visitor perspective from strong environmental values, to values surrounding facilities and social interaction. This would likely change both the demographic of visitors to the Ningaloo coast, and the dynamic of the region as a whole.

A2.7 CONCLUSION

A solid understanding of visitor preferences is a necessary first step towards the planning and design of campsites. Through understanding camper preferences, use distributions may be managed better to protect the natural environment, and conflict between campers and managers may be avoided through understanding specific needs of campers in different locations. This research is timely given that campsite management is very important for future planning of the Ningaloo coast.

The results prove the hypothesis that significant differences exist between Clusters concerning campsite preferences and activities at Ningaloo reef. However, similarities between Clusters were also found. Therefore there are two levels of preferences for remote campers within the Ningaloo region. The first are preferences common to all clusters that reflect the regions' amenities as a remote coastal camping destination. The 'average' Ningaloo remote camper has high values for the natural environment, solitude and beach access. A second level of preferences was identified through campsite Cluster comparisons. Significant differences were found between Clusters for both a variety of campsite attributes and activities. These included ablution and sewerage dump point facilities, allowance for dogs and campfires, and length of stay allowed. The activities surfing, snorkelling, fishing from a boat and participating in organized tours differed across Clusters. These differences likely occur because of different length of stay and the fact that campsite attributes and activities apply to specific sites and management regimes. Using

camper preferences for management purposes would require consideration of both the region as a whole in terms of its general character preferred by all Clusters, in addition to area-specific considerations based on the Cluster type categories identified within this study. Planning documents should therefore capture the uniqueness of remote camping at Ningaloo to offer a breadth of remote camping experiences, whilst also taking the necessary precautions to limit environmental degradation.

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Table 1: A comparison of different camp areas and campsite Clusters

Camp area	Management	Access	Cost	Facilities	Regulation	Demographic source:Author	Activities source:Author
CLUSTER 1							
Warroora (not 14mile)	Warroora Station	Corrugated dirt tracks, 25 to 200km from paved road; 100km to 250 km from a town	No cost to $5/night per person	Rubbish tip (1km-50km away) Sewerage dump point (1km-200km away)	NCORA Regulations* Do not litter No Firearms Do not remove shells 1 kg fish per person per day No firewood collection	31.2 % Retired. Age distribution even. Largest age group 56 to 65 (24.7%). Most campers from West Australia.	Enjoying the beach, Fishing from shore, snorkelling, fishing from boat
Bruboodjoo	Cardabia Station, Baiyungu Aboriginal Corp.						
Learmonth Bombing Range	Dep. of Defence						
CLUSTER 2							
The Blowholes	Shire of Carnarvon	Dirt tracks, 10 meters to 25km from main road. 100km from a town	$5 per night per person	Rubbish tip (100m-2km away) Sewerage dump point up to (2km-100km away) Public phone (Blowholes only) Drop toilet (Blowholes only)	NCORA Regulations (as above)	64.3 % Retired. Only 15.7% of campers under the age of 45. Largest group 56-65 (42.5%). Most West Australian	Enjoying the beach, Fishing from shore, Sightseeing/4WD, Fishing from boat
14 mile (Warroora)	Warroora Station						
CLUSTER 3							
Quobba Homestead	Quobba Station	Corrugated dirt tracks, 15 to 150km from paved road. 95 to 250 km from Carnarvon.	Unpowered $8, to $20 adult (powered sites at Quobba Homestead only, $10). Dogs free to $2.50 a night.	Powered & unpowered sites Public phone Compost or flush toilets Rubbish bins at camps Small store *Gnaraloo only:* Brackish water showers Wireless internet Alcohol licence	Collecting firewood prohibited Dogs allowed if follow rules Campfires allowed Generators tolerated	12.9% Retired. Only7.7% over the age of 56. Largest age group 26-35 (30.6%). Most from Western Australia	Enjoying the beach, Surfing, snorkelling, fishing from shore
Red Bluff camp	Quobba Station						
3 Mile camp	Gnaraloo Station						
CLUSTER 4							
CRNP	State Government Department of Environment & Conservation	100km from Exmouth	$10 per person per night	Compost toilets Management presence Numbered & hardened camp sites Bins near campsites/rubbish collection One public phone Refreshments at visitor center	No dogs or Campfires Generators tolerated (ltd times) No driving on beaches/dunes Max stay 4 weeks No removal of natural material	39.8% Retired. Fairly even age distribution. Largest group 56-65 (34.6%). From Australia & overseas.	Enjoying the beach, Snorkelling, beach walking sightseeing

* NCORA Regulations: Ningaloo Reef Outback Coastal Association (2003). Ningaloo outback code. Safety and survival guidelines. *

A3 CONSOLIDATION IN A WILDLIFE TOURISM INDUSTRY: THE CHANGING IMPACT OF WHALE SHARK TOURIST EXPENDITURE IN THE NINGALOO COAST REGION

A3.1 Summary

This chapter presents an element of James Catlin's doctoral research into changes in the whale shark tourism industry on the Ningaloo Coast. Specifically, this chapter examines changes in expenditure of whale shark tour participants over a decade at Ningaloo Marine Park, Western Australia. In turn these changes are linked to the broader industry and tourism context in the region. The key science findings are:

- In 2006 whale shark tour participants' expenditure in the region was $894 per trip, and total expenditure was $6.0 million (all figures are in Australian dollars). Between $2.4 and $4.6 million would have been lost to the region if whale shark tourism did not exist.
- This measure of participants' expenditure is substantially lower than the calculation of $2370 per participant from a previous study of whale shark tourists using data collected in 1995.
- This is consistent with a change in the types of wildlife tourists that participate in an activity as the industry reaches the point of consolidation, where the industry has moved towards the tourist mainstream and 'generalist' participants displace 'specialists'. Specialists tend to prefer an unmediated experience and tend to have higher expenditure levels.

The implications for management are:

- Using old data to forecast wildlife tourists' expenditure needs to take into account changes in the industry's stage of development.
- There is a need to regularly (every three to four years) update expenditure data if either managers or the industry requires an indication of the industry's economic size.
- The cost of tours, and the expenditure of tourists, has declined in real terms since 1995, which has been offset by increasing the size of participant groups and reducing expenses such as by sharing a spotter plane.

This chapter is largely drawn from the article cited in the footnote below.[34] The authors would like to thank the *International Journal of Tourism Research* for providing permission to use material from the article.

[34] J. Catlin, T. Jones, D. Wood & B. Norman. 2010. 'Consolidation in a wildlife tourism industry: the changing impact of whale shark tourist expenditure in the Ningaloo Coast region.' *International Journal of Tourism Research*, 12 (2): 134-48.

A3.2 Introduction

Whale shark tourism is an important drawcard for the Ningaloo Coast region in the mid-northwest of Western Australia.[35] In addition to attracting local and international visitors and making a contribution to the regional economy, it also fits within the category of 'iconic' tourism (Stoeckl *et al.*, 2005), providing the region with a recognisable brand and point of difference from its competitors. Previous research into whale shark tourism valued the expenditure of whale shark tourists in the region at $4.7 million (Davis *et al.*, 1997).[36] However, the Davis *et al.*,study was conducted in 1995, only six years after the first whale shark tours, when the industry was in its infancy.

In this paper we discuss and assess changes to whale shark tourism since 1995 focussing on the local economic impact of whale shark tourists' expenditure. This paper consists of five sections. The first section provides a brief description and history of tourism to the Ningaloo Coast and the Ningaloo whale shark tourism industry. The second section reviews the literature analysing the economic impact of tourist expenditure. The third section describes the methodology focussing on the survey questionnaire, its administration and treatment of the data. The fourth section presents the survey results and compares the results to the earlier Davis *et al.,* study. The final two sections discuss the implications of the results. They draw conclusions regarding changes in the whale shark tourism industry and the effects of industry consolidation in a wildlife tourism industry on tourist expenditure and characteristics.

A3.3 Background

A3.3.1 The Whale Shark Tourism Industry on the Ningaloo Coast

There are only a handful of places around the world where whale sharks appear consistently and in sufficient numbers upon which to base a tourism industry. Together with the recognized and developed industry operating at Ningaloo Marine Park (NMP), opportunities to swim with whale sharks also occur at about 20 international destinations including Mozambique, the Maldives, Seychelles, Baja California, Costa Rica, the Philippines, Belize, and Djibouti. Whale shark tours have been operating out of Exmouth since 1989, but it was not until their popularity grew and the need for regulation became apparent that licences were first issued to operators in 1993, thus establishing a regulated tour industry (Coleman, 1997). Originally 13 licences were granted. This has since increased to 15, with 12 at Exmouth and three at Coral Bay (Wilson, W. *et al.*, 2005). Currently the number of licences is set at 15 and these are valid for a period of one to five years with the option of renewal.

Interest in the whale shark tours has continued to grow since 1993, with the number of people participating in the tours increasing five fold to 5000 visitors in 2004 during the official DEC whale shark season of April and May (CALM, 2005; Coleman, 1997). However, whale shark tours have been known to run at any time from March to August and total visitor numbers are therefore likely to be considerably greater and in some seasons are possibly double those collected officially. The timing of the whale shark season complements the peak tourist season,

[35] The term 'Ningaloo Coast region' refers to the coast that runs from the town of Exmouth to the town of Coral Bay in the Coral Coast tourism region.
[36] All figures are in Australian dollars

which runs from June to October. Furthermore, the effect of whale sharks on the tourism industry in Exmouth extends beyond the whale shark season since they assist in attracting tourists throughout the year (Wood & Glasson, 2006).

A3.3.2 Literature Review

While economic analysis of tourism is increasingly important to tourism planning and policy development (Tyrrell & Johnston, 2006), measuring the economic impacts of nature-based tourism has proven particularly useful for increasing the recognition of the economic value of wildlife and national parks, and for helping to ensure adequate management (Eagles, 2002; Wood & Glasson, 2006). This usefulness underlies the recent growth in assessments of the expenditure of visitors to National Parks in Australia (Carlsen, 1997; Carlsen & Wood, 2004; Driml, 1998; Economics and Regulatory Reform Unit, 1999, 2000; Pearson *et al.*, 2000; Stoeckl *et al.*, 2006; Ward, 1999; Wood *et al.*, 2006) and other countries (Eagles, 2002; Fesenmaier *et al.*, 1989; Lee & Han, 2002; Nayak, 2001; Saayman & Saayman, 2006; Xue *et al.*, 2000). For instance, Stoeckl, Smith *et al.* (2005) found that visitors who interacted with dolphins at Monkey Mia, Western Australia, contributed between $4.2 million and $8.8 million per annum in direct expenditure to the local economy and that visitors who participated in whale watching in Hervey Bay, Queensland contributed between $6.5 million and $11.5 million per annum. While the range of expenditure here is large, the level of expenditure is sizable for small regional economies even at the lower end of the scale. In another study, Tisdell and Wilson (2002) found turtle viewing at Bundaberg, Queensland, contributes $0.8 million annually in tourist expenditure to the local economy.

There are two broad groups of economic indicators that can be used to assess the economic value of nature-based tourism (Driml, 1998). The first group involves measuring the economic benefits or total benefits of tourism and then subtracting any costs to society in the provision of those benefits. A problem with this group of approaches for whale shark tourism, which takes place in a remote regional location, is the data-poor environment and the concomitant difficulties of accessing data from local businesses. The second group involves calculating the direct expenditure associated with tourism and recreation and using a multiplier to calculate the net economic benefit of tourism to the region. Mihalic (2002) argues for the centrality of expenditure to the understanding of the economic consequences of tourism. She writes that “the consumption of tourism is at the economic centre of the economic measurement of tourism and the foundation of the economic impacts of tourism” (2002, p. 88). Similarly, Pearce (1981, p. 240) argues that establishing a figure for direct expenditure provides the “first indication of the significance of tourism to a national, regional or local economy”. Within this second group of approaches, direct expenditure can be calculated through the use of a survey or through the application of expenditure models (Frechtling, 2006). Given the data poor environment, it was decided to use a survey to gather information directly from participants.

This study uses the following formula to calculate visitor expenditure:

> Total visitor expenditure = Average daily visitor expenditure x average length of stay x total number of participants

To calculate the average daily expenditure, visitors were asked to record the total expenditure for their expenditure group and their expenditure group size. According to Stynes and White

(2006), this is easier for participants than recording individual expenditure. We have decided to use paying visitor numbers as many of the non-paying participants are repeating an earlier unsuccessful tour and other non-paying participants were researchers who undertook multiple trips. All figures are in Australian dollars.

Johnson and Moore (1993) argue that providing figures for the total expenditure of tourists who visit a particular resource overestimates the economic impact of that resource. Instead, it is necessary to know the expenditures that are specifically due to that resource – the expenditure that would be lost if that resource was not there. Such a measurement can be made through a scenario question addressing whether participating in a whale shark tour was the reason for a trip, destination choice, or increased the length of time spent in the region. Recent economic studies of wildlife tourism participants have measured the expenditure 'attributable' to the resource, generally through asking such a question (Carlsen, 1997; Carlsen & Wood, 2004; Stoeckl *et al.*, 2005). However, to date there has been a lack of attention to terminology in such studies. A scenario question measures what we label the 'substitution' value, or the amount of money that would have been spent outside the region ('substituted' with a trip elsewhere or staying at home) if a particular activity or resource were not available.

A number of studies use input-output (IO) multipliers to calculate the indirect and induced effects of visitor expenditure on the economy (Driml, 1998; Economics and Regulatory Reform Unit, 1999, 2000; Saayman & Saayman, 2006). Recently there have been a number of criticisms of the use of IO multipliers, particularly because they do not capture the feedback effects of tourism growth within an economy (Carlsen & Wood, 2004; Dwyer *et al.*, 2004; Saayman & Saayman, 2006). Dwyer *et al.*, (2004) argue that IO multipliers measure the positive effects of tourism growth on economic activity but ignore the fact that this growth reduces the resources available to other industries within the economy, which can, in some cases, outweigh the positive effects (2004; see also Sahli & Nowak, 2005). They advocate the use of Computable General Equilibrium methods (CGE), which model the interactions between different sectors of the economy. However, both IO and CGE require economic data sets that are not available for the Ningaloo Coast region. Regional locations are generally heavily reliant on imports and consequently have very small multipliers due to this high level of leakage (Stoeckl *et al.*, 2006; Stoeckl *et al.*, 2005). Rather than using estimates to generate IO tables (a precondition of CGE analysis), a number of recent studies have chosen to limit their analyses to direct visitor expenditure in the region citing the absence of IO tables and their small value in regional locations (Carlsen & Wood, 2004; Stoeckl *et al.*, 2006; Stoeckl *et al.*, 2005). Given these considerations, this study does not employ multipliers and our expenditure figures should therefore be seen as a conservative indicator of the value of the whale shark tourism industry to the regional economy.

A3.4 Methods

Calculating visitor expenditure in a region is conceptually simple but it entails many difficulties in collecting and treating data that can potentially skew results (Frechtling, 2006). The first challenge is to ensure that the survey sample reflect the characteristics of the population (in this case, whale shark tour participants). The demographic parameters of the entire whale shark tourist population were not available for comparison with this study, since such data are not collected. However, representativeness of the sample can be confirmed by comparison with

another independent study of whale shark participants. Results from Catlin's (2005) whale shark tourism study found very similar demographic characteristics to the participants of this study in the categories of age, gender and nationality. This suggests that the sample for this study is representative and that it is legitimate to generalize to the broader population of whale shark participants at NMP.

The Ningaloo Coast regional boundary captures most important aspects of the impact from visitor expenditure, in particular accommodation costs, because the area is isolated and a whale shark tour is a day long activity that departs around 7.30am. Only 2.8% of respondents listed their accommodation location as 'other', meaning not in Exmouth, Coral Bay or the National Park, but most likely still within the region. The surveys were distributed to the participants who departed from Exmouth. Tours that departed from Coral Bay were not surveyed. However, the majority of operators (and therefore the majority of participants) depart from Exmouth, as indicated by the location of licences, as previously discussed, and the mixture of accommodation is similar for both locations. Furthermore, expenditure patterns are likely to be similar for the two locations.

A3.4.1 Questionnaire Design and Administration

The questionnaire used in the survey was based on that used by Wood since 1997 in the Ningaloo Coast region (Wood, 2000). The survey was developed further by Carlsen and Wood in conjunction with the Sustainable Tourism Cooperative Research Centre (STCRC) (Carlsen & Wood, 2004). Through a process of refinement, the questionnaire has been reduced to two pages that capture the significant elements of visitor expenditure and visitor characteristics. Accommodation and activity costs; accommodation type; visitor origin; household income and age are particularly important (Wood *et al.*, 2006). The expenditure categories, much like those suggested by Stynes and White (2006), cover accommodation, food and drink, transportation, other costs (including souvenirs and retail), equipment costs and activities costs. Telescoping, the inclusion of expenditure incurred outside the region, was further reduced by asking participants to provide figures for both purchases inside and outside of the region.

The questionnaires were administered, in both English and Japanese language versions, to whale shark tour participants from the month of April through to June 2006 as part of a broader Earthwatch Institute-supported project participating in the conservation group Ecocean's photograph identification programme of whale sharks. Two different methods of administering the survey were employed. First, questionnaires were distributed directly to the whale shark participants at Tantabiddi boat ramp to the north of NMP. This method had already been proven successful in achieving a high response rate by Catlin (2005). Although an exact response rate was not calculated for this survey, the questionnaire was received very well by the whale shark participants and a high return was attained (estimated to be >90%). This method accounted for close to one third of all completed questionnaires.

The other mode of distribution was to give bundles of the questionnaires to the whale shark tour operators. The survey forms could then be passed on to the participants by the operators. This method allowed for a large number of questionnaires to be distributed. Davis and Tisdell (1998), in their previous study of whale shark tourists, acknowledged that this approach may have introduced bias as a result of a variations in participation levels amongst operators. To overcome this potential bias, regular contact was maintained with operators to encourage

participation. In addition, it was assumed that the inclusion of a whale shark educational brochure and a sticker promoting whale shark photo identification would persuade tour operators to hand out the survey forms. From both methods of distribution, a total of 804 questionnaires were completed and returned. Analysis of the results showed very little variations between the two methods of survey administration.

A3.4.2 Data Treatment

Before beginning analysis, it was necessary to address a series of potential measurement errors and to formulate strategies for dealing with contaminants and outliers. Five potential measurement errors relating to visitor expenditure were addressed in preparing the data for analysis.

- All of the activities costs were reviewed against the cost of a whale shark tour ($300-350) and, where the entries were not consistent with the cost of the tour for that number of participants, they were reviewed or excluded, or when appropriate the number of participants was excluded or corrected. For instance, one participant entered $300 for activity expenditure for a group of two people. Since the cost of a whale shark tour is over $300 per person, either the expenditure or the number of people in the expenditure group is likely to be incorrect and the expenditure results were excluded.
- Following Stynes and White (2006), we have reviewed all of the expenditure categories and have entered in a 'zero' for blank categories where the respondents' entries indicate this may be the case. This generally occurred in the transportation expense category. For instance, it is possible that a participant on a package tour paid for their transportation outside the region, or that participants who drove themselves bought their petrol elsewhere. Where this was possible and the travel expenditure was blank, we entered 'zero'.
- The high cost of travelling to the region by either road or air travel could have potentially inflated the travel costs in the region, if the question was misinterpreted. However, care was taken to remove any individual travel costs which were unreasonably high. For instance, one respondent entered $10,000 as the travel expenditure for a trip lasting three days. This is likely to be the cost of flying to Australia, which does not itself contribute to the regional economy. Travel expenditure was excluded when this was likely to have occurred.
- The most likely contaminant to our data was participation by residents. For this reason participants who reported to have stayed for extended periods in rental accommodation were excluded from the study as they were deemed to be residents.
- Participants who stayed over four weeks were excluded as outliers (n=14); these constituted only 1.7% of total surveys. Participants who stayed for extended periods skew the length of stay figure and are not representative of the total sample.

Twenty eight surveys were excluded using this methodology. Given the often skewed distribution of expenditure data, it is recommended that the mean expenditure is calculated using either a trimmed mean or a weighted mean (Pol *et al.*, 2006). However, Stynes and White (2006) recommend the use of a trimmed mean (and by extension a weighted mean) only in

instances where it is impossible to vet the entries or where the size of the data set precluded this option. Given the principles applied to verify the data and the attention to outliers, this study uses the mean of each expenditure category to calculate expenditure.

A3.5 Results

A3.5.1 Demographics

The number of participants was and still is provided by a head count undertaken by Western Australian Department of Environment and Conservation (DEC) as part of their regulation of the whale shark industry. Previously, this head count only covered the official two month whale shark season from March until May even though whale shark tours can run for a period almost double the length of the official season. The first complete annual headcount, which we employ here, was undertaken in 2006 and the total number of paying participants was 6,677.

Table 1 displays the demographic and trip characteristics of the whale shark tour participants. As can be seen females (55.8%) slightly outnumbered males. This gender composition is consistent with studies on the Great Barrier Reef where snorkelling was also the main activity (Davis *et al.*, 1997; Green, 1997). Whale shark tourists came from a variety of locations throughout the world. Of the international participants, the main sources were the United Kingdom and Ireland (33.8% of international visitors); Germany (16.5%); the rest of Europe (20.1%); and Japan (13.1%). Australian visitors made up nearly half the population, close to half again coming from Western Australia. Over half the participants were aged between eighteen and thirty (51.1%), and the mean age was 34.4 years. The age distribution of whale shark tour participants is akin to similar activities (Green, 1997; Musa, 2003).

The long distances required to travel to the North West Cape, compounded with the relatively high cost of swimming with whale sharks, have the potential to restrict the experience to people with higher incomes. It would therefore be anticipated that a large proportion of people would have higher incomes, as was the case in these results (Table 1). As can be noticed, most visitors stayed for a week or less, with camping & caravan park as the most used type of accommodation by a small margin over hotels/motels, followed by backpackers.

As mentioned earlier Ningaloo is one location in an exclusive group of sites where the opportunity to view whale sharks is readily available. Thus it is interesting that only 37.0% came specifically because whale shark tours were available in the region. On the other hand, 60.2% would have still visited the area regardless of whether the whale shark tours were available. However, close to two thirds (65.9%) of this group would have spent less time if the whale sharks were not present. This suggests that the other attractions of the region are also an important component of people’s decisions to visit the area.

Table 11.1. Demographic and Trip Characteristics of Whale Shark Participants (%)

Variable	Categories				
	18-30	**31-45**	**46-60**	**61+**	
Age (n=763)	51.1	30.5	13.0	5.4	
	Male	**Female**			
Gender (n=765)	44.2	55.8			
	Intrastate	**Interstate**	**International**		
Origin (n=764)	24.0	24.9	51.2		
	$10,000 - $29,999	**$30,000 - $39,999**	**$50,000 - $74,999**	**$75.000 - $99,999**	**$100,000 +**
Annual Household Income (n=661)	16.9	20.4	20.0	16.0	26.6
	1-3	**4-7**	**8-14**	**15+**	
Number of Nights in the Region (n=726)	41.0	46.8	11.0	1.1	
	Campsite & Caravan Park	**Backpackers**	**Hotel / Motel**	**Other**	
Accommodation Type (n=774)	37.0	25.7	31.3	6.1	
	Would not have visited (a)	**Less time (b)**	**The same amount of time (c)**	**Do not know (d)**	
If whale sharks were not available (n=774)	37.0	39.7	20.5	2.8	
	Word of mouth	**Guide book**	**Advertisement**	**Documentary**	**Internet site**
Top 5 information sources (n=767)	43.5	24.3	16.0	14.2	13.7

A3.5.2 Participant Expenditure

The per person total and nightly expenditure in the Ningaloo region is presented in Table 2. The per night expenditure category was based on the average number of nights in the region for whale shark tour participants: 4.8. Despite removing outliers from the data set, the median total expenditure was noticeably lower than the mean for all categories. This is, however, typical of visitor expenditure data and is due to the large range of individual expenditure. Notwithstanding this, the mean is still the appropriate figure for measuring average expenditure (Stynes & White, 2006).

Table 11.2. Total and per night visitor expenditure

	Number	Median Trip Expenditure$	Mean Trip Expenditure$	Mean Per Night Expenditure$
Travel	455	63.98	130.32	27.11
Accommodation	565	115.16	186.39	38.78
Food and Drink	555	95.97	130.42	27.13
Activities	523	319.89	363.54	75.63
Equipment	498	15.99	45.07	9.38
Other	490	22.39	38.53	8.02
Total		**$633.38**	**$894.28**	**$186.04**

Not surprisingly the greatest proportion of participants' expenditure in the region was on activities; throughout the whale shark season tours are consistently offered for between $300 and $400. In addition, tourists may also pay for other activities in the region, such as scuba diving and nature based tours. The relatively low average nightly expenditure on accommodation ($38) can be explained by the majority of respondents residing in campsites, caravan parks and backpackers (Table 11.1). During the whale shark season, there is generally a wide range of accommodation available (for instance, caravan park occupancy was under 50 percent at the time of this study), although visitors staying in the region at the end of a long whale shark season that overlaps with the July school holidays would find their accommodation options limited and would struggle to find accommodation without a booking.

The total and nightly expenditures were further categorized according to the affect of whale sharks on participants' travel plans in the region. Respondents who stated that they did not know how the presence of whale sharks affected their travel plans were excluded since their sample size was too small for consideration. As seen in Table 3, the respondents who visited the region primarily for the whale sharks spent considerably more per day than other visitors.

Table 11.3. Expenditure based on trip intentions

	Per Person Trip Expenditure$	Ave Number of Nights	Per Night Expenditure$
Stayed the same amount of time (n=86)	$860.37	5.4	$158.49
Stayed less time (n=184)	$861.30	5.0	$172.62

Would not have visited the region (n=174)	$952.10	4.3	$219.28

Once the per person direct expenditure is known it is possible to calculate the total expenditure in the region by whale shark tourists ($5 971 108). This is achieved by multiplying the per person total trip expenditure by the number of whale shark tour participants for the entire season. The total number of full fee paying whale shark participants (n=6,677) is believed by the authors to be a conservative estimate. It is highly likely that participant numbers are higher than 6,667 and may have been as high as 8,000 in 2006 which was considered a short season, and 10,000 in 2005, which overlapped with the July school holidays. Nevertheless, it is the most robust available figure for total tourist numbers.

Total expenditure overestimates the value of whale shark tourism to a region. A more accurate measure of the worth of an industry to a region is the substitution value, or the amount of expenditure that would be lost to a region if whale shark tourism did not exist. The following calculation employs a modified method introduced by Stoeckl *et al.,* (2005). The expenditure of the people who would not have visited at all if whale shark tours were not offered (Group a) would have been lost to the region and therefore is wholly due to the whale sharks. A portion of the expenditure of people who would have spent less time in the region if whale shark tours were not offered (Group b) is also due to the whale shark tours. Since it is impossible to calculate this proportion with any accuracy, the expenditure of this group sets the upper and lower limit of the substitution value. We have calculated the expenditure for these groups separately since, as noted previously, people who came to the region specifically to view whale sharks had a higher expenditure. Following this method, the substitution value has a range of **$2.4 to $4.6 million**.

Table 11.4. Attribution of expenditure to whale shark tours

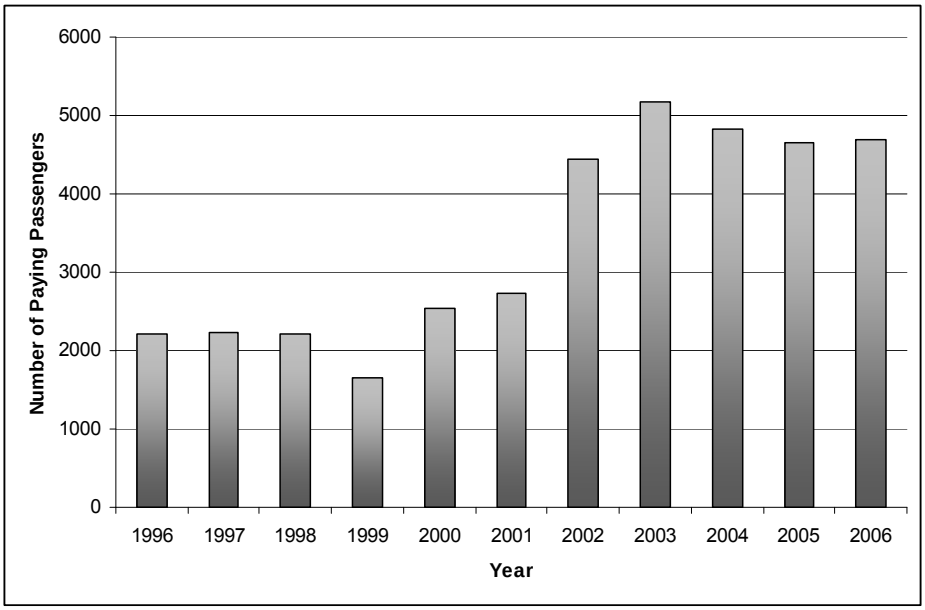
	Per Person Trip Expenditure$	Ave Number of Nights	Per Night Expenditure$
Stayed the same amount of time (n=86)	$860.37	5.4	$158.49
Stayed less time (n=184)	$861.30	5.0	$172.62
Would not have visited the region (n=174)	$952.10	4.3	$219.28

A3.6 Discussion

With regard to whale shark tourism at Ningaloo, Davis *et al.,*found that individual expenditure per trip in 1995 for whale shark participants was $2370, which, as mentioned previously, contributed $4.7 million to the regional economy based on a tourist number of 2000 (Davis *et al.*, 1997). A number of subsequent reports and articles have used Davis *et al.*'s expenditure figure by extrapolating the total visitor expenditure using updated participant numbers. These figures range from $10 million (Newman *et al.*, 2002) to $12 million (Fowler, 2000; Wilson *et al.*, 2001) to as much as $16 million (Norman, 2002). A recent management plan for the Ningaloo Marine Park (NMP) also quoted a figure of $12 million (CALM, 2005). Given the widespread use of this figure in policy and planning documents and in the framing of other research, the figure for expenditure per participant needed to be reviewed.

A discrepancy between the Davis *et al.*, study and this study is the measurement of participant numbers. The Davis *et al.*, study used participant numbers only from the official season. Since 1995 participant numbers have substantially increased during the official whale shark season (Figure 1), in addition the first 'complete' annual headcount was undertaken in 2006 and is employed in this study. Therefore, although participant expenditure in the region is lower, the total number of participants is larger.

Figure 1. Whale shark tour participant numbers for the official season of April and May



*Note: Official statistics from the 1995 season are not available.

Davis *et al.* (1997) had three objectives for their study: to gather information on the demographic characteristics of participants; to gather data on participant expenditure and incomes; and to elicit information on the quality of the experience (Davis *et al.*, 1997, pp. 264-8). They found that the largest group of visitors came from Japan, followed by Australians, then smaller numbers from continental Europe and the UK. Females slightly outnumbered males and more than half the respondents were between 20 and 30 years old, although the mean age was 32.7 years. Participants were found to be very satisfied with the experience (a mean of 4.56 out of 5). In this study we focus on two of the objectives of the Davis *et al.* study: participants' expenditure in the region; and information on the demographic characteristics of participants, which provide indications of how the industry has changed since 1995.

The results of our study demonstrate that there have been substantial changes to the whale shark tourism industry since the Davis *et al.* (1997) study in 1995. In order to assist discussion, Table 11.5 compares our data set with the Davis *et al.* data set and the 2003 results from Carlsen and Wood (2004) for all tourists to the Ningaloo region. It should be noted that Whale Shark participants are desirable visitors. They spend $103 more per trip than the average tourist and stay for just over half the amount of time, reducing their consumption of local resources and potentially putting less stress on the natural environment. Whale shark tourism also disproportionately attracts visitors from overseas and interstate, thus benefiting the National and State economies.

Table 11.5. Data from Three Surveys in the Ningaloo Coast Region*

Source	Davis *et al.*	Our Study	Carlsen & Wood
Survey Subjects	WS participant	WS participant	All tourists
Year of Data Collection	1995	2006	2003
Number	464	804	373
Expenditure per trip*	$ 3,147	$ 894	$ 791
Average Stay	N/A	4.8 nights	9 days
Expenditure per day	N/A	$ 186.04	$ 87.85
Total Expenditure	$ 6.2 mil.	$ 6.0 mil.	$ 149 mil.
Av. Age	32.7	34.4	N/A
Japanese	42.3%	6.7%	N/A
West Australian	24.1%	24.0%	48.2%
Australian	34.9%	48.8%	60.7%
International	65.1%	51.2%	39.3%

*indexed to 2006 using ABS data.

The largest discrepancy between the Davis *et al.*, study and our findings is the amount of participant expenditure per trip. There are a number of possible reasons for this discrepancy, discounting errors in data handling or calculation. One explanation is that the cost of staying on the Ningaloo Coast has declined but this is highly unlikely given increases in fuel costs and accommodation costs over the last decade. Another possibility is that the decrease in the proportion of international whale shark tour participants has impacted upon the total expenditure. In particular, the most dramatic shift is seen in the percentage of Japanese tourists, from the 42.3% in 1995 to only 6.7% in 2006. Although other studies have demonstrated that international visitors to Australia spend more than domestic tourists, this is not the case amongst whale shark tour participants in 2006. Table.6 demonstrates that although international visitors spend more per night than domestic tourists, their total trip expenditure is lower. Moreover, in the early 1990s there was a concerted push by some whale shark tour operators into the Japanese market, which was perceived as being higher spending (pers. com. whale shark tour operator). It is therefore feasible that this is part of the explanation for the discrepancies between the data sets.

Table 11.6. Expenditure by Origin of Whale Shark Participant

Origin	Per Person Trip Expenditure$	Average Number of Nights	Per Night Expenditure$
Australian (n=240)	$922.87	5.3	$174.00
International (n=224)	$857.27	4.3	$199.06

It is likely that the decline in international participants is only partly the reason for the large drop in participant expenditure. Another related explanation is that the change in expenditure is

due to a shift in the whale shark tourism market from the periphery to the mainstream amongst both domestic and international visitors as the industry has reached the consolidation phase. The term ‘consolidation’ refers to the fourth stage of Richard Butler’s (2006)Tourism Area Life Cycle (TALC), following the exploration, involvement and development stages. By the development stage, local control has declined, and regional and national bodies generally have become involved in the planning and provision of facilities. The consolidation stage is characterised by a reduction in the growth rate of tourism numbers, by a major part of the area’s economy being tied to tourism and by wide-reaching marketing and advertising. While the TALC was developed for destinations, the model also has relevance for tourism industries where these are tied to particular locations.

TALC is one of the concepts Duffus and Dearden (1990) use to model site evolution of non-consumptive wildlife tourism. Duffus and Dearden’s model incorporates TALC and Bryan’s (1977) model of specialisation for recreationalists over time. They propose that, as the popularity of a site increases, more ‘generalists’ are attracted to the site, requiring greater interpretative facilities and guidance from instructors. ‘Specialists’, who are the first to discover and utilize a wildlife tourism destination, desire little infrastructure and are focussed on accessing the destination’s attraction themselves. As the experience caters more to growing numbers of generalists who want increased management intervention and infrastructure, specialists increasingly avoid the area. A site at the consolidation stage of development attracts more generalists than specialists, with the latter being displaced to less developed sites. Duffus and Dearden suggest a measure of specialisation that includes equipment and past experience along with their focus on their activity of interest.

Although we did not measure equipment and past experience, we do have a measure of the importance of whale shark tours relative to other activities that provides a method of dividing specialists from generalists. More information can be found in Catlin and Jones (2006) research on the whale shark tourism experience at NMP in 2005, that updated the Davis *et al.,* findings from over a decade earlier. By comparison with the past, there was a much greater proportion of domestic tourists, an increased tolerance to crowding, a greater distribution of ages amongst those participating and a greater focus on the service elements of the experience. These results are also in agreement with a shift towards a greater proportion of generalists according to the Duffus and Dearden (1990) model.

There is a substantial difference in expenditure between participants who would not have come to the region if it were not for the whale sharks (specialists) when compared to participants who would have come regardless (generalists). Specialists spent over $90 per trip and over $47 per day more than generalists (see Table 11.4). While Duffus and Dearden do not consider the impact of consolidation on wildlife tourists’ expenditure, recent research suggests that specialists are higher spenders than generalists (Dearden *et al.*, In Press), which has implications for whale shark participant expenditure in the Ningaloo Coast region. The implications for forecasting here is that, as a wildlife tourism industry gains popularity, the individual expenditure of tourists declines and the experience becomes more popular for a general public.

In the case of whale shark tourism, the cost of participation has not risen from $300 in 1995. If the 1995 price is adjusted using the Australian Government Consumer Price Index, it is $397, indicating that the 1995 price was inelastic. As competition has increased, operators have increased the number of participants to increase return, rather than the cost of a trip, which in

real terms is much lower now than in 1995 ($370 when this survey research was conducted in 2006). Over the last decade whale shark tour operators have responded to growing tourist numbers by conducting more tours per season (a 44% increase between 1996 and 2005) with more people on board each tour (a 37% increase between 1996 and 2005) (Wilson, E. *et al.*, 2005). Increased competition along with increased visitor numbers has therefore contributed to keeping prices down. This change should be viewed in the context of a change in the profile of participants and industry consolidation.

Our results suggest that whale shark tourism at Ningaloo now attracts large numbers of generalists, which reflects consolidation in the local whale shark tourism industry. In 2006, over 60% of participants would have come to the region regardless of whale shark tours. In particular, our statistics point to a large proportion of international backpackers, who stay in low-cost accommodation and are in the 18-30 age bracket. The Ningaloo Coast is an increasingly popular destination on the backpacker route along the Western Australian coast. Information sources for whale shark tourism are now easily accessible by the general public. While word of mouth is still the most common way of finding out about whale shark tours (43.5%), participants also found out through other sources such as guidebooks (24.3%), advertising (16.0%), documentaries (14.2%) and the internet (13.7%). This spread of marketing is noted by Butler (2006)as a feature of the consolidation stage International visitors in particular discovered whale shark tours through guidebooks (28% compared to 17% for all participants), and tended to stay in backpacker accommodation (38% compared to 24.1% for all participants), which suggests that the largest group of international participants is now backpackers. This helps explain the current similarities in expenditure between international and domestic participants and the decline in expenditure since 1995.

A3.7 Conclusion

Whale shark tourists spent on average $186 per day and $894 per trip in the Ningaloo Coast region in 2006. Whale shark tourists' expenditure in the region has been conservatively measured as $5,971,108 with a substitution value of $2.4 to $4.6 million. While this is a large contribution to the regional economy, it is significantly lower than estimates of the value of the industry based on 1995 expenditure data. The reason for the difference is a decline in individual participant expenditure in the region. The most likely explanation is that the change is a result of the growth of the industry, which has now reached the consolidation stage in its development.

There is evidence to suggest that the profile of whale shark tour participants has changed substantially in the eleven years between 1995 and 2006. Industry consolidation has moved the industry towards the tourist mainstream, demonstrated through a spread of marketing through a wide range of information sources and a large proportion of 'generalist' participants, who view whale shark tours as one of a number of features that attracted them to the region. Another factor is the increasing popularity of the region as a destination with outstanding natural attributes, demonstrated by the displacement of fishing by snorkelling as the region's most popular activity for tourists. As more tourists participate in whale shark tours, the proportion of specialists has declined and the proportion of generalists increased. The effect has been to cause a decrease in individual expenditure.

Lastly, our research suggests that using old data to measure wildlife tourist expenditure needs to take account of the development of the industry. Tourism is a dynamic industry which can attract different types of visitors at different stages of development. As wildlife tourism experiences become more popular, they tend to attract more generalists that spend less than the specialists, who usually make up the majority of the first waves of tourists attracted to an experience. The increasing popularity of a region can also contribute to greater participation by generalists. Similarly, forecasting the economic impact of growth in wildlife tourism industries should also take declines in expenditure into account as the profile of participants change in connection with increases in participant numbers. Further research on expenditure changes due to industry growth would greatly assist managers in tourism planning and regulation.

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APPENDIX B: VISITOR SURVEY TESTS FOR SIGNIFICANCE

Pearson Chi Squared test results for Table 3.7 (Activities rated as important or very important by Visitor Origin)

	Value	df	Significance
Pearson Chi-Square	361.586	24	P =0.000
Valid Cases	1574		

Pearson Chi Squared test results for Table 3.8 (Age of Respondents by Visitor Origin)

	Value	df	Significance
Pearson Chi-Square	341.895a	6	P =0.000
Likelihood Ratio	321.255	6	P =0.000
Linear-by-Linear Association	153.011	1	P =0.000
N of Valid Cases	1504		

Pearson Chi Squared test results for Table 3.9 (Selected Statistics for Nights in the Region by Visitor Origin)

	Value	df	Significance
Pearson Chi-Square	158.780[a]	6	P =0.000
Likelihood Ratio	159.016	6	P =0.000
Linear-by-Linear Association	134.193	1	P =0.000
Valid Cases	1310		

APPENDIX C: RESIDENT SURVEY RESULTS

Q7: Impacts - EXMOUTH

	Agree	Disagree	Don't Know	personal impact	community impact
interesting things to do	64.8	26.6	8.6	0.8	1.2
public money	33.6	49.2	17.2	-0.4	-0.4
Facilities	59.4	36.7	3.9	1.0	1.2
Disruption	59.4	35.2	5.5	-0.6	-0.7
Prices	74.2	20.3	5.5	-1.0	-1.1
economic benefit	89.1	7.0	3.9	0.9	1.6
Justice	38.3	39.8	21.9	-0.4	-0.4
Maintenance	49.2	42.2	8.6	0.5	0.8
Environment	62.5	27.3	10.2	-0.8	-1.1
character of region	67.2	24.2	8.6	0.0	0.2
Pride	48.4	32.8	18.8	0.5	0.9
Overcrowding	57.0	35.9	7.0	-0.6	-0.8
Showcase	91.4	3.1	5.5	0.8	1.5
Dislocation	84.4	10.9	4.7	-1.3	-2.0
different cultures	87.5	5.5	7.0	0.8	1.1
Unites	40.6	43.0	16.4	0.4	0.7
delinquent behaviour	64.1	23.4	12.5	-0.7	-1.1

Q7: Impacts – CORAL BAY

	Agree	Disagree	Don't Know	personal impact	community impact
interesting things to do	80.8	15.4	3.8	1.5	2.0
public money	19.2	61.5	15.4	-0.1	-0.1
Facilities	73.1	26.9	0	1.5	1.8
Disruption	56.0	40.0	4.0	-0.6	-0.7
Prices	69.2	23.1	7.7	-0.5	-0.3
economic benefit	100	0	0	1.8	2.4
Justice	19.2	61.5	19.2	-0.1	0.0
Maintenance	76.9	19.2	3.8	0.9	1.3
Environment	88.5	11.5	0	-1.3	-1.8
character of region	72.0	28.0	0	0.0	0.3
Pride	53.8	23.1	23.1	0.9	1.0
Overcrowding	68.0	28.0	4.0	-0.6	-0.6
Showcase	88.0	8.0	4.0	1.0	1.7
Dislocation	45.5	36.4	18.2	-0.2	-0.2
different cultures	100	0	0	1.3	1.3
Unites	54.2	29.2	16.7	0.8	1.0
delinquent behaviour	80.0	16.0	4.0	-1.0	-1.4

Q7: Impacts – CARNARVON

	Agree	Disagree	Don't Know	personal impact	community impact
interesting things to do	49.3	42.9	7.9	0.5	1.0
public money	13.6	80.0	6.4	0.0	0.0
facilities	47.9	47.9	4.3	0.7	1.0
disruption	20.7	77.1	2.1	-0.1	-0.1
prices	40.7	56.4	2.9	0.1	0.3
economic benefit	94.3	5.0	0.7	1.0	1.9
justice	17.9	67.1	15.0	-0.1	-0.2
maintenance	71.4	22.9	5.7	0.8	1.4
environment	21.4	73.6	5.0	-0.1	-0.3
character of region	48.6	47.1	4.3	0.3	0.8
pride	81.4	11.4	7.1	0.8	1.5
overcrowding	15.7	79.3	5.0	0.0	-0.1
showcase	85.7	10.1	3.6	0.9	1.7
dislocation	25.7	69.3	5.0	-0.1	0.0
different cultures	93.6	5.0	1.4	0.8	1.5
unites	72.9	19.3	7.9	0.6	1.4
delinquent behaviour	17.1	77.9	5.0	-0.1	-0.2

APPENDIX D – SUMMARY OF STAKEHOLDER ASSESSMENT

	Surveys	Public workshop	Modelling workshops	Data collection	Capacity to participate
1. Government authorities					
Shire of Exmouth Employees	√	√√√	√√√	√√√	H
Water Corporation*	√√	-	-	√√	H
Dept. of Environment and Conservation	-	√√√	√√√	√√√	H
Dept. of Fisheries*	-	-	-	-	H
Horizon Power*	-	√√	-	√√	M
Dept. of Planning and Infrastructure	-	√√	√√	√√	H
Gascoyne Development Commission	√	√√√	√	√√	H
2. Tourism associations					
Exmouth Visitors Centre	√	√√√	√√	√√	M
Tourism Western Australia	-	√√√	√√√	√√√	H
Carnarvon Visitors Centre					M
3. Local tourism operators					
Dive/Whale Shark Tour Operators	√√√	√√√	√√√	-	L
Other Tour Operators	√√√	√√√	√√√	-	L
4. Local accommodation providers					
Caravan Parks	√√√	√√√	√	√	L
Hotels	√√√	√√√	√	√	L
5. NGOs and non tourism associations					
Recreational Fishing Advisory Committee	-	√√√	-	√√	M
Cape Conservation Group	-	√√√	-	√√	M
6. Research institutions/projects					
Terrestrial impact studies	-	√√	√√√	√√√	M
Social tourism impact studies	-	√√	√√√	√√√	H
Economic yield of tourism	-	√√	√√√	√√√	H
Indigenous studies	-	√√	√√√	√√√	M
Geology (groundwater)	-	√√	√√√	√√√	M
Tourism benchmarking/ecotourism	-	√√	√√√	√	H
Modelling experts	-	√√	√√√	√√√	H
7. Others					
Shire of Exmouth Councillors	-	√√√	-	√	M
Tourists	√√√	-	-	-	L
Residents**	√√√	√√√	√√	√	L
Local industry	√√	√√	√√	√√	L
Indigenous groups***	√√	√√√	√√	√√	L
Military/Airbase	-	√√	√	√√	M

Rating of importance for participation: √√√ very important, √√ important, √ of minor importance, - not considered as important.

Rating of Capacity to Participate: H high, M medium, L low.

* The organisation was invited to participate but did not do so. However, follow-up contact has led to the organisation becoming involved in the project.

** While only three attendees listed themselves as 'residents', 30 of the participants actually reside in the region.

*** An indigenous tourism workshop is being planned and will involve this stakeholder group.

APPENDIX E – THE THREE VISITOR EXPERIENCES AT NINGALOO

Given the variation within the visitors to the Ningaloo Coastal region, this dataset presents an opportunity to analyse differences and draw conclusions about the different experiences sought by visitors to the Ningaloo Coast. This chapter explores three different generalised visitor experiences that were identified through a statistical technique called factor analysis. This chapter provides a brief overview of factor analysis, before exploring the characteristics and differences between the identified groups. The detailed results from the factor analysis are provided at the end of this Appendix.

Factor Analysis

The primary purpose of factor analysis is to identify if groups of factors can explain patterns within the results for a range of variables. For instance in our factor analysis, we analysed the importance measures of trip elements. The trip elements analysed included both motivations for visiting the region and characteristics of the region, in order to provide a broad basis for identifying the underlying factors that structured the different experiences desired by visitors. What we wanted to know is if patterns within the scores could be simplified by grouping factors and whether these factor groupings could help identify generalised visitor experiences. Factor analysis is a common tool for assessing both motivations (Poria *et al.*, 2004) and trip characteristics (see in connection with risk, Fuchs & Reichel, 2006). Factor analysis has also been applied for tools that address a variety of elements of the tourist experience. For instance, Gross and Brown (2006) use factor analysis to assess a variety of elements of lifestyle tourism to wine regions in South Australia.

The Kaiser low approach was used here to extract as many factors as have an eigenvalue greater than one (Poria *et al.*, 2004). Varimax rotation with a Kaiser normalisation was then carried out because of the assumption that the factors are related to each other. To decide which motivations are included in each factor, it was decided to include those that wee correlated above the .4 level (larger than .4 or smaller than -.4, following Poria *et al.*, 2004) The factor analysis identified three types of experience that explained patterns within the importance ratings. The factor analysis explains 58.4% of the variance amongst visitor's ratings and was based on 1578 surveys. After the three types of experiences were identified, Pearson's correlations between the three types of experience and other characteristics of the tourists were then explored to see if a more detailed picture could emerge of the characteristics of visitors that were seeking different experiences. All of the statistics for the factor analysis are included in Appendix 2.

The Three Experiences Sought by Visitors to the Ningaloo Coastal Region

Three different visitor experiences were identified using factor analysis. Table 1 provides a clear rationale for the three different experiences, based on the results of the factor analysis. This picture was further clarified through an examination of the correlations between the three

experience types and other trip characteristics. Table 2 provides the statistically significant correlation scores between the three experience types and a range of visitor characteristics.

A score of 0 in table 2 indicates that there is no correlation whatsoever between the experience type and another variable. A Pearsons Correlation score of 1 indicates a perfect positive correlation. For instance, a score of 1 between age and the importance of fishing would mean that if a visitors age doubled, they would place twice as much importance on fishing. Scores of 1 are very rare. A negative score indicates a negative correlation. For instance, Table 2 indicates a negative correlation between the nature lover experience and age, indicating that as age **decreases** amongst survey respondents, visitors are **more** likely to seek this experience.

A second post-hoc test was also performed. The one way anova tests the hypothesis that different groups have the same mean score. We used this test to investigate if there were significant differences between the kinds of experiences sought and the origins of visitors (WA, interstate and international). Put simply, the mean score for each of the three experiences was compared for each origin type to see if certain experiences were preferred by different origins. There were statistically significant differences for each of the origin types (Tables 3 and 4).

Table 1: Matrix of Trip Elements for a Visit to the Ningaloo Coastal Region

	Comfortable Visit	Nature Lover	Fishing Escape
	1	2	3
Importance of bitumen access roads	0.82		
Importance of toilet facilities	0.81		
Importance of going to viewpoints	0.64		
Importance of camping facilities	0.51		0.41
Importance of natural environment		0.79	
Importance of access to Ningaloo Reef		0.76	
Importance of fishing			0.76
Importance of getting away from it all			0.64
Importance of region's warm weather			0.63

Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 4 iterations.

The Comfortable Visit

The first visitor type places a higher importance on facilities in the region and on sightseeing than other groups. The consistently high scores in the areas of facilities indicated that this experience was linked to travelling in a region that provides a well developed and maintained infrastructure for tourism, in particular self-drive tourism. We labelled this visitor experience the **Comfortable Visit**.

The Comfortable Visit experience correlates positively with age (0.126, $t<0.01$)) indicating that older visitors are more likely to seek this kind of experience. There are particularly strong correlations with importance ratings for camping facilities, going to viewpoints, bitumen access roads and toilet facilities. The comfortable visit experience correlates positively with a number

of activities. The most positive is shopping (0.246, t<0.01), followed by sightseeing (0.229, t<0.01). The only significant negative correlation was with fishing from a boat (-0.107, t<.05). This group had no significant correlations with expenditure, indicating that visitors who seek this type of experience have a range of different expenditure levels. This experience negatively correlated with length of stay (-0.067, t<0.05).

The one way anova test to see if there were statistically significant differences between the origins of visitors (WA, interstate and international) and the three visitor experiences indicated that there was a significant difference for the comfortable visit experience. Interstate visitors were more likely to seek the comfortable visit experience (mean = 0.148). Internationals were less inclined (mean = 0.033), while WA visitors were less inclined again (mean = -0.077).

The Nature Lover

The second visitor experience received the highest scores for the natural environment (although it should be noted that all groups rated the natural environment as important) and accessing Ningaloo Reef. We labelled this visitor experience the Nature Lover.

The nature lover experience correlated negatively with age (-0.246, t<0.01), indicating that younger visitors are more likely to seek this experience. This experience had the strongest negative correlation with length of stay (-0.161), indicating that visitors who seek this experience are likely to stay for shorter periods than the average. There was a very strong correlation with the natural environment (0.716, t<0.01) and access to Ningaloo Reef (0.726, t<0.01). There were also strong significant correlations between this experience and getting away from it all (0.324, t<0.01) and going to viewpoints (0.309, t<0.01). There was a strong negative correlation between this group and fishing (-0.324, t<0.01), indicating that fishing was not an important element of this experience. Turning to activities, the nature lover experience was correlated significantly with every activity, indicating that there are strong patterns of activity behaviour for visitors seeking this experience. The positive correlations are with snorkelling (0.361, t<0.01), safari tours (0.270, t<0.01), sightseeing (0.170, t<0.01), scuba diving (0.164, t<0.01), eating out (0.081, t<0.05) and sunbathing / laying on the beach (0.080, t<0.05). There were negative correlations with the fishing from the shore (-0.196, t<0.01), fishing from a boat (-0.140, t<0.01) and shopping (-0.76, t<0.05). This group was positively correlated with expenditure on activities.

The one way anova test for differences between visitor origins indicates that internationals are the origin most inclined towards the nature lover experience (mean = 0.216) than Western Australian (mean = -0.017) and interstate visitors (mean = -0.045).

The Fishing Escape

The third type of experience was highly correlated with fishing, escaping from cool weather and getting away from it all. We labelled this experience the Fishing Escape.

The fishing escape experience correlates positively with age (0.126, t<0.01) and length of stay (0.288, t<0.01), indicating that visitors who seek this experience are likely to be older and to stay for longer periods. In addition to the correlations already mentioned, visitors who seek this

experience also have weaker correlations with the natural environment (0.098, t<0.01), and toilet facilities (0.078, t<0.01). As would be expected, this experience correlates strongly with the fishing activities, with fishing from the shore (0.478, t<0.01) and fishing from a boat (0.407, t<0.01) having the strongest activities correlation. There are small weaker negative correlations with swimming with whale sharks (-0.195, t<0.01), safari tours (-0.156, t<0.01), scuba diving (-.107, t<0.05) and sightseeing (-0.083, t<0.05). These negative correlations, alongside the strong correlations with fishing, indicate that visitors who seek this experience tend to place more importance on a small number of fishing activities, while the other experiences are linked to a wider set of activities. The fishing escape experience is negatively correlated with expenditure on a wide number of different categories, indicating that this group is likely to be lower spending than the other two groups.

The one way anova test indicated that Western Australians were much more likely to seek this experience (mean = 0.345) than interstate visitors (mean = -0.107) and that internationals were the least inclined to seek the fishing escape experience (mean = -0.600).

Table 2: Significant Results for Pearson Correlations Between Experiences and Tourists' Age, Important Trip Elements, Important Activities and Expenditure

		Comfortable Visit	Nature Lover	Fishing Escape
Age		0.126**	-0.246**	0.126**
Nights in the Region		-0.067*	-0.161**	0.288**
Trip Elements	The natural environment		0.716**	0.098**
	Fishing		-0.324**	0.791**
	Getting away from it all		0.312**	0.646**
	The region's warm weather	0.159**	0.189**	0.615**
	Access to Ningaloo Reef	0.181**	0.746**	
	Camping Facilities	0.537**		0.411**
	Going to viewpoints	0.655**	0.309**	-0.066*
	Bitumen access roads	0.827**	-0.107**	
	Toilet facilities	0.815**		0.078**
Importance of Activities	Sunbathing / Laying on Beach	0.078*	0.080*	0.125**
	Fishing from the Shore		-0.196**	0.478**
	Fishing from a Boat	-0.107*	-0.140**	0.407**
	Snorkelling		0.361**	
	Scuba Diving		0.164**	-0.107*
	Shopping	0.246**	-0.076*	
	Eating Out	0.145**	0.081*	
	Sightseeing	0.229**	0.170**	-0.083**
	Safari Tours	0.174**	0.270**	-0.156**
	Swimming with Whale Sharks		0.289**	-0.195**
Expenditure per night	Accommodation			-0.146**
	Activities		0.080*	-0.163**
	Equipment			-0.089**
	Food			-0.128**
	Other		-0.156**	

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Table 3: Means for the Visitor Experiences by Origin

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Comfortable Visits	West Australian	809	-0.077	1.059	0.037	-0.150	-0.004
	Interstate	333	0.148	0.983	0.054	0.042	0.254
	International	386	0.033	0.904	0.046	-0.057	0.124
	Total	1528	0.000	1.009	0.026	-0.051	0.050
Nature Lovers	West Australian	809	-0.017	0.991	0.035	-0.085	0.051
	Interstate	333	-0.045	1.046	0.057	-0.158	0.068
	International	386	0.216	0.882	0.045	0.128	0.304
	Total	1528	0.036	0.982	0.025	-0.014	0.085
Fishing Escapes	West Australian	809	0.345	0.908	0.032	0.282	0.408
	Interstate	333	-0.107	0.989	0.054	-0.213	0.000
	International	386	-0.600	0.907	0.046	-0.691	-0.509
Total		1528	0.008	1.007	0.026	-0.043	0.058

Table 4: One Way ANOVA for the Visitor Experiences by Origin

		Sum of Squares	df	Mean Square	F	Sig.
Comfortable Visit * Visitor Origin	Between Groups (Combined)	12.547	2	6.274	6.206	0.002
	Within Groups	1541.520	1525	1.011		
	Total	1554.067	1527			
Nature Lover * Visitor Origin	Between Groups (Combined)	16.962	2	8.481	8.880	0.000
	Within Groups	1456.365	1525	0.955		
	Total	1473.326	1527			
Fishing Escape * Visitor Origin	Between Groups(Combined)	238.954	2	119.477	139.250	0.000
	Within Groups	1308.457	1525	0.858		
	Total	1547.411	1527			

Summary: Comparing the Visitor Experiences

The comfortable visit experience was strongly linked to well maintained infrastructure that assists visitors, in particular self-drive visitors, to easily access sites and experiences. This experience correlated with placing importance on a number of activities beyond nature based experiences, many of which generate economic activity in Exmouth. Shopping and eating were

important to respondents who sought this experience, as were sightseeing and safari tours. Visitors who sought this experience were likely to be older and to stay for short periods. There was also a strong correlation with interstate visitors. The overall picture is of an experience for self-drive visitors who wanted to make use of the available facilities and experiences in the region, but in order to do so require a higher level of infrastructure investment than the other visitor types.

The nature lover experience is linked to respondents who are strongly motivated by the natural environment of the region and accessing Ningaloo Reef. Visitors who seek this experience tend to be younger and stay for short periods. They also tend to place importance on a wide variety of experiences with an emphasis on the experiences that allow them to engage in a non-extractive way with the natural environment, such as snorkelling, safari tours and swimming with whale sharks. There is a strong negative correlation with fishing from the shore and fishing from a boat, indicating that respondents who seek this experience place very little importance on fishing. This experience correlates higher with international visitors than interstate or WA visitors. While placing less importance on infrastructure, this group relies on the tourism industry for its important activities and requires access to Ningaloo Reef.

The fishing escape experience was about getting away from cold weather and home and going fishing. It is important to note that this group also correlated with placing importance on the natural environment. This experience tended to be sought by older visitors who are Western Australian and tended to stay for longer periods. This experience was unlikely to be sought by many international visitors. The fishing escape tended to include a smaller variety of activities than the other experiences, in particular tours (it was negatively correlated with placing importance on safari tours, scuba diving or swimming with whale sharks). This experience was likely to have a lower level of nightly expenditure than the other experiences.

These three experiences also present three alternative investment strategies for the region. The Comfortable Visit would be enhanced by more toilets, better roads, and more attractions. An investment in this infrastructure and a focus on increasing the activities for self-drive visitors would encourage these visitors to stay longer. While this strategy would suit Carnarvon, caravan parks in Exmouth Shire in the peak season are already close to or exceeding their capacity. The nature lover experience is most likely to grow in Coral Bay and Exmouth as these two towns act as the locus for nature based activities, although tours to the Kennedy Ranges from Carnarvon and a focus on Carnarvon as the gateway to two internationally significant natural heritage regions could increase the visitors who are seeking this experience in Carnarvon. Focusing on this experience will increase the use of the reef through both commercial tours and through visitor activities. Given the importance of the natural environment to the nature lover experience, it is important that interactions with the environment are well managed such that any increase in numbers does not adversely affect the environment. The Fishing Escape experience would be reinforced by boat ramps and taking steps to ensure that new developments do not impact on the capacity of visitors to feel that they are escaping to a remote location. A decision to further pursue the fishing escape experience would increase pressure on fish stocks, potentially causing this group to decline in numbers if there is depletion in the fish available. Recreational fishing pressure on fish stocks is a concern in Western Australia and measures have already been taken to discourage recreational fishing in Western Australia, including the introduction of an annual license (Spencer, 2009). Increasing infrastructure to enhance the comfortable visit experience could impact on the fishing escape

experience if such infrastructure begins to impact on the remoteness values (the feeling of 'getting away from it all'). This is not to say that additional infrastructure would not be accepted by these groups, but that its implementation would need to be handled carefully.

Statistics

Visitor Groups FA	
Valid	1578
Missing	11

Communalities

	Initial	Extraction
Importance of natural environment	1	0.64618154
Importance of fishing	1	0.650993652
Importance of getting away from it all	1	0.564886904
Importance of region's warm weather	1	0.504685633
Importance of access to Ningaloo Reef	1	0.608973684
Importance of camping facilities	1	0.437817866
Importance of going to viewpoints	1	0.510146841
Importance of bitumen access roads	1	0.673617927
Importance of toilet facilities	1	0.659131344

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.47	27.49	27.49	2.47	27.49	27.49	2.04	22.66	22.66
2	1.56	17.34	44.83	1.56	17.34	44.83	1.63	18.09	40.75
3	1.22	13.58	58.40	1.22	13.58	58.40	1.59	17.66	58.40
4	0.79	8.73	67.13						
5	0.68	7.60	74.73						
6	0.66	7.37	82.11						
7	0.63	6.97	89.08						
8	0.55	6.09	95.17						
9	0.43	4.83	100.00						

Component Matrix[a]

	Comfortable Campers	Nature Lovers	Fishing Escapees
Component	**1**	**2**	**3**
Importance of natural environment	0.47	0.45	-0.48
Importance of fishing	0.17	0.34	0.71
Importance of getting away from it all	0.48	0.56	0.15
Importance of region's warm weather	0.54	0.39	0.24
Importance of access to Ningaloo Reef	0.53	0.25	-0.52
Importance of camping facilities	0.59	-0.08	0.28
Importance of going to viewpoints	0.60	-0.32	-0.20
Importance of bitumen access roads	0.54	-0.61	0.11
Importance of toilet facilities	0.64	-0.48	0.11

Extraction Method: Principal Component Analysis
[a] 3 components extracted.

Rotated Component Matrix[a]

	Comfortable Campers	Nature Lovers	Fishing Escapees
	1	**2**	**3**
Importance of natural environment	-0.01	0.79	0.14
Importance of fishing	-0.04	-0.27	0.76
Importance of getting away from it all	-0.02	0.39	0.64
Importance of region's warm weather	0.15	0.29	0.63
Importance of access to Ningaloo Reef	0.16	0.76	0.03
Importance of camping facilities	0.51	0.07	0.41
Importance of going to viewpoints	0.64	0.31	-0.05
Importance of bitumen access roads	0.82	-0.07	-0.03
Importance of toilet facilities	0.81	0.03	0.09

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
[a] Rotation converged in 4 iterations.

Component Transformation Matrix

Component	Comfortable Campers	Nature Lovers	Fishing Escapees
1	0.73	0.52	0.45
2	-0.68	0.45	0.57
3	0.09	-0.72	0.68

Component Score Coefficient Matrix

	Comfortable Campers	Nature Lovers	Fishing Escapees
Component	**1**	**2**	**3**
Importance of natural environment	-0.10	0.51	-0.02
Importance of fishing	-0.04	-0.29	0.55
Importance of getting away from it all	-0.09	0.17	0.38
Importance of region's warm weather	0.01	0.09	0.38
Importance of access to Ningaloo Reef	0.01	0.49	-0.10
Importance of camping facilities	0.23	-0.06	0.23
Importance of going to viewpoints	0.30	0.15	-0.12
Importance of bitumen access roads	0.43	-0.13	-0.07
Importance of toilet facilities	0.41	-0.07	0.00

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Component Scores.

Component Score Covariance Matrix

	Column1	Column2	Column3
Component	**1**	**2**	**3**
1	1	0	0
2	0	1	0
3	0	0	1

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Component Scores.

APPENDIX F: CONTACT DETAILS FOR DESTINATION MODELLING DATA SOURCES IN AUSTRALIA

Source	Data	Unit	Specific Data Source	Other Sources (when available)
Australian Bureau of Statistics (ABS) www.abs.gov.au	Length of Stay	Nights	Tourist Accommodation (by local government area)	The local Visitors Centre also often keeps information on accommodation capacity. Can also be cross checked with TRA data.
	Occupancy	Percentage		
	Accommodation Capacity	Beds		
	Number Of Residents	people	Census Quickstats	National Regional Profiles (ABS) provide similar information, but use smaller samples.
	Employed Residents	people		
	Workforce From Outside Of Region	people		
	Workers Supported By Other Industries	people		
	Estimated Growth Of Resident Population	percentage		
	Resident Accommodation Capacity	beds		
	Workers Supported By Tourism	people	Tourism Satellite Account	
	Water use by residents	Gigalitre	National Regional Profiles	
Federal Department of the Environment, Water, Energy and the Arts	Electricity for residents	Kilowatt Hour	Australian residential energy consumption trends	Also see entry for EC3 Global This data is available from utility providers and may be available through the local government municipality
	Electricity for other industries	Kilowatt Hour	National and State Energy Projections	

Source	Data	Unit	Specific Data Source	Other Sources (when available)
www.environment.gov.au	Electricity for tourism	Kilowatt Hour	Becken, S. et al (2001). Energy consumption patterns… Journal of Ecological Economics	Another source in Western Australia is the Water Corporation's Water Efficiency Project
Source	Data	Unit	Specific Data Source	Other Sources (when available)
EC3 Global www.ec3global.com	Water use by tourism accommodation	Gigalitre	Contact EC3 Global	Relevant academic publications are: • Becken, Frampton & Simmons (2001) • Do and Kumar (2005), and • Warnkena, Bradleya and Guilding (2005) See also the entry for the Federal Department of the Environment, Water, Energy and the Arts
	Waste by tourism accommodation	KG		
	Electricity by tourism accommodation	MJ/guest night		
Tourism Research Australia (TRA)	Visitor Arrivals	Tourists	National Visitor Survey and International Visitor Survey statistics Available by request or by paying for access to TRA's online database	
	Visitor Accommodation	Tourists		
	Length of stay	Nights		
	Activity Hours	Hours		
	Expenditure	$AU		

APPENDIX G: TABLE OF DATA AVAILABILITY FOR THE MARGARET RIVER REGION

#	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
1	Visitor Arrivals	Tourists	Tourism Research Australia (TRA)	Visitors by time of year (quarterly or monthly) by visitor segment (domestic overnight, domestic day-trip, international)	Registered user access	Approx 2,600	1998 to 2009	Sample size for less-visited regions	Visitor Accommodation and Arrival Information: Tourism Research Australia (TRA) provides a wealth of data on tourist activity and segments visitors into 1) International 2) Overnight-Domestic and 3) Day-Trip Domestic. The ABS provides small-area data on Length of Stay but does not distinguish between tourist segments. The ABS also collects data on International Visitor Arrivals for the Tourism Satellite Accounts but only down to the state level and does not report on domestic visitation.
2	Visitor Accommodation	Tourists	Tourism Research Australia (TRA)	Visitor Accommodation by time of year (quarterly or monthly) by visitor segment (domestic overnight, domestic day-trip, international)	Registered user access	Approx 2,600	1998 to 2009	Sample size for less-visited regions	
3a	Length of stay	Nights	Tourism Research Australia (TRA)	Length of stay by quarter, segment (international, domestic overnight, domestic day-trip) and accommodation type	Registered user access	Approx 2,600	1998 to 2009	Sample size for less-visited regions	
3b	Length of Stay	Nights	Australian Bureau of Statistics (ABS)	Length of stay by accommodation type (and choice of by SLA or by Star Rating)	Public	Survey does not have a sample componen t	Jun-09	Does not report on visitor segment	
4	Activity Hours	Hours	Tourism Research Australia (TRA)	Visitor segment: (international/domestic , day-trip/overnight) in number of participants	Registered user access	Approx 2,600	1998 to 2009	Estimates rounded to the nearest ‘1000’ in some cases. At times specific location is unspecified.	Activity Data Sources: The TRA is a good source of tourism activity data; however, data is not supplied in terms of activity hours. For resident activity data, the Community Facilities

#	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
5	Resident Activities	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	department of the A-MR shire was contacted but they only had information on the types of activities residents engage in, not on the frequency or duration. The local recreation centre was also contacted but the promise of this lead was inconclusive as the request for information did not receive a response despite repeated requests. Activity hours are important as they determine ecological impacts.
6a	Accommodation Capacity	Beds	Australian Bureau of Statistics (ABS)	Establishments, rooms, beds, etc. by short-term accommodation type	Public	Survey does not have a sample componen t	Jun-09	Survey only covered short-term accommodation (<2 mo's) & establishments must have 5 or more rooms for inclusion in survey	Accommodation Capacity Data Sources: The ABS has pretty good small-area accommodation capacity data; however, they only survey accommodations with a capacity of 5 or more rooms, thus leaving out some rental houses and properties. The Tourist Information Centre does have capacity data because they do facilitate bookings, however, they warn that not all accommodation businesses make suites available through them and of those that do, they often do not make all their units available for booking through the visitor's centre. They claim that more remote destinations will keep better accommodation capacity data b/c if accommodation cannot be found in A-MR, then there are likely to be vacancies in nearby towns.
6b	Accommodation Capacity	Beds	Margaret River Visitor Centre	Accommodation capacity by Accommodation provider				The visitor centre only has data on the units that members make available.	

	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
7	Number Of Residents	people	Australian Bureau of Statistics (ABS)	Population by age and sex	Public		2006 Census		Resident Population and Employment Data: The ABS is a good source for these types of data; however, not all of it is free. Number of residents and employment levels can be found from census data provided online. One can specify if they want employment data by place of work or by place or residence, but neither can provide information on the number of employees living in or outside the administrative boundary. For this, either Origin-Destination Journey-to-work data would have to be purchased, a consultant would have to provide this data for a fee, or 'table-builder' could be purchased from the ABS for $1655 which includes a great variety of census data. Small area population growth is not provided by the ABS but historical population growth is and can be used as a proxy for estimated future growth.
8	Employed Residents	people	Australian Bureau of Statistics (ABS)		Public	Survey does not have a sample componen t	2006 Census	SLA employment can be found on the ABS website. The ABS 'Table Builder ($1655) or fee for service provides more complete data.	
9	Workforce From Outside Of Region	people	Australian Bureau of Statistics (ABS)		Purchase (ABS)	Survey does not have a sample componen t	2006 Census	As above	
10	Estimated Growth Of Resident Population	percent age	Australian Bureau of Statistics (ABS) Census		Public	Survey does not have a sample componen t	2007/08	It is possible to use the national average, but this would need to be adjusted for MR-A using local information and comparable regions.	
11	Transient Workforce	people	Not found	Not found	Not found	Not found	Not found	Not found	Tourism Employment and Tourism-Supported Employment Data: Transient Workforce data seems to not be estimated or held by any organization in WA. The Shire, the Chamber of Commerce, the Tourism Centre, Tourism WA, and
12a	Workers Supported By Tourism	people	Tourism Western Australia	Number and share of people employed in each industry for WA (sourced from ABS tourism satellite accounts)	Public	Derived	2006/07		

#	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
12b	Workers Supported By Tourism	people	Australian Bureau of Statistics (ABS) Tourism Satellite Account	The number and share of people employed in each industry, nation-wide.	Public	Derived	2007/08	Augusta-Margaret River tourism-driven employment could be calculated from the national averages, but there is always the risk that August-Margaret River may deviate significantly from the mean.	even recruitment offices were contacted an none could even provide an anecdotal rough estimate, although further searching could possibly provide something. Workers supported by tourism are estimated at the national and state levels by the ABS in their Tourism Satellite Account (TSA). Employment supported by tourism is determined by using the same ratio derived from the proportion of expenditure on goods by tourists, since 'tourism' is not actually an industry of its own and tourists often consume the same products as domestic residents. State Tourism Satellite account data for the 2007/08 year will be released soon. Employment supported by tourism is not estimated at the small-area level. Workers supported by other industries can be simply calculated as the balance remaining after subtracting tourism-supported employment from total employment.
13	Workers Supported By Other Industries	people	Australian Bureau of Statistics (ABS)		Public	Derived	2007/08		
14	Resident Accommodation Capacity	beds	Australian Bureau of Statistics (ABS) Census	Number of beds, minus holiday accommodation in the region	Public	Survey does not have a sample componen t	2006 Census	Length of time between census Capacity to address inclusion of holiday accommodation in the figures Capacity to address residents living in holiday accommodation	Resident Accommodation Capacity: ABS Census data includes a count of beds, but this includes holiday accommodation, which needs to be subtracted from the ABS figures. The figures for resident beds will need to be checked with relevant groups; in particular the local area's planning department and local real estate agents.

#	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
15a	Expenditure	$AU	Tourism Western Australia	Visitor segment, expenditure, and # of visitors and daily expenditure per annum	Public	2,500	2004 to 2007	Data is sourced from Tourism Research Australia. TWA can make this data available on request. Small sample size for some regions.	Tourism Expenditure: Tourism Research Australia (TRA) provides tourist expenditure data by tourist segment. Data is reported at the national scale. TRA provides expenditure for Local Government Areas on request, depending on the sample size. The issue of sample size can be addressed by providing an average across two more years to increase reliability.
15b	Expenditure	$AU	Tourism Research Australia (TRA)	Visitor segment, expenditure, and # of visitors by quarter and expenditure item, but not location specific	Registered user access	Varies month-to-month but generally from 20,000-50,000 nationally Samples vary between regions	1999 to 2007	Small sample size for local government area-sized regions.	
16a	Water use by tourism	Gigalitre	Warnken, J. et al (2006). Eco-resorts vs. mainstream accommodation… *Tourism Management*	Benchmarks energy and water consumption levels of eco-resorts with hotels and caravan parks	Subscription		2006	Applicability to MR-A and other regions Size of study	Water Data Sources: The International Council For Local Environment Initiatives has environmental data for some small areas. Contacting a Landcare/Environment officer for the Shire of A-MR was helpful as only those working for the Shire have access to their region's water data in ICLEI and Water Corporation Data bases. The

#	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
16b	Water use by tourism	Gigalitre	EC3 Global	Benchmarks energy and water consumption levels of different accommodation types across Australia	Agreement with EC3	Unknown	Unknown	Average taken from accommodation providers in regions with similar climates. Quality is assured through EC3 processes	Water Corporation requires a memorandum of understanding (and for data specific to accommodation providers, individual agreements) before they will release data. The Water Services Association of Australia (WSAA) has some aggregated data for states and subregions. The ABS has decent water data but only for WA. A major issue with acquiring water data is the need to set up an agreement with the utility provider before any data on the region can be obtained. The Water Corporation website has current dam capacity and dam storage levels but it is unclear which dams service which townships (further investigation would be needed). Contacting the Regional Communications Coordinator for Contacting the Shire proved fruitful, although there were large delays before they responded and required repeated requests. The email response to capacity issues was, 'Total supply capacity is approximately 1.2 Gigalitres annually. Supply capacity varies from year to year based on available yield from Ten Mile Brook Dam and the Margaret River pumpback facility. Detailed planning work is under way to
17	Water use by other industries	Gigalitre	Shire of Augusta-Margaret River Water Campaign	Water consumption is reported for a variety of industries for the Margaret River Region	Free from a contact in the Shire	Unknown, data sourced from Water Corporation	1999/00 to 2004/05		
18a	Water use by residents	Gigalitre	Water Services Association of Australia (WSAA)	Subregional data for average residential water use and total residential and commercial water supplied	Free data from Website			There are data for neighbouring regions.	
18b	Water use by residents	Gigalitre	Australian Bureau of Statistics National Regional Profiles	Average residential water use for Augusta-Margaret River	Free data but need Super Table software		2002 to 2006		
18c	Water use by residents	Gigalitre	Shire of Augusta-Margaret River Water Campaign	Average annual water use for the residential sector, caravan parks, and a number of commercial activities	Free from a contact in the Shire	Unknown, data sourced from Water Corporation	1999/00 to 2004/05		

#	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
19a	Water availability		Water Corporation Water Efficiency Project Officer	Gigalitres per year (subject to variation annually)	Public	N/A		The estimate given was very rough, not allowing one to get a clear idea of what the implications of marginal changes in the regions residency or tourist visitations. Supply capacity varies annually and thus some uncertainty is unavoidable.	reduce per service consumption and significantly increase supply capacity.' There are a small number of journal articles exploring water consumption by tourist accommodation type from which it is possible to begin constructing a lookup table. However EC3 Global is a potential provider of high quality data for water, electricity and waste that can be divided into particular climates. The easiest way forward would be to construct a lookup table based on academic research and EC3 Global data to allow for quick estimation of water use.
9b	Water availability	Gigalitre	Water Corporation Website	Gives dam storage capacity, current storage, and storage % of all dams	Public		Current	One can select a region of interest and find the information on all the dams in the region. It is unclear which dams service which population.	
20a	Waste per tourist	KG	EC3 Global	Divided by accommodation type.	Agreement with EC3 Global	Not given	2010	Average taken from accommodation providers in regions with similar climates. Quality is assured through EC3 processes.	Waste Data Sources: Contacting the Department of Environmental Services was able to provide me with aggregate average annual waste per person, but distinction between tourism and residential is apparently very difficult or impossible to make. The

#	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
20b	Waste per tourist	m3	Shire of Augusta-Margaret River Environmental Services	875 Kg's per person per year	Public	12,400	2007	Contact said that they do not have the resources to do headcounts and distinguish waste production between residents and non-residents/visitors, thus a general average annual waste figure is presented.	waste management and recycling centre had no data. It is possible to use other studies (such as the Gascoyne) and a breakdown of waste into different types to undertake estimation. EC3 Global is a potential provider of high quality data for water, electricity and waste. EC3 Global would prove a valuable source for this information that is only available if past studies have been undertaken. The easiest way forward would be to construct a lookup table based on academic research and EC3 Global data to allow for quick estimation of water use.
21	Waste per resident	m3	Shire of Augusta-Margaret River Environmental Services	875 Kg's per person per year	Public	12,400	2007	As above.	
22a	Electricity for tourism	Kilowatt Hour	Becken, S. et al (2001). Energy consumption patterns… *Journal of Ecological Economics*	Energy use per m-squared by accommodation type	Subscription	Drew results from 3 different surveys	2001	The study's results differed from similar studies conducted in Canada and Europe, thus climate may potentially influence energy-use rather significantly. This must be considered if using these figures in Australian areas.	Electricity Data Sources: First tried contacting Western Power. Their response to the region's electricity capacity question was 'The available supply of power is dependent on the load drawn. As load demand increases, Western Power will upgrade transformers to allow for the extra demand. Because of this there is no set figure for available electricity. The available amount depends on what time of the day it is and what infrastructure is around each suburb.' Attempts to contact Synergy for the other three

#	Data	Unit	Source	Format	Access	Sample Size	Date	Quality Issues/ Measures	Personal Notes
22b	Electricity for tourism	MJ/guest night	EC3 Global	Benchmarks energy consumption levels of different accommodation types across Australia	Agreement with EC3	Unknown	2010	Average taken from accommodation providers in regions with similar climates. Quality is assured through EC3 processes	data items were fruitless. The Planning Department for the Shire was contacted and it sources its own data (in aggregate form) from the ABS, which is not specific for the A-MR region. There are few quantitative academic studies on tourism accommodation energy consumption, but they do exist. The Australian Department of the Environment, Water, Energy and the Arts website has several publications with National energy data. EC3 Global is a potential provider of high quality data for water, electricity and waste. EC3 Global would prove a valuable source for electricity information that is only available through an agreement with the utility provider and from accommodation providers—a time consuming process. The easiest way forward would be to construct a lookup table based on academic research and EC3 Global data to allow for quick estimation of water use.
23	Electricity for residents	Kilowatt Hour	Australian Department of the Environment, Water, Energy and the Arts	GJ per household & per person	Public	Unknown	1986 to 2020	Energy consumption is not stated below the national level. See pg. 41 for average residential energy consumption.	
24	Electricity for other industries	Kilowatt Hour	Australian Department of the Environment, Water, Energy and the Arts	PJ per industrial sector	Public	Unknown	2001 to 2020	Energy consumption by industry is not stated below the national level.	
25	Electricity Capacity for Region	Kilowatt	Local power providers (Synergy and Western Power)	Not found	Not found	Not found	Not found	Response from Western Power: 'The available supply of power is dependent on the load drawn. As load demand increases, Western Power will upgrade transformers to allow for the extra demand.'	