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**Changing behaviour in a changing climate:  
An empirical study of influences on pro-  
environmental protective action among key  
stakeholder groups of the Great Barrier Reef**

Thesis submitted by

Jeremy Adam Goldberg, BS, MAppSc

on September 8, 2016

in total fulfilment of the requirements of the degree of Doctor of  
Philosophy in the College of Business, Law, and Governance at James  
Cook University, Townsville, Queensland, Australia



## ABSTRACT

Hundreds of millions of people rely upon coral reef ecosystems for sustenance, culture, and economic benefits. Unfortunately, severe threats such as climate change are endangering the long-term survival of coral reefs around the world, including the Great Barrier Reef (GBR). Despite its international status as an environmental icon, recognition as a World Heritage Area, and management widely regarded as world's best practice, the long-term outlook for the GBR is poor, and getting worse. This projected decline in the health of the GBR is anticipated to have considerable repercussions for stakeholders who depend upon these ecosystems for recreation and livelihood opportunities. For tourism operators along the GBR, the potential implications are vast: The GBR provides more than 64,000 full-time jobs and marine tourism contributes \$5.2 billion to the economy each year.

The extensive ongoing decline in coral cover, in addition to the recent mass bleaching event along the GBR in early 2016 as well as the increasing severity of climate change and other threats, requires an urgent resource management response in order to secure the health of the GBR into the future. This response necessitates widespread community action, including fundamental changes to the way that economies, industries, and individuals interact with the environment. Importantly, perceptions about the natural world influence how people feel about environmental protection and management. The ways that people connect to the environment can thus affect support for conservation measures, influencing the environmental outcomes that result. Consequently, an enhanced understanding of the connections between people and places may provide valuable insights for those seeking to affect widespread pro-environmental outcomes. The focus of this thesis is to understand the complex interactions between individual attitudes and behaviours of GBR stakeholders, and the extent to which people care about protecting the GBR. Particular attention is given to how a multi-disciplinary understanding of behaviour may contribute to resource management decision-making.

Understanding the human dimension of natural resource systems (or ecosystems) is part of a growing research momentum that attempts to articulate and nuance the complex relationship between people and the environment. It is also a vital component of natural resource management. Without it, environmental managers lack an understanding of what is important to people, the impact that environmental decisions may have, and a means by which to prioritise management effort. An enhanced understanding of key behavioural influences can assist resource managers to minimise threats to the environment and develop solutions that benefit conservation. Furthermore, resource managers can design and discuss interventions that are more likely to sustain the long-term preservation of natural resources if they better understand the reasons that stakeholders actively ignore or proactively address threats to the environment. Documenting the attitudes and beliefs that drive individual behaviours is a pivotal part of this process. For example, research that clarifies why people feel responsible for the environment, and why they choose to take action to protect it, will be critical for resource managers seeking to initiate conservation programs and policies. However, few studies have systematically explored the relationship between individual connection to an environmental icon and the actions taken to protect it. Research that addresses these issues along the GBR is particularly lacking. As a result, resource managers remain unclear about the best way to communicate with the general public about the long-term conservation of the GBR, including the immediate actions required to address crucial environmental threats like climate change.

This thesis attempts to address this knowledge gap. Using three levels of hierarchical sampling (large-scale social surveys conducted throughout Australia, regional surveys of residents and tourists, and in-depth semi-structured interviews with local marine tourism operators in the tourism hotspots of Airlie Beach and Cairns, this thesis shows that a vast majority of people closely connect with the GBR and care deeply about it. It also describes how and why factors like identity and pride drive stakeholders to take responsibility and actions that help to protect the GBR. Specifically, this thesis explains how key stakeholder groups feel about the GBR, and how their differing beliefs affect whether

or not they undertake certain pro-environmental behaviours. Such knowledge provides foundational research about the relationship between people and natural resources. This is critically important for resource managers because an enhanced understanding of the people they seek to influence will put them in a better position to create impactful and effective ways of doing so. Understanding the main drivers of behaviour, particularly the influential attitudes and beliefs, is a key first step.

**Chapter 2** describes the beginning of the process to understand the linkages between individual attitudes and behaviour of GBR stakeholder groups, summarising a literature review I conducted of the psychological research related to behaviour change, including how behaviours are formed, transformed, and reinforced. The Theory of Planned Behaviour is explored in depth, including its individual constructs of attitudes, social norms, and perceived self-efficacy. This chapter also synthesises key findings from related social science fields such as communication science and marketing. In doing so, it shows that attitudes are crucial drivers of behaviour that can be influenced by strategic messaging and communication outputs, presenting a clear opportunity for creating widespread change. To explore whether these findings have relevance in GBR conservation and management, I conducted a multi-disciplinary study of the attitudes and pro-environmental behaviours of key stakeholders, surveying more than 7,800 people from all across the country using face-to-face, telephone, and online methods. These surveys relied upon a close partnership and considerable support from the CSIRO, including an opportunity for me to join a research team working on the development of a large-scale social and economic long-term monitoring program along the GBR. **Chapter 3** summarises this approach and describes how the various surveys were designed and administered.

A key principle in the psychological literature is that individual beliefs play a pivotal role in the establishment and maintenance of attitudes. In turn, attitudes influence actions, including those related to sustainability and conservation of the environment. Unfortunately, how people feel about the natural world around them, i.e., the connection between people and the environment, is rarely quantified. Policymakers thus find it difficult to incorporate the human dimension into decision-making processes related to environmental protection and resource management. I attempt to address this issue in **Chapter 4**, by quantifying the personal concern and connection that Australians have with the GBR using 10-point scales. Using a nationally-representative online survey of 2,002 Australians, the first ever done about the GBR and part of the 7,923 total surveys completed, the data indicated empirically that the GBR inspires people, promotes a sense of pride, and generates both a personal and collective responsibility to protect it. Thus, I demonstrate that attitudes like inspiration and pride play a pivotal role in the way people associate themselves with natural environments. Further, I reveal that a majority of Australians recognise and acknowledge various anthropogenic impacts to the GBR such as climate change. I also discuss how an increased understanding of the personal connection people have with iconic places may help to enhance public support for protecting climate-sensitive systems within Australia and around the world.

After suggesting that the GBR is a key part of the broader Australian culture, I next compare these findings with an in-depth exploration of how regional stakeholders feel about protecting the GBR. Using principles commonly used by environmental psychologists, I describe in **Chapter 5** how and why a sense of individual and collective responsibility to protect the environment relates to the ways people connect to the GBR. Using large-scale face-to-face interviews as well as online surveys, I found that Australians throughout the country (n=2,002), local residents living near the GBR (n=3,181), and tourists visiting the GBR region (n=2,621) perceived responsibility to protect the GBR in significantly different ways. These perceptions were positively correlated with the attitudes people had about the GBR, including the levels of personal identity an individual derives from the GBR, pride in the status of the GBR as a World Heritage Area, optimism about the future of the GBR, and concerns about a decline in the health of the GBR. I conclude by discussing how a more comprehensive consideration of the

attitudes that influence responsibility to protect the GBR may contribute to management interventions, increasing stewardship, resilience, and support for conservation activities in linked socio-ecological systems such as the GBR.

Resource managers and policymakers have initiated numerous projects and programs to engage, influence, and encourage stakeholders to behave more sustainably. However, a significant research gap exists concerning how or why the attitudes people have about the GBR influence the pro-environmental behaviours they undertake to protect the natural world around them. In **Chapter 6**, I address this knowledge gap, using 5,921 face-to-face and telephone surveys to show the attitudes that residents, tourists, and tourism operators have about the GBR are closely tied to the behaviours and actions they take to protect the environment. Specifically, my findings suggest that the responsibility, pride, identity, and optimism that people associate with the GBR are significantly correlated with pro-environmental behaviours such as recycling, participation in conservation groups, and climate change mitigation activities. I also show that respondents who felt the strongest connection to the GBR took the most action to protect the environment, carrying implications for resource managers trying to build sustainable communities and industries such as tourism. These implications may include a renewed focus on promoting community stewardship as well as a reassessment of the message frames used to communicate with key stakeholders.

GBR stakeholders like tourism operators have both a considerable interest in protecting coral reefs as well as a pivotal role to play in taking action to ensure the long-term sustainability of these ecosystems. Long-recognised as important stewards of the GBR, tourism operators engage tourists with strategic messaging about marine conservation, informing them about ongoing threats and providing ideas to address these concerns. In **Chapter 7**, I discuss 119 surveys and 19 in-depth semi-structured interviews conducted with tourism operators in Cairns and Airlie Beach, two of the most important tourism centres along the GBR. The surveys were conducted in 2013 and the interviews were done in December, 2014 and January, 2015. I observed that tourism operators recognise the threat of climate change and strongly support increased action to protect the GBR. However, I also use the Theory of Planned Behaviour as a structuring conceptual framework to discuss various barriers and obstacles that prevent tourism operators from taking action despite acknowledging an interest, expertise, and responsibility to do so. Understanding these barriers is an important part of overcoming them, helping resource managers to encourage tourism operators, as well as the tourists who visit the GBR, to take action to protect it.

The final chapter, **Chapter 8**, synthesises the main findings of the thesis and provides answers to the various research questions explored in each of the previous chapters. Chapter 8 also includes a discussion of how social science data may be operationalised in a resource management context along the GBR. Specifically, I critically analyse various large-scale conservation initiatives currently underway in the GBR region, including the various community engagement approaches proposed and ongoing. In doing so, and with reference to segmentation approaches utilised by marketing professionals as well as key findings from this thesis, I discuss how targeted communication efforts may contribute to the enhancement of local support for conservation as well as the encouragement of pro-environmental behaviours. Finally, I provide an overview of how these engagement strategies may be tailored to particular stakeholder groups such as marine tourism operators. I conclude this thesis by proposing future research topics that build upon the main findings found therein.

Humans are complex beings whose behaviours are influenced by internal beliefs and attitudes. In this thesis, I suggest that a better understanding of the identity, pride, optimism, and responsibility that people associate with the GBR can contribute towards more influential stakeholder engagement, better resource management decision-making, and improved environmental outcomes. Such knowledge can assist resource managers in designing programs that are more personally relevant and

effective. I have sought to make modest theoretical, methodological, and empirical contributions to assist with this process. From an applied standpoint, I suggest that using techniques from a multi-disciplinary perspective including psychology, marketing, and strategic engagement may contribute to the development of innovative communication outputs in the GBR region, e.g., in the design, implementation and improvement of stewardship programs and community engagement projects. I also demonstrate a novel data collection effort by showing how online market research tools can collect nationally-representative information across geographic regions and with respect to demographic factors such as gender, income, and education. Additionally, I document various empirical findings that quantify the concern and connection that individuals have about the GBR. Together, these findings offer new ways of thinking about the day to day interactions that resource managers have with stakeholders, connecting psychological concepts with the relationship people have with the environment. Specifically, my results identify key attitudes like responsibility and identity that can be integrated into strategic communication outputs that could leverage behaviour change among GBR stakeholders. Whilst there exists considerable potential to incorporate social science data into management decision-making related to the GBR, significant work is needed to operationalise data in a resource management context. In clarifying the links between attitudes and behaviours, as well as quantifying the influential beliefs that drive them, this thesis provides a small yet hopefully valuable step on this journey.





This is to certify that:

1. The thesis comprises only my original work towards the PhD.
2. Due acknowledgment has been made in the text to all other material used.
3. Every reasonable effort has been made to gain permission and acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who I have unintentionally omitted or incorrectly acknowledged.
4. The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council (NHMRC) National Statement on Ethical Conduct in Human Research, 2007. The research study received human research ethics approval from James Cook University (#H5197 and #H5046) and the Commonwealth Scientific and Industrial Research Organisation (#014/13 and #024/13).
5. The thesis is less than 100,000 words in length, exclusive of tables, maps, references and appendices.

Jeremy A. Goldberg



## SOURCE REFERENCES

Excluding Chapter 3, the content within Chapters 2 – 7 of this thesis has been published (Chapter 4), is currently in review (Chapter 5 and 7), or is in preparation for submission (Chapter 2 and 6). All manuscripts were developed, submitted, reviewed, and edited during my PhD candidature at James Cook University. Several manuscripts are ancillary to the thesis and do not form an integral part of it. However, they remain relevant and closely related to the core research objectives included within the thesis, namely to explore, document, and analyse the human dimension of the Great Barrier Reef within a natural resource management context. None of these manuscripts contributed to the award of another degree. Each of these manuscripts includes numerous colleagues as co-authors. In the examples below in which I am not the lead author, I have only included in this thesis the portions of the papers related to my own work. For the papers that I am the lead author, the work included in this thesis reflects the analyses, research questions, and data collection efforts that I initiated, led, or co-developed with colleagues. Please see the Statement of the Contribution of Others section that follows for qualitative descriptions of the contributions from co-authors to my thesis content.

**Goldberg J**, Marshall N, Birtles A, Case P, Bohensky E, Curnock M, Gooch M, Parry-Husbands H, Pert P, Tobin R, Villani C and Visperas B (2016) Climate change, the Great Barrier Reef, and the response of Australians. *Palgrave Communications*. 2:15046.

**Goldberg, J.**, Marshall, N., Curnock, M., Stone-Jovicich, S., Bohensky, E., Gooch, M., Birtles, A., Parry-Husbands, H., Pert, P., Tobin, R., and C. Villani (2014) SELTMP 2013: A National Survey of the Great Barrier Reef (pp. 43): CSIRO.

**Goldberg, J.**, Marshall, N., Gooch, M., Birtles, A., Bohensky, E., Curnock, M., Parry-Husbands, H., Pert, P., Stone-Jovicich, S., Tobin, R., and B. Visperas (2015) SELTMP 2014: A National Survey of the Great Barrier Reef (pp. 45): CSIRO.

Marshall, N.A., Bohensky, E., Curnock, M., **Goldberg, J.**, Gooch, M., Nicotra, B., Pert, P., Scherl, L., Stone-Jovicich, S., and R. Tobin (2016) Advances in Monitoring the Human Dimension of Natural Resource Systems: An example from the Great Barrier Reef. *Environmental Research Letters*.

Bohensky, E., Marshall, N., Curnock, M., Gillet, S., **Goldberg, J.**, Gooch, M., Pert, P., Scherl, L., Stone-Jovicich, S., Tobin, R. (2014) The Social and Economic Long Term Monitoring Program (SELTMP) 2013, Coastal Communities in the Great Barrier Reef. Report to the National Environmental Research Program. Reef and Rainforest Research Centre Limited, Cairns (35pp.).

Bohensky, E., Curnock, M., Gillet, S., **Goldberg, J.**, Gooch, M., Marshall, N., Pert, P., Scherl, L., Stone-Jovicich, S., Tobin, R. (2014) The Social and Economic Long Term Monitoring Program (SELTMP) 2013, Drivers of Change in the Great Barrier Reef. Report to the National Environmental Research Program. Reef and Rainforest Research Centre Limited, Cairns (51pp.).

Curnock, M., Marshall, N., Tobin, R., Stone-Jovicich, S., Bohensky, E., Pert, P., **Goldberg, J.**, Gooch, M., Heindler, F., Parker, J., Gillet, S., Scherl, L. (2014). The Social and Economic Long Term Monitoring Program (SELTMP) 2014, Tourism in the Great Barrier Reef. Report to the National Environmental Research Program. Cairns, Australia: CSIRO (69pp.)

Tobin, R., Bohensky, E., Curnock, M., **Goldberg, J.**, Gooch, M., Marshall, N., Nicotra, B., Pert, P., Scherl, L., Stone-Jovicich, S. (2014) The Social and Economic Long Term Monitoring Program (SELTMP)

2013, Recreation in the Great Barrier Reef. Report to the National Environmental Research Program. Reef and Rainforest Research Centre Limited, Cairns (77pp.).

Marshall, N., Bohensky E., **Goldberg J.**, Gooch M., Lankester A., Pert P., Stone-Jovicich S., Tobin, R. (2012) Social and economic long-term monitoring program: social and economic conditions of the Great Barrier Reef. Technical report published by the CSIRO. 415 pp.

**Goldberg, J.**, Marshall, N., Birtles, A., Case, P., and M. Curnock (revised and resubmitted) Environmental attitudes are linked to the behaviours of key Great Barrier Reef user groups. *Ecology and Society*.

**Goldberg, J.**, Birtles, A., Marshall, N., Case, P., and M. Curnock (revised and resubmitted) Changing behaviours in a changing climate: The role of Great Barrier Reef tourism operators in influencing tourist perceptions. *Journal of Sustainable Tourism*.

Chaigneau, T., **Goldberg, J.**, Cooper, J., and N. Marshall (in review) Wellbeing and pro-environmental behaviours along the Great Barrier Reef: Who is doing what and why? *Environment and Behaviour*.

**Goldberg, J.**, Bonin, M., Birtles, A., Marshall, N., Bohensky, E., Case, P., Curnock, M., Gooch, M., Pert, P., Stone-Jovicich, S., and R. Tobin (in preparation) Why do people in Australia feel responsible for protecting the Great Barrier Reef? *AMBIO*.

**Goldberg, J.**, Birtles, A., Marshall, N., Case, P., and A. Beeden (in preparation) Changing behaviour in a changing climate: the role of social science in improving resource management. *Australasian Journal of Environmental Management*.

Brown, K., D'Lima, C., Lau, J., Szaboova, L., Revmatas, M., Marshall, N., and **J. Goldberg** (in preparation) Harnessing inspiration for sustainability. *Science*.

Marshall, N.A., Birtles, A., Brown, K., Cinner, J., Curnock, M., Eakin, H., **Goldberg, J.**, Gooch, M., Kittinger, J., Marshall, P.A., Manuel-Navarrete, D., Pelling, M., Pert, P., Smit, B. and R.C. Tobin (in review) Culture Matters in the Great Barrier Reef. *Proceedings of the National Academy of Sciences*.



## STATEMENT OF THE CONTRIBUTIONS OF OTHERS: THESIS CONTENT

All of the work included in this thesis was accomplished during my PhD candidature at James Cook University. I led the development of all content contained within, including those chapters that have already been published or submitted for publication. Although the work presented in this thesis has benefited in numerous ways from invaluable contributions from my co-authors and work colleagues, the work presented in each chapter is my own. Below, I summarise the co-author contributions made to each chapter. I also include the relevant source references.

### Chapter 2

The information contained in Chapter 2 is based upon a Literature Review of multiple social science disciplines relevant to applied natural resource management. This chapter is based upon the following publication currently in review:

**Goldberg, J.**, Birtles, A., Marshall, N., Case, P., and A. Beeden (in preparation) Changing behaviour in a changing climate: the role of social science in improving resource management. *Australasian Journal of Environmental Management*.

Birtles helped provide strategic direction about the theoretical framework and implications for resource management. Marshall and Case assisted with clarification of the focus and vision of the manuscript as well as the key aspects to highlight and expand. Beeden assisted with various aspects related to the psychological literature and individual decision-making process.

### Chapter 3

The work included in Chapter 3 includes some background information detailed in the publication below.

Marshall, N.A., Bohensky, E., Curnock, M., **Goldberg, J.**, Gooch, M., Nicotra, B., Pert, P., Scherl, L., Stone-Jovicich, S., and R. Tobin (2016) Advances in Monitoring the Human Dimension of Natural Resource Systems: An example from the Great Barrier Reef. *Environmental Research Letters*.

Marshall led the initiation and development of the SELTMP, including the acquisition of funding and the recruitment and management of the research team. Marshall, Bohensky, Curnock, Gooch, Pert, Stone-Jovicich, Tobin, and Goldberg contributed to the development of the research design, surveys, data collection, and all other research methods. Nicotra assisted with data collection and database management, including quality control and assurance. Scherl assisted with survey design and data analyses, specifically those areas related to community wellbeing.

### Chapter 4

The work included in Chapter 4 includes analyses and information presented within the three publications below.

**Goldberg J**, Marshall N, Birtles A, Case P, Bohensky E, Curnock M, Gooch M, Parry-Husbands H, Pert P, Tobin R, Villani C and Visperas B (2016) Climate change, the Great Barrier Reef, and the response of Australians. *Palgrave Communications*. 2:15046.

**Goldberg, J.**, Marshall, N., Gooch, M., Birtles, A., Bohensky, E., Curnock, M., Parry- Husbands, H., Pert, P., Stone-Jovicich, S., Tobin, R., and B. Visperas. (2015) SELTMP 2014: A National Survey of the Great Barrier Reef (pp. 45): CSIRO.

**Goldberg, J.,** Marshall, N., Curnock, M., Stone-Jovicich, S., Bohensky, E., Gooch, M., Birtles, A., Parry-Husbands, H., Pert, P., Tobin, R., and C. Villani. (2014) SELTMP 2013: A National Survey of the Great Barrier Reef (pp. 43): CSIRO.

The online survey was carried out by Pollinate, a marketing company based in Sydney, and Parry-Husbands, Villani, and Visperas led the data collection and collation. Marshall, Bohensky, Curnock, Gooch, Pert, Stone-Jovicich and Tobin contributed to the development of the research design, surveys, data collection, and all other research methods. Birtles and Case assisted with the design of the survey, the presentation of key findings, and the direction of the project and manuscript. The two CSIRO technical reports included similar responsibilities and contributions.

#### Chapter 5

The work included in Chapter 5 is similar to the manuscript below, but also expands upon a few key findings and discussion topics.

**Goldberg, J.,** Bonin, M., Birtles, A., Marshall, N., Bohensky, E., Case, P., Curnock, M., Gooch, M., Pert, P., Stone-Jovicich, S., and R. Tobin (in preparation) Why do people in Australia feel responsible for protecting the Great Barrier Reef? *AMBIO*.

Data were acquired via the SELTMP regional surveys of GBR residents and tourists and via the national survey conducted by Pollinate. Marshall, Bohensky, Curnock, Gooch, Pert, Stone-Jovicich and Tobin contributed to the development of the research design, SELTMP surveys, data collection, and all other research methods. Parry-Husbands, Villani, and Visperas led the national survey data collection and collation. Birtles and Case assisted with the design of the national surveys, the SELTMP surveys, the presentation of key findings, and the direction of the project and manuscript development.

#### Chapter 6

The work included in Chapter 6 is largely the same as the manuscript below written by me. This document is currently in review.

**Goldberg, J.,** Marshall, N., Birtles, A., Case, P., and M. Curnock (revised and resubmitted) Environmental attitudes are linked to the behaviours of key Great Barrier Reef user groups. *Ecology and Society*.

Marshall, Birtles, Case, and Curnock contributed to the development of the research design, surveys, data collection, and all other research methods.

#### Chapter 7

The work included in Chapter 7 is largely the same as the manuscript below written by me. This document is currently in review.

**Goldberg, J.,** Birtles, A., Marshall, N., Case, P., and M. Curnock (revised and resubmitted) Changing behaviours in a changing climate: The role of Great Barrier Reef tourism operators in influencing tourist perceptions. *Journal of Sustainable Tourism*.

I identified potential respondents and conducted interviews with marine tourism operators in Cairns and Airlie Beach. Birtles, Marshall, Case, and Curnock contributed to the development of the survey questions, the data collection protocols, and all other aspects of research design.

#### Chapter 8

The analyses and content included in Chapter 8 was written by me and is not being prepared for publication at this stage.





## STATEMENT OF THE CONTRIBUTION OF OTHERS: ADMINISTRATIVE SUPPORT

Nature of assistance	Contribution	Names, Titles, and Affiliations of Co-Contributors
Fees	Tuition fee waiver in 2012 – 2013	<p>Dr. David Low, College of Business, Law and Governance, James Cook University, Townsville, Australia</p> <p>Dr. Alastair Birtles, College of Business, Law and Governance, James Cook University, Townsville, Australia</p>
Stipend support	International Post-Graduate Research Scholarship from 2013 – 2016	<p>Dr. David Low, College of Business, Law and Governance, James Cook University, Townsville, Australia</p> <p>Dr. Alastair Birtles, College of Business, Law and Governance, James Cook University, Townsville, Australia</p>
Supervision	PhD Supervision	<p>Dr. Alastair Birtles, College of Business, Law and Governance, James Cook University, Townsville, Australia</p> <p>Dr. Nadine Marshall, CSIRO Land and Water Flagship, Townsville, Australia and College of Marine and Environmental Sciences, James Cook University, Townsville, Australia</p> <p>Dr. Peter Case, James Cook University, Townsville, Australia and School of Business, University of the West of England, Frenchay Campus, Bristol, United Kingdom</p>
Other collaborations	Survey design, pilot testing, and reporting	<p>Dr. Erin Bohensky, Dr. Matt Curnock, Dr. Petina Pert, Dr. Samantha Stone-Jovicich, CSIRO Land and Water Flagship, Townsville</p> <p>Dr. Nadine Marshall, CSIRO Land and Water Flagship, Townsville, Australia and College of Marine and Environmental Sciences, James Cook University, Townsville, Australia</p> <p>Dr. Margaret Gooch, Great Barrier Reef Marine Park Authority, Townsville, Australia and The Cairns Institute, Cairns, Australia</p> <p>Dr. Lea Scherl, North Queensland Dry Tropics, Townsville, Australia</p> <p>Dr. Alastair Birtles, College of Business, Law and Governance, James Cook University, Townsville, Australia</p> <p>Dr. Renae Tobin, Centre for Sustainable Tropical Fisheries and Aquaculture, James Cook University, Townsville, Australia and College of Marine and Environmental Sciences, James Cook University, Townsville, Australia</p>
Statistical support	<p>Quality control and quality assurance related to the national survey</p> <p>Statistical analyses</p>	<p>Bernard Visperas, Christopher Villani, Howards Parry-Husbands, Pollinate, Sydney, Australia</p> <p>Dr. Mary Bonin, ARC Centre of Excellence for Coral Reef Studies, College of Marine &amp; Environmental Sciences, James Cook University</p>

		Dr. Matt Curnock, CSIRO Land and Water Flagship, Townsville, Australia
Editorial assistance	Revisions, reviewing, and rewriting	<p>Dr. Alastair Birtles, College of Business, Law and Governance, James Cook University, Townsville, Australia</p> <p>Dr. Nadine Marshall, CSIRO Land and Water Flagship, Townsville, Australia and College of Marine and Environmental Sciences, James Cook University, Townsville, Australia</p> <p>Dr. Peter Case, James Cook University, Townsville, Australia and School of Business, University of the West of England, Frenchay Campus, Bristol, United Kingdom</p> <p>Dr. Jane Addison, Dr. Matt Curnock, CSIRO Land and Water Flagship, Townsville, Australia</p> <p>Dr. Roger Beeden, Great Barrier Reef Marine Park Authority, Townsville, Australia</p> <p>Dr. Paul Marshall, Reef Ecologic, and the Centre for Biodiversity &amp; Conservation, University of Queensland</p>
Research assistance	Data collection	<p>Research Assistants for CSIRO's SELTMP surveys: Sophie Essberger, James McEvoy-Bowe, Brock Bergseth, Chad Goldberg, Jessica Morris, Charles Couka, Margot Boulanger, Lauren Davy, Jacquie Sheils, Sue Wynn</p> <p>Assistance with the national survey included in Chapter 4: Bernard Visperas, Christopher Villani, Howards Parry-Husbands, Pollinate, Sydney, Australia</p>
Any other assistance	Data quality control and quality assurance	Sarah Gillet, Jason Townsend, Charles Couka, research assistants, CSIRO
Project costs	Accommodation, supplies, transportation, materials, equipment	<p>Dr. Nadine Marshall, CSIRO Land and Water Flagship, Townsville, Australia and College of Marine and Environmental Sciences, James Cook University, Townsville, Australia</p> <p>Dr. Margaret Gooch, Great Barrier Reef Marine Park Authority, Townsville, Australia and The Cairns Institute, Cairns, Australia</p> <p>The National Environmental Research Program, the Great Barrier Reef Foundation, James Cook University, the Great Barrier Reef Marine Park Authority, and the CSIRO</p>
Use of infrastructure external to JCU	A laptop computer, workspace, and many morning teas	<p>Dr. Nadine Marshall, CSIRO Land and Water Flagship, Townsville, Australia and College of Marine and Environmental Sciences, James Cook University, Townsville, Australia</p> <p>Dr. Ian Watson, Officer-In-Charge, CSIRO, Townsville</p>



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This PhD has felt like winning a ballroom dancing competition held in a hurricane – I didn't know the steps, was occasionally terrified, and I'm not too sure what happens next, but I am extremely honoured, humbled, and grateful for the achievement nonetheless. Onward and upwards...

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### 1.1 Introduction and context

Coral reefs are among the most diverse and important ecosystems on the planet, providing critical social and ecological benefits for hundreds of millions of people around the world. These benefits include the provision of food and sustenance (Moberg & Folke, 1999; Roberts *et al.*, 2002), contributions to culture (Cinner *et al.*, 2005), and coastal protection from erosion and storms (Wilkinson, 1999). Additionally, coral reefs are hugely important from an economic standpoint (Cesar *et al.*, 2003). The Great Barrier Reef (GBR), for example, provides more than 6 billion dollars to the Queensland state economy each year, and provides approximately 64,000 full-time jobs (Deloitte Access Economics, 2013).

I present the case of the GBR, one of the most iconic and famous ecosystems in the world, the first coral reef to be established as a World Heritage Area, and one of the largest, healthiest, and most remarkable coral reef ecosystems on the planet (Great Barrier Marine Park Authority, 2009). Composed of 2,900 individual coral reefs, the GBR spans 2,300 km along the northeast coast of Australia and is approximately 350,000 square kilometres in area (Johnson & Marshall, 2007). The GBR contains nearly 10% of the coral reef area in the world and is home to a globally significant amount of biodiversity and beauty, as well as exceptional social, economic and cultural values (McCook *et al.*, 2010). More than two million people visit the GBR each year, providing huge benefits for tourism operators and other businesses along the coastline. There are currently 1,073 permits for tourism activities within the Marine Park, including actions such as snorkelling, SCUBA diving, fishing, scenic flights, and whale watching.

#### *Overview of GBR threats and management*

Major and destructive environmental changes are expected in coming years and coral reefs like the GBR are threatened by a variety of human impacts, including climate change (Great Barrier Marine Park Authority, 2014), the most significant threat to the long-term health of coral reefs around the world (Anthony *et al.*, 2015; Anthony *et al.*, 2011; Hoegh-Guldberg *et al.*, 2007). In addition to projected declines in coral health (De'ath *et al.*, 2009), further impacts of climate change are expected to include a greater predominance of coral diseases (Beeden *et al.*, 2012) an increase in tropical cyclone severity (Knutson *et al.*, 2010), ocean warming and acidification leading to decreased coral growth (Anthony *et al.*, 2011; De'ath *et al.*, 2013; Lough & Cantin, 2014), and changes to the abundance and distribution of marine species (Great Barrier Marine Park Authority, 2007). As well as the vast ecological effects, these impacts are projected to have huge socio-economic implications for stakeholders who depend upon the GBR (Anthony *et al.*, 2015; Marshall *et al.*, 2013). Successfully preventing and preparing for climate change impacts by enhancing socio-ecological resilience is crucial to ensure the long-term survival of the GBR (Great Barrier Marine Park Authority, 2009). However, serious action is needed to prevent catastrophic damage to these beautiful and vital underwater landscapes (Great Barrier Marine Park Authority, 2014; Hughes *et al.*, 2010).

In response to the multitude of threats facing the GBR, the Great Barrier Reef Marine Park Authority (GBRMPPA), the federal government agency tasked with the long-term preservation of the GBR, has initiated a comprehensive, ecosystem-based approach to resource management (Ruckelshaus *et al.*, 2008). This approach focuses on facilitating two key actions: 1) mitigating the root cause of key ecosystem threats (e.g., the reduction of nutrient runoff to improve coastal water quality), and 2) enhancing the adaptive capacity and resilience of individuals and industries to existing and expected changes in the socio-ecological system of the GBR (Johnson & Marshall, 2007). Adaptive capacity and social resilience are influenced by individual behaviours, and these behaviours are ultimately driven by psychological attributes such as attitudes and beliefs (Ajzen, 1991; Conner & Armitage, 1998; Godin & Kok, 1996), including behaviours related to environmental protection and sustainability (Fielding *et al.*, 2008a; Kaiser *et al.*, 1999; Stern, 2000b).

Despite decades of sustained management efforts<sup>1</sup>, the Great Barrier Reef has lost half of its live coral cover in the last 27 years (De'ath *et al.*, 2012). Further, a 2014 assessment by the Great Barrier Reef Marine Park Authority (the federal government agency tasked with managing the GBR) determined that the long-term forecast for the GBR was “poor, and getting worse” (Great Barrier Marine Park Authority, 2014). The GBR is currently managed via a cooperative arrangement between local, state, and federal governments, including a variety of collaborative programs that encourage the protection of the GBR (Evans, 2011; Great Barrier Marine Park Authority, 2007, 2012). These programs include large-scale projects such as rezoning the Marine Park to protect 33% of the area from fishing (Fernandes *et al.*, 2005), regional activities such as the Reef Guardians campaign that promotes community stewardship of the environment (Evans, 2011), and local actions like the establishment of no-anchoring areas in the Southern GBR (Beeden *et al.*, 2014a). Further, various efforts exist to integrate stakeholder engagement and participation in management (Day & Dobbs, 2013). These projects include citizen science activities such as the Sightings Network or Eye on the Reef programs, where community members can contribute data and observations, as well as local advisory committees that offer a forum to influence policy discussions and development.

The Australian and Queensland governments annually spend more than \$200 million on a variety of conservation measures to secure the long-term sustainable future of the GBR. Together, these governments have spent decades fostering collaborations with important stakeholders like farmers, fishers, and tourism operators, in hopes of encouraging conservation outcomes and best practices for their industries (Great Barrier Marine Park Authority, 2009, 2014). Projects include a \$40 million Reef Trust that reduces runoff from agricultural practices that contribute to crown-of-thorns starfish outbreaks, the ~\$140 million Reef Rescue initiative that provides water quality grants for thousands of land managers to adopt better practices, and numerous smaller activities such as the development of coral disease response plans (Beeden *et al.*, 2012) and a Reef Guardians program to raise awareness about conservation (Evans, 2011). Overall, resource managers are heavily invested in conservation projects that rely on interpersonal communication to advance program outputs and conservation activities. Among various priority actions related to ecosystem health and the preservation of biodiversity, the human dimension of the GBR is a unifying theme for many ongoing management activities. Much of this work focuses upon knowledge transfer, fostering relationships through regular meetings to discuss ongoing progress, and distributing information related to pressing issues such as deteriorating water quality. Thus, the influence of people on the environment is of particular importance to regional resource managers, especially activities and behaviours undertaken by stakeholders that negatively affect the health of the GBR.

The creation of innovative conservation partnerships is particularly important to halt the ongoing degradation of natural resources (Biggs *et al.*, 2012). These projects, and others like them, devote considerable resources towards establishing strategic collaborations among community members, primary industries, and governments to take action to protect the GBR (Day & Dobbs, 2013). Enhanced community understanding, collaborative learning, and public awareness have been shown to be key components of successful adaptive management and for maintaining the resilience of linked socio-ecological systems (Olsson *et al.*, 2004). Further, understanding how people relate to the environment is a key first step towards designing resource management programs that encourage pro-environmental behaviours (Vaske & Kobrin, 2001), including those that maintain or enhance valued attributes of that setting (Stedman, 2002). One way to understand the connection that people have for a place is to clarify the meanings they associate with that setting (Wynveen *et al.*, 2010).

Governments, environmental groups, and resource managers, i.e., individuals who develop conservation policies, plans, and projects that help people interact with the environment in an

---

<sup>1</sup> The GBR has been a protected Marine Park since 1975 and was delegated a World Heritage Area in 1981 (Bohensky *et al.*, 2011).

ecologically sustainable manner, engage the public to help protect the environment through initiatives that encourage pro-environmental behaviours (Beeden *et al.*, 2014a; Beeden *et al.*, 2014b; Commonwealth of Australia, 2009; Evans, 2011). However, behaviours are complex and difficult to influence, and the social science research to support engagement processes is occasionally insufficient. Further, many obstacles can prevent effective communication, limiting the impact that community engagement can have in fostering widespread change. The lack of connection between knowledge and action is one such obstacle. Despite an awareness of environmental threats and access to scientific information, various cognitive, psychological and social barriers prevent individuals from initiating responsive pro-environmental behaviours (O'Neill & Hulme, 2009). Understanding the obstacles that impede people from protecting the environment is part of the process of creating engagement programs to encourage action. It is not possible to develop effective and appropriate interventions to enhance resilience without knowing how people feel about the issues and how they create, resolve, implement and evaluate their own behaviours (Fischhoff, 2007). Consequently, a comprehensive understanding of the individual drivers of behaviour is important for developing responsive solutions to environmental threats (Ehrlich & Kennedy, 2005), particularly because individual attitudes and beliefs influence decision-making processes (Moser & Ekstrom, 2010). The integration of stakeholder attitudes and perceptions into planning is vital for the management of natural resources (Larson *et al.*, 2013) as it increases the probability that conservation activities will be successful and sustainable (McCook *et al.*, 2010).

Although stakeholder engagement is crucial to empowering people and affecting widespread societal change for dealing with environmental threats like climate change (Bohensky *et al.*, 2012; Howell, 2013; Sutton & Tobin, 2011), information alone is not sufficient to influence behaviour (Kollmuss, 2002). Rather, a variety of components related to the creation and delivery of strategic communication will affect the way that people respond to messages, including the actions people take to protect the environment (Moser, 2010). These components include the development of targeted messages for specific types of people, e.g., how to design messages for different audiences that facilitate rather than constrain action, and the creation of appropriate interventions that help people to overcome difficulties that impede a pro-environmental response, e.g., how to minimise barriers while simultaneously enhancing the benefits of taking action (Lorenzoni *et al.*, 2007; McKenzie-Mohr, 2000; Moser & Ekstrom, 2010). Strategies that are tailored to specific segments of the general population may also be more effective than a one-size-fits-all approach which fails to distinguish between different social positions, attitudes, and individual constraints to action (Maibach *et al.*, 2011; Martin, 2011). Consequently, if researchers can clarify key factors that influence behaviour, then policy makers and resource managers will be better placed to talk about conservation with the public in a more meaningful and relevant way, influencing stakeholder actions more effectively and improving environmental outcomes (Leitch, 2011). While there has been growing interest in understanding the factors that influence conservation behaviours, research related to community engagement along GBR has been especially deficient. In particular, little is known about why people connect to the GBR, or how these connections influence the actions they take to protect the health of the GBR.

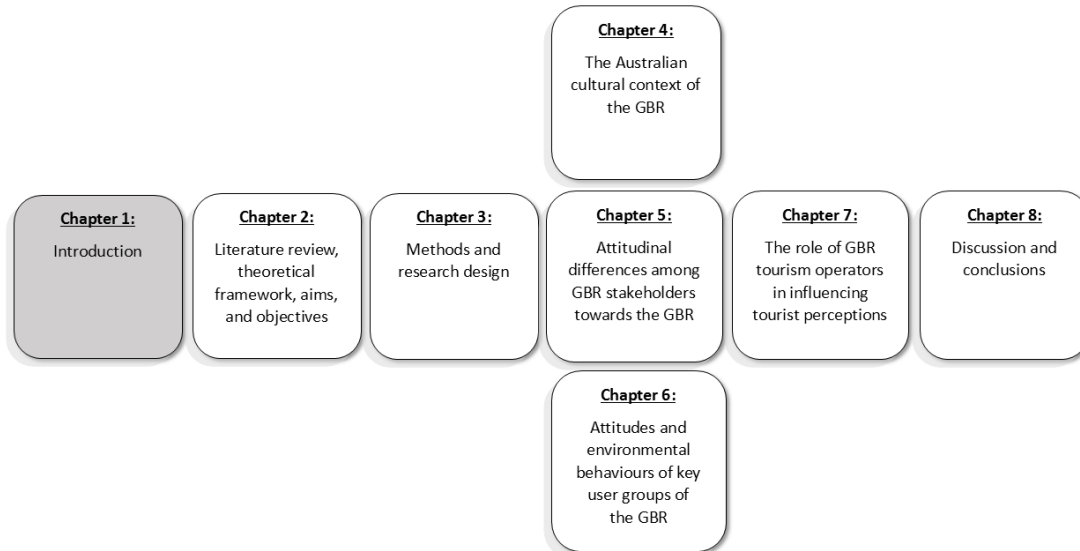
## **1.2 Thesis focus and structure**

This thesis reports on research analysing the complex interactions between individual attitudes and behaviours. Particular focus is given to advancing a multi-disciplinary understanding that contributes towards resource management decision-making along the GBR, specifically addressing how to encourage pro-environmental behaviours and enhance socio-ecological resilience. A socio-psychological lens was used to explore the complex linkages between environmental threats such as climate change, the ongoing coral reef crisis, and the conservation behaviours required to promote the long-term sustainability of tropical ecosystems. However, I also consider the multifaceted linkages between natural and social systems in which psychological processes manifest. Specifically, I

investigated how people perceive an environmental icon (the GBR), the ways in which they feel connected to it, the concerns they have about its future, and the critical attributes that influence their decision-making processes. A central theme in my thesis is the empirical examination of responsibility, identity, and place attachment as possible influences on pro-environmental behaviour. These factors have been shown elsewhere to be potentially influential in affecting individual decisions, but in rather indirect ways (Devine-Wright & Clayton, 2010; Fielding *et al.*, 2008b; Halpenny, 2010; Nigbur *et al.*, 2010). Here, building upon the work of Wynveen *et al.* (2014) and Wynveen *et al.* (2015), I test them directly.

Large-scale surveys of Australian residents, tourists, and marine tourism operators were conducted with the assistance and partnership of researchers from various research institutions such as James Cook University and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Importantly, I was employed as a part-time researcher with the CSIRO during the development and implementation of the Social and Economic Long-Term Monitoring Program (SELTMP) of the major users and stakeholders within the GBR Marine Park. The SELTMP was a regional collaboration to collect data from key stakeholder groups about issues, opinions, and actions most relevant to the management of the GBR. My role in the program allowed me to integrate my own research questions into the broader SELTMP surveys. This opportunity also provided me with invaluable access to a large sample size to investigate the linkages between individual attitudes and pro-environmental actions. Finally, I was given considerable access to the GBR management agency (the GBRMPA) that was inputting the resource management needs/objectives for the SELTMP study, thus ensuring that my own research questions and data would be applicable to ongoing management needs and knowledge gaps. The SELTMP is described in depth in Chapter 3.

Four chapters within this thesis address the link between individual attitudes about the GBR and subsequent behaviours taken to protect it. More concretely, these chapters clarify why and what people feel about the GBR and how these beliefs influence their actions. I also explore the contexts in which pro-environmental behaviours develop and are expressed in several key stakeholder groups such as Australians throughout the country, local residents and tourists in the GBR region, and marine tourism operators working in the GBR Marine Park. The specific research objectives addressed by the thesis chapters build on one another and are inter-related (Figure 1.1); all work to build a dynamic understanding of the people of the GBR in order to improve the programs and policies in place to communicate with them, and to encourage sustainable actions.



**Figure 1.1.** Conceptual diagram of the thesis chapters, including this introduction (Chapter 1), literature review (Chapter 2), description of the methods (Chapter 3), four studies summarised as data chapters (Chapters 4 – 7), and a discussion of the broader implications of the key findings (Chapter 8). This diagram is included at the start of each thesis chapter with the relevant sections of the diagram highlighted. Each chapter also includes a brief caption that describes how the content within that chapter builds on that of the preceding chapter and, where applicable, the chapters end with a section on management applications that details how resource managers may utilise the outputs of the work presented. Overall, the figure shows how a targeted behaviour change campaign may be operationalised in an applied conservation context, e.g., a review of relevant literature, a strategic evaluation of appropriate methods, an exploration of influential components, an analysis of key drivers of change, and an in-depth study that builds upon key findings to follow up with critical research needs and possible intervention approaches.

Overall, this thesis presents a multi-disciplinary approach to improving stakeholder engagement along the GBR, integrating key concepts from a variety of social science disciplines to develop research questions that support the long-term management of the GBR. For example, I used a widely recognised concept in environmental psychology, place attachment, to develop survey questions that explored the link between Australian residents and their connection to the GBR. I also utilised concepts from a widely renowned psychological theory, the Theory of Planned Behaviour, to develop questions included in surveys I conducted with GBR residents and tourists, and during in-depth interviews with tourism operators about climate change. Finally, I integrated principles from marketing and communication science to explain how and why my findings may be incorporated into behaviour change programs that promote the long-term resilience of the GBR.

The next section reviews the theoretical underpinnings of the research presented in this thesis. Following a literature review of multiple social science disciplines such as psychology, marketing, and communication, I present my research aim, objectives, and research questions. These are presented in Section 2.9 at the end of the next chapter.

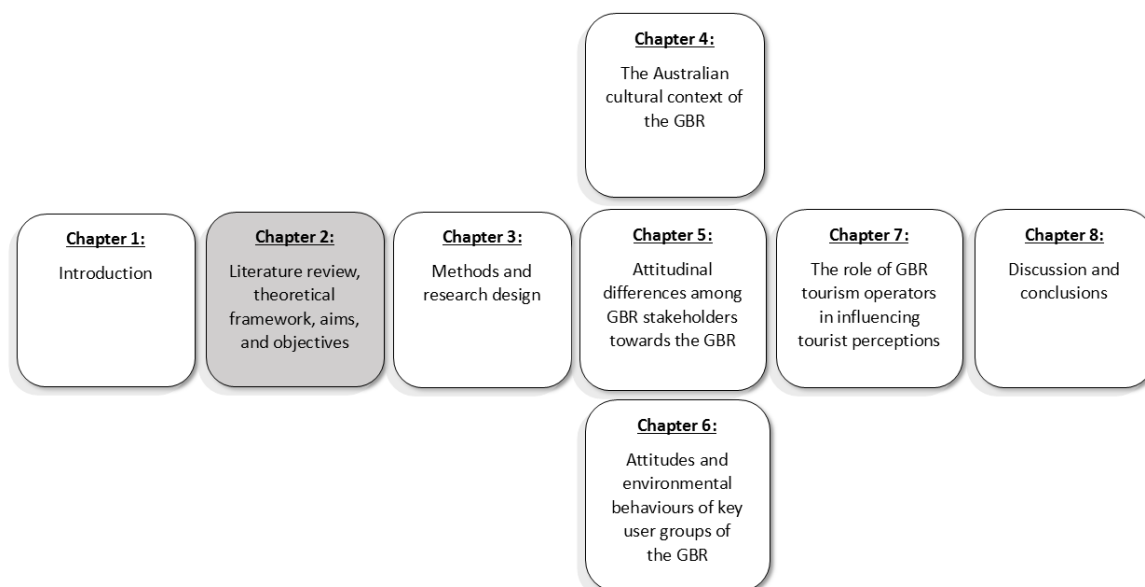




## CHAPTER 2: LITERATURE REVIEW

The aim of this chapter is to present the scientific literature and theoretical framework used to develop the thesis, including a review of key psychological principles. This chapter also provides a brief synthesis of strategic approaches used by marketing and communication professionals. These approaches may be used to improve stakeholder engagement about coral reef conservation.

People act differently in different situations according to cultural influences, past experiences, and the people and circumstances around us. However, decades of psychological research has enhanced our understanding of why behaviours form and how they can be changed. In this chapter, I briefly summarise the history of psychological research related to behaviour change, including a synthesis of prevailing scientific theories and how they have evolved through the last few decades. I also discuss several influential attributes that have been shown to affect behaviours, including those that relate to conservation, sustainability, and the environment. Finally, I review how strategic communication and community engagement can be utilised to affect widespread change in attitudes, beliefs, and behaviours. I conclude by presenting my research aim, objectives, and research questions.



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Urgent action is needed to minimise the impacts of climate change, yet a significant gap exists between possessing knowledge of climate change and pursuing actions to address it. In addition, effectively communicating about climate change is challenging, as is changing the individual behaviours associated with its cause and the ongoing and anticipated effects. However, practical multi-disciplinary approaches from psychology, communication science, and marketing, offer insights to improve the effectiveness of public engagement used to promote adaptation and mitigation behaviours related to climate change. Below, I begin with a brief description of the ecological impacts of climate change as well as a description of how resource managers are addressing these issues via the promotion of socio-ecological resilience. Specifically, I show that many of their programs and projects focus upon the creation of widespread behaviour change. I then describe several psychological components that influence the individual decision-making process, as well as key communication and marketing approaches that may contribute to changes in behaviour. Using the Great Barrier Reef as a case study, I clarify how a multi-disciplinary communication process may be developed and applied within a behaviour change context, potentially bolstering resource management effectiveness and the resilience of social and ecological systems.

## **2.1 Ecosystem impacts of a changing climate**

The scientific evidence that human activities cause climate change is unequivocal (Parmesan *et al.*, 2013). Increasing greenhouse gas emissions are the main cause of climate change (Solomon *et al.*, 2009) and they will lead to significant and long-lasting changes in the environment, culture, and society (Adger *et al.*, 2013). Future impacts are likely to be severe; average global temperatures are projected to increase 2°C by 2060, if not sooner, (Joshi *et al.*, 2011) and sea levels may rise an average of two meters by 2100 (Nicholls *et al.*, 2011). Thus, significant climate change impacts are largely unavoidable and widespread, particularly for vulnerable ecosystems such as coral reefs (Johnson & Marshall, 2007).

Coral reefs are critically important ecosystems that provide food for millions of people (Moberg & Folke, 1999), sustain cultures (Cinner *et al.*, 2005), and contribute extensive economic benefits to society (Cesar *et al.*, 2003). However, these vast socio-economic contributions are threatened by climate change (Great Barrier Marine Park Authority, 2009), now recognised as the most significant risk to the long-term health of coral reefs around the world, including the Great Barrier Reef (GBR) (Anthony *et al.*, 2011). Despite its status as one of the most extraordinary natural and cultural icons on the planet, the GBR is under threat and its long-term outlook is “poor, and getting worse” (Great Barrier Marine Park Authority, 2014). Additional climate change impacts on coral reef ecosystems include a greater prevalence of coral disease (Beeden *et al.*, 2012) and changes to the abundance and distribution of marine species (Johnson & Marshall, 2007). Severe changes to the ecology of the GBR are already manifest as a mass coral bleaching event in early 2016 killed more than 20% of corals on the GBR (Terry Hughes, 2016, pers. comm., 22 June)<sup>2</sup>.

Effectively managing climate change impacts is crucial to ensure the long-term survival of the GBR (Great Barrier Marine Park Authority, 2009). In response to the diverse suite of threats facing the GBR, the Great Barrier Reef Marine Park Authority (GBRMPA), the federal agency tasked with the long-term protection of the GBR, has initiated a comprehensive, ecosystem-based approach to management (Ruckelshaus *et al.*, 2008). This approach has focused on facilitating activities that 1) mitigate the root cause of threats to the GBR like climate change (i.e. greenhouse gas emissions) and

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<sup>2</sup> An interim report by the GBRMPA documented widespread yet variable bleaching throughout the Marine Park. It also noted this bleaching event is anticipated to have lasting impacts not only on the health of affected reefs, but also on the social and/or economic value of reef sites important to Reef-based industries (Great Barrier Reef Marine Park Authority, 2016). Although data analyses are still ongoing and no publications have yet detailed the extent or severity of the 2016 event, it is anticipated to be of a similar impact to the mass bleaching events that occurred in 1998 and 2002. Approximately 42% of reefs bleached in 1998 while ~54% bleached in 2002. Nearly twice as many offshore reefs bleached in 2002 as compared to 1998 event, making it the worst bleaching event on record for the GBR (Berkelmans *et al.*, 2004).

2) enhance the adaptive capacity and resilience of individuals and industries to associated impacts (Great Barrier Marine Park Authority, 2007). As such, a valuable opportunity exists to explore how interdisciplinary approaches may assist ongoing management activities within the GBR region, potentially improving management practices but also the long-term prognosis of the resource itself. However, a comprehensive synthesis of all relevant social science is beyond the scope of this review. Instead, I focus on several key considerations most relevant for resource managers seeking to influence individual behaviours that affect conservation, resource management, and resilience.

## **2.2 Managing behaviour to build social and ecological resilience**

Social resilience is defined by Adger (2000, p. 347) as “the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change” while ecological resilience is a system’s ability to absorb and recover from impact while retaining functional and structural integrity (Folke *et al.*, 2010). While social resilience and ecological resilience might superficially seem to operate in conceptually different domains, the two concepts are linked in both theory and practice (Folke *et al.*, 2010). From a theoretical view, combining social and ecological perspectives offers a systematic framework for understanding their inherent interconnectivity and how they might respond interactively to change (Marshall, 2010). When practically managing the GBR, a linked socio-ecological system in which environment status influences societal actions and vice versa, there is no meaningful way to separate the two components. Indeed, resource managers and coral reef scientists have spent considerable resources to understand and enhance the socio-ecological resilience of the GBR (Great Barrier Marine Park Authority, 2009; Hughes *et al.*, 2010).

Individual attributes, and the perceptions that drive them, ultimately influence the behaviours that contribute to the resilience of industries and individuals (Marshall *et al.*, 2007). These characteristics have been used to assess the social resilience of resource users within primary industries (Marshall, 2010) as well as to explore the influence of perceptions on the emotional and behavioural response to change (Marshall, 2007). Additionally, factors that contribute towards the resilience of a system change across multiple scales (Folke *et al.*, 2010) and through time, affecting the function and stability of the system (Bohensky, 2008). However, these factors ultimately operate at an individual level. For example, the level of attachment that an individual has to his/her occupation influences the ability of that individual to adapt to change, thus becoming a key behavioural construct for managers to consider (Marshall *et al.*, 2012). In other words, by better understanding the drivers of the behaviours that confer resilience, resource managers and policy makers can encourage the adoption of actions that enhance that resilience, thereby increasing capacity to adapt to anticipated impacts of threats like climate change.

Managing for socio-ecological resilience helps to ensure that resource-dependent industries such as tourism are better able to adapt to climate change impacts (Biggs, 2011; Marshall, 2010). Many tourism operators are already taking action to prepare for the impacts of climate change. For example, Lady Elliott Eco Resort has installed a hybrid solar diesel power station (Zeppel, 2012a). Other operators are creating and distributing interpretation materials that have been shown to not only educate tourists about key issues, but enhance their satisfaction as well (Coghlan, 2012). However, some businesses avoid responsibility for conservation activities, preferring to focus upon providing a valuable tourism experience instead of learning about and addressing climate change (McKercher *et al.*, 2014). In a study that explored the reasons for these discrepancies, Zeppel and Beaumont (2013) found that operators preferred easy actions that save them money. Cost has been shown to be one of the largest barriers to conservation action among tourism operators (Biggs *et al.*, 2012). Consequently, government interventions may be required when market forces are insufficient to produce sustainable tourism (Bramwell, 2012). Overall, innovative partnerships between government and industry may be particularly important to halt the ongoing degradation of natural resources (Biggs *et al.*, 2012).

Understanding social resilience helps resource managers predict the likely consequences of climate-related events, as well as the strategies and policies designed to protect ecological resilience. If social resilience eroded, ecological resilience may also erode as people attempt to minimise further impacts to themselves at the expense of the resource (Marshall & Marshall, 2007). Hence the concept of managing for social resilience is a serious consideration for resource managers, and a key component of that resilience involves the capacity of individuals to respond appropriately. This capacity is inherently linked to the social context in which the individual is embedded – the industries, economies, relationships and stressors/impacts that surround and influence available choices. Class, gender, and culture, in addition to technological and economic factors, are also significant influences on whether or not climate change behaviours are initiated (Nielsen & Reenberg, 2010). Understanding the context in which individuals take action, including the various internal and external factors that affect the decision-making process, is key to developing effective engagement approaches that influence behaviour, protect the environment, and promote social and ecological resilience.

Adequately addressing climate change requires a rapid and widespread change in behaviour, both at the individual and societal level (Whitmarsh & Lorenzoni, 2010). Along the GBR, various action plans seek to promote effective communication that assists with stewardship promotion and behaviour change (Great Barrier Marine Park Authority, 2007, 2012, 2015, 2016). However, the implementation of these plans is now largely unfunded and, consequently, the institutional focus of community engagement about climate change is much diminished. Regardless, these plans recognise that behaviour is complex and frequently mediated by different motives, during different times, at different locations. Context is thus a significant driver of human behaviour and varies depending upon situation, environment and surroundings (Sommers, 2011). Furthermore, people are complex beings whose conduct is occasionally non-rational (Jensen, 1994). Behaviour is difficult to predict, influence or explain (Ajzen & Fishbein, 2005), making it challenging to promote actions that confer social and ecological resilience.

Because the causal variables of individual resilience interact across multiple domains, interdisciplinary research is crucial for understanding and influencing the drivers of human behaviour (Stern, 2000b). But, what are the best approaches and how is behaviour changed? To answer this question, we must first understand the concept of behaviour itself, including how core attributes influence decision-making processes. Below, I discuss two key psychological theories related to human behaviour, including the main constructs of each. I then discuss the role of communication in changing behaviour, and how psychological theory can contribute to successful messaging. Throughout this chapter, I utilise the GBR as a case study demonstration to show how behaviour change theory can be incorporated into a real world communication context for an iconic natural system threatened by climate change.

### **2.3 Theories of human behaviour**

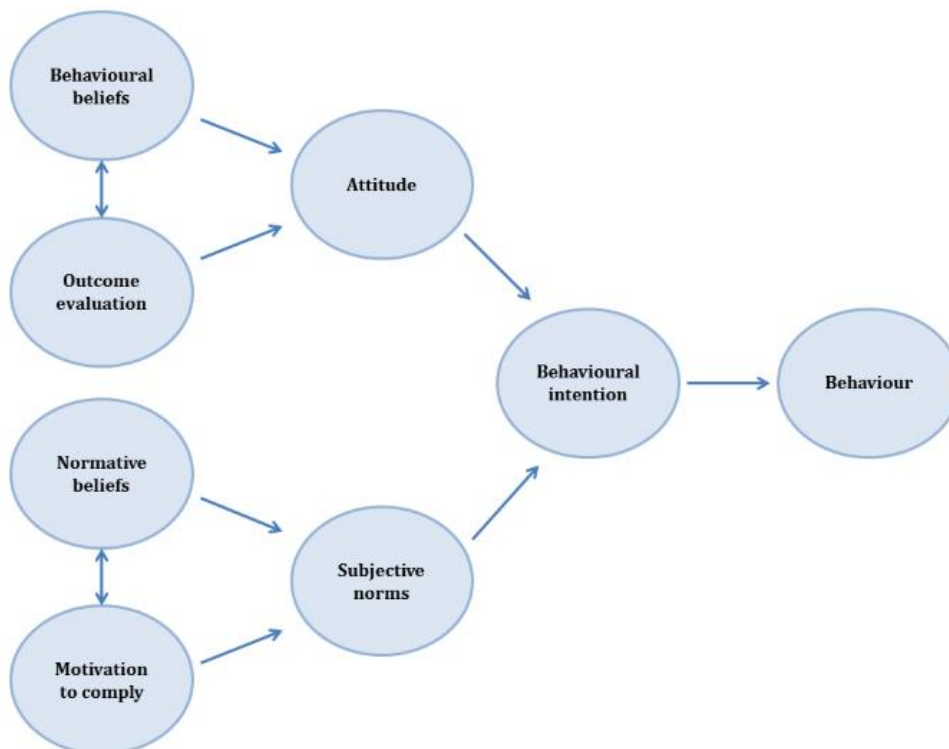
Scientists have tried to understand human behaviour for centuries and pro-environmental behaviour for decades (Hines *et al.*, 1987). Original models of pro-environmental behaviour were based upon the development of ideas into attitudes, and attitudes into action (Figure 2.1). Consequently, these early rationalist models assumed that education transforms attitudes, eventually leading to the automatic demonstration of new, more acceptable or desired behaviours. These models are so intuitive that they form the foundation for many community engagement and public awareness campaigns today. Unfortunately, the enhancement of environmental knowledge and the creation of supportive attitudes has limited impacts on behaviour (McKenzie-Mohr, 2000). Indeed, these ‘information deficit’ models of human understanding are now deemed to be overly simplistic and inadequate, leaving a significant knowledge gap to be filled between attitude and behaviour (Kollmuss, 2002).



**Figure 2.1.** Early, rationalist models of environmental behaviour implied a linear progression between knowledge, attitudes, and behaviour. Thus, these models assumed that increasing environmental knowledge would lead to changes in environmental attitudes, which would subsequently influence pro-environmental behaviour (Adapted from Kollmuss, 2002).

Several theoretical frameworks have been developed to explain the underlying psychological processes that influence human behaviour (Ajzen, 1991), including a focus on values (Stern, 1999), a new ecological paradigm (Dunlap *et al.*, 2000), and altruistic motivations (Schwartz, 1977). Additionally, a comprehensive review of pro-environmental behaviours by Stern (2000b) noted that a unifying theory does not yet exist for a topic that is “dauntingly complex, both in its variety and in the causal influences on it (p. 421).” However, one of the more widely studied and applied models of human behaviour is the Theory of Reasoned Action (TRA; (Manstead, 2011; Sheppard *et al.*, 1988). As such, the TRA provides a robust starting point for an explanation of pro-environmental behaviours.

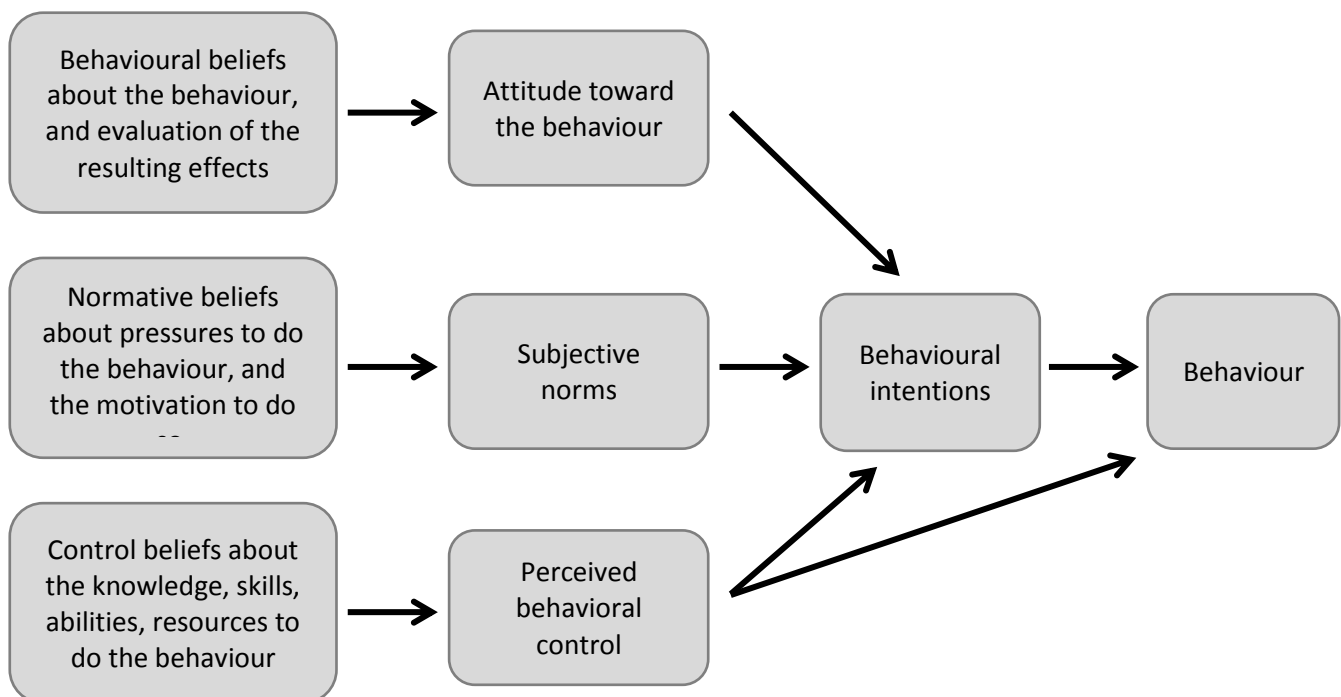
The TRA is a progressive development of the earliest models of human behaviour, inserting two important steps into the original progression from attitudes to behaviour – those of intentions and subjective norms (Figure 2.2). In addition to the clarity and simplicity of the individual TRA components, the development of a mathematical equation to express the model has allowed researchers to conduct widespread empirical studies (Kollmuss, 2002).



**Figure 2.2.** The Theory of Reasoned Action asserts that behavioural intention is the key driver of behaviour. These intentions are influenced by attitudes and subjective norms, which are, in turn, influenced by a set of key salient beliefs about the behaviour in question such as outcome evaluations and motivations to comply (adapted from (Ajzen, 1985) and Vallerand *et al.*, 1992).

Although the TRA had broad acceptability and widespread usage, significant limitations and inadequacies arose, leading researchers to suggest extensions and modifications (Sheppard *et al.*, 1988). Two key additions to the TRA led to the development of the Theory of Planned Behaviour (TPB): control beliefs and a measure of perceived behavioural control (Ajzen, 1991). Accordingly, while the TPB includes three of the same attributes as the TRA (attitudes, norms, and intentions), it also has a perceived control variable along with its corresponding control beliefs (Figure 2.3). As with the TRA, the TPB suggests the key determinant of an individual’s behaviour is the intention to do it. In turn, these behavioural intentions are influenced by individual attitudes toward the behaviour, subjective norms about whether or not to do the behaviour, and perceived behavioural control that reflects whether the individual believes he/she is capable of doing the behaviour. Importantly, only a small subset of truly ‘salient beliefs’ will influence whether or not a person performs the behaviour (Brown *et al.*, 2010). These key salient beliefs influence behaviour, but they are also dynamic, enabling them to be influenced by external forces. Thus, when the appropriate salient belief is changed, a change in behaviour may result. For example, strategic messages targeted at a salient belief related to littering in a national park (“Picking up rubbish sets a good example for others”) led to a 20% reduction in litter (Brown *et al.*, 2010).

The TPB is an effective model for predicting intentions and behaviours (Armitage & Conner, 2001). Because of the broad theoretical approach taken to explain individual behaviour, the TPB, much like the TRA before it, has been widely used across a range of diverse disciplines. In addition, the TPB has explored the role of self-identity and environmental activism, crucial considerations for groups seeking to protect ecosystems (Fielding *et al.*, 2008a) such as the Great Barrier Reef. The TPB may also assist with the establishment and support of long-term behaviour change by helping to break down old habits and foster the creation of new ones (Holland *et al.*, 2006). However, as habits become more established and routine, the intentions to do them matter less, thus becoming less relevant predictors of these behaviours (de Bruijn *et al.*, 2009).



**Figure 2.3.** The Theory of Planned Behaviour asserts that individual attitudes, social norms, and perceived behavioural control are the key influences of behavioural intention, the main driver of behaviour (adapted from Ajzen, 1991, and Armitage & Conner, 2001). These three constructs are, in turn, influenced by three distinct beliefs: behavioural, normative and control.

Whilst widely used, the TPB has weaknesses. Most criticisms note that its emphasis on the rational, cognitive and premediated aspect of human behavior (Protogerou *et al.*, 2012) does not necessarily fit within daily decision-making processes. Other criticisms suggest the TPB may provide an insufficient account of social factors (Manstead, 2011) or other key variables such as personal norms (Parker *et al.*, 1995) and self-identity (Conner & Armitage, 1998). The TPB may also be limited in its ability to successfully model strongly formed habits (de Bruijn *et al.*, 2009) and may thus best be suited for understanding and explaining the formation of new behaviors (Ajzen, 1991).

Despite these criticisms, the popularity of the TPB is a result of its widespread success in helping researchers to understand and influence human behavior, i.e. it is widely used because it is useful. The strength of the TPB lies in its ability to evaluate goal-directed behaviours that are steered by conscious self-regulatory processes (Ajzen, 2011), pro-environmental behaviours being one example. While there are undoubtedly similarities between planned behaviours and habits, many climate change mitigation and adaptation behaviours are intentional, not habitual. As such, these behaviours require planning prior to initiation and thus are well suited for study via the TPB. For example, a meta-analysis of 46 studies by Bamberg & Moser (2007) found that attitude, personal norms and behaviour control, i.e. the TPB constructs, were the most influential factors affecting the formation of pro-environmental intentions. Stern (2000b) uncovered similar links, showing that attitude, personal capability and contextual forces were influential causal variables related to environmentally significant behaviour. Thus, for resource managers along the GBR seeking to promote behaviours that confer socio-ecological resilience, an in-depth exploration of the TPB may provide a robust framework for how to strategically and effectively influence individual behaviours.

## **2.4 The Theory of Planned Behaviour**

The individual TPB components play a major role in explaining and understanding certain behaviours. These components informed the development of the survey questions that were measured and analysed in subsequent thesis chapters 4 – 7. They also formed a conceptual understanding of human behaviour that I relied upon whilst discussing ways to operationalise social science data within a GBR resource management context. As such, additional commentary will be provided below. Following this section, the role of communication in fostering behaviour change will be discussed, as well as how the TPB constructs can inform strategic messages and delivery mechanisms. The GBR case study is used throughout this discussion to provide examples of how these ideas and approaches may be operationalised in an applied resource management context.

### **2.4.1 Attitudes: how beliefs affect behaviour**

Attitudes help people perceive and evaluate the consequences of undertaking a behaviour (Vallerand *et al.*, 1992). Understanding how and why individuals think and feel can help to clarify why some environmental behaviours are undertaken while others are not (Langford, 2002). For example, perceptions of risk, among many other variables, can influence the actions that may lead to pro-environmental behaviours (Leiserowitz, 2005). The application of the TPB to pro-environmental behaviours has shown that certain attitudes are more meaningful than others, having higher priority and greater emphasis in the internal decision-making process.

Along the GBR, residents differ in their attitudes about climate change (Tobin *et al.*, 2014b). Some residents recognise the importance of taking action or feel morally obligated to act, while others are less concerned (van Riper *et al.*, 2012b). Understanding these individual evaluations of attitudes is important for developing appropriate solutions to respond to climate change (Ehrlich & Kennedy, 2005), particularly as our attitudes about options influence our decision-making processes (Moser & Ekstrom, 2010). Consequently, resource managers seeking to implement climate change policies and programs would be prudent to direct resources in ways that appeal to specific segments of the population rather than assuming one broad approach will resonate for all attitudes (van Riper *et al.*,

2012b). The attitudes people have about climate change may thus influence the actions they take to address it. Additionally, the ways that people connect with the GBR, including the identity, pride, and responsibility they feel to protect it, may affect the pro-environmental behaviours they undertake. These ideas are explored in depth in Chapters 4, 5, and 6.

#### **2.4.2 Norms: the influence of others on individuals**

Social norms are rules that govern, influence, and direct an individual's behaviour in specific and meaningful ways (Cialdini, 2003). There are two main types of social norms: descriptive and injunctive. Descriptive norms are perceptions of behaviour that is normally performed in a specific situation, thus providing a standard to follow based upon what others typically do (Cialdini, 2007). The GBR tourism industry standard to not dump litter at sea is one example of a descriptive norm. While these norms can motivate action by informing people what others are doing, injunctive norms are influential because they pressure people into conforming to perceptions of what is commonly approved or disapproved (Rimal & Real, 2003). Injunctive norms have two key socially desirable effects: they shift focus away from socially unacceptable descriptive norms and they motivate individuals to perform an acceptable behaviour regardless of what others are doing (Reno *et al.*, 1993). For example, marine tourism operators along the GBR feel a very strong personal responsibility to protect the GBR, possibly because they believe it is the right thing to do (Curnock *et al.*, 2014). Both types of norms, descriptive and injunctive, motivate human behaviour because people tend to act in ways that are popular and socially acceptable (Cialdini, 2003). Hence, when both norms operate concurrently, the contextually appropriate behaviour may appear normal and/or familiar.

Because many behaviours are not consciously driven, common contextual cues such as social norms exert a powerful influence (Whitmarsh *et al.*, 2011). Individuals conform to social norms because they provide information about whether a behaviour is just, beneficial, easily performed or appropriate (Bamberg & Moser, 2007). Further, just as stronger behavioural intentions are better predictors of behavioural occurrence (Ajzen, 1991), stronger normative beliefs (called salient norms) have greater influence on behaviour, suggesting potential applications for reducing undesirable actions (Cialdini *et al.*, 1990). Along the GBR, a strong majority of tourism operators believe there are industry expectations for them to reduce their impacts on the GBR (Curnock *et al.*, 2014a). In this way, these existing and recognised social norms may affect the way that tourism operators choose to do business along the GBR. However, little is known about the way these tourism operators feel about industry expectations or the influence these expectations have on the actions they take to address threats to the GBR such as climate change. In Chapter 7, I explore how these actions are influenced by perceptions of other tourism operators, but also by the expectations of visiting tourists.

#### **2.4.3 Perceived Behavioural Control: how capabilities influence action**

Adequately addressing climate change impacts will require people to overcome barriers to action, including an individual's perception of his/her self-efficacy (van Riper *et al.*, 2012b), defined as "a person's estimate of his or her capacity to orchestrate performance on a specific task" (Gist & Mitchell, 1992, p. 183). Thus, in terms of initiating behaviour change, this concept is a subjective evaluation of one's ability to complete a task, affect a situation or reach a goal. In other words, the perceived control that an individual has in accomplishing the behaviour plays a large role in determining the actual level of behavioural response. For example, a commercial fisher who wants to avoid visiting a damaged coral reef may not do so if the conditions are perceived to be impractical (e.g. the distance to undamaged reefs is too far), improbable (e.g. the weather is too poor to make the journey), or unachievable (e.g. there are undamaged reefs close by but they are unaware of them; adapted from van Riper *et al.* 2012). Thus, whether or not a person believes they are able to do something affects whether or not they will attempt to do it. This is important because the level of perceived self-efficacy required to carry out the behaviour facilitates the transition of intentions into action (Armitage & Conner, 2001), and is thus a strong predictor of the behaviour itself (Moser & Dilling, 2004). For



example, if a fisher wishes to reduce their impact on the GBR and they strongly believe that they have the knowledge, skills, abilities and resources to do so, then the corresponding perceived behavioural control is high. That is, they believe that they can reduce the impact. On the other hand, if they believe that they lack the knowledge, skills, abilities or resources to reduce their impact, then their perceived behavioural component is low, and action is less likely. Thus, if individuals believe that they can accomplish the behaviour and they believe that they have the required skills and abilities, they are more likely to do it. Identifying the specific barriers to action is essential for resource managers seeking to develop programs that encourage widespread behaviour change. I explore various perceptions of behavioural control in Chapters 6 and 7.

#### **2.4.4 Intentions: plan to act, and then act on the plan**

Intentions are motivational indicators of the dedication and effort individuals plan to exert in order to perform a behaviour (Ajzen, 1991). Behavioural intentions can be influenced by the worldview an individual holds, including constructs such as beliefs, values, and perceptions of social norms (Stern, 1999). The relationships between these constructs can be explored and strengthened by stakeholder engagement focusing upon raising awareness and exploring environmental concern (Wynveen et al., 2015). Strengthening of the relationships between internal beliefs, values, and norms can ultimately lead to stronger intentions and more robust pro-environmental behaviours (Wynveen, Kyle, and Tarrant 2012). While individuals commonly form intentions for behaviours they believe they can enact (Armitage & Conner, 2001), numerous obstacles can hinder behaviour initiation, including confusion, distractedness, or a lack of understanding or time (Sutton & Tobin, 2011). However, these barriers may be overcome with the use of implementation intentions (Gollwitzer & Brandstatter, 1997).

Implementation intentions use simple plans to assist individuals in successfully transitioning intentions to behaviours. They work by strategically shifting the conscious control of behaviour (“I intend to achieve X”) towards an autonomous self-regulated behavioural tool that is directed by critical situational cues (“When situation Y arises, I will do Z”) (Gollwitzer, 1999). From a pro-environmental behaviour context, one example for a tourism operator may be that “I will encourage tourists to reduce their impact on the GBR” becomes “When my boat departs the marina, I will show my guests a video about the importance of not touching the corals when snorkelling.” In this way, implementation intentions are a powerful and universal concept based upon readily identifiable cues applied across multiple scenarios and environments (Gollwitzer & Brandstatter, 1997)

In the previous sections, I explored the idea that changing behaviour is critical to achieving a sustainable future (McKenzie-Mohr, 2000) by discussing the key attributes that influence individual behaviours (attitude, norms, control beliefs and intentions). However, these attributes are dynamic perceptions influenced by external forces such as communication. Below, I review several aspects of communication science, including the process that individuals use to interpret information, how a message frame influences interpretation, and what rules of communication most effectively transmit ideas into action. I also further develop the GBR case study to provide examples of how communication may assist resource managers in their day to day activities.

## **2.5 Communicating behaviour change: engagement, marketing, and segmentation**

Effective public engagement may change three types of behaviours related to climate change:

- **Mitigation** – advancing carbon reduction to diminish the root cause of climate change (Dechezlepretre *et al.*, 2011) (e.g. the use of solar panels on fishing boats rather than generators);
- **Adaptation** – promoting socially acceptable options and institutions that adapt to social, economic and ecological impacts on livelihoods, industries and economies (Adger, 2003) (e.g. diversifying business plans to minimise risks related to climate change impacts);

- **Policy and decision-making** – encouraging the acceptance of policies that reduce greenhouse gas emissions (e.g. supporting national guidelines which increase fuel economy standards for automobiles) or help to address and adapt to projected climate change impacts (Shove, 2010) (e.g. transitioning the workforce into a renewable-energy-driven economy).

However, addressing climate change is not simply a matter of providing people with more information or helping them to interpret complex scientific principles (Weber & Stern, 2011). As shown in the previous sections detailing the TPB, additional factors such as normative and control beliefs may be influential than individual understanding or attitudes. Indeed, a change in attitude does not necessarily guarantee a change in corresponding behaviour (Whitmarsh & Lorenzoni, 2010).

Numerous ongoing and oftentimes expensive efforts are underway to educate the public about climate change and to encourage low-carbon lifestyles (Ockwell *et al.*, 2009). While high levels of public awareness related to climate change are commonly reported, these studies also document little corresponding behavioural response (Leviston & Walker, 2011a, 2011b). Thus, although knowledge is necessary to address the problem, a lack of understanding is not necessarily the main obstacle to encourage changes in behaviour (Stern, 2012). For example, recent surveys along the Great Barrier Reef show a large proportion of coastal residents believe that “Climate change is an immediate threat requiring action” but these same residents are not doing all they can do to take action in response (Tobin *et al.*, 2014b, p. 67). In Chapter 6, I address this discrepancy, exploring how the actions people take to protect the environment relate to their perceptions of those behaviours. Specifically, I explore how perceived difficulty or effectiveness relates to the proportion of people who undertake climate change mitigation behaviours.

One of the main problems with changing behaviour is that a significant gap exists between having knowledge of the issue and taking action to address it. For example, a recent investigation explored the role of communication, motivation and information in affecting climate change behaviours among coastal residents of Queensland, Australia. Approximately 85% of survey respondents wanted to take action to respond to climate change but the majority believed their actions would not be impactful (Sutton & Tobin, 2011). These findings document a common and important issue: despite an awareness of climate change and access to scientific knowledge, various cognitive, psychological and social barriers prevent individuals from initiating responsive behaviours (O'Neill & Hulme, 2009).

In response, some researchers recommend that public engagement efforts focus on creating communication outputs that target strategically important audiences (Maibach *et al.*, 2008), i.e., population segments. A vital consideration for these communication outputs is how to design messages that facilitate rather than constrain action (Leitch, 2011), and minimise barriers while simultaneously promoting the benefits of taking action (McKenzie-Mohr & Smith, 1999). By considering key socio-cognitive factors, such as the normative and control beliefs discussed in Sections 2.4.2 and 2.4.3, researchers can improve assessments and policy makers can influence people’s actions more effectively (Grothmann & Patt, 2005). Thus, a better understanding of individual psychographic variables may enhance the creation, delivery and effectiveness of the communication product. Several disciplines have practical insights to offer this process, including segmentation tools used by marketing professionals.

Audience segmentation is a process in which similar groups of individuals within a population are identified and collated based upon specific arbitrary characteristics, e.g., demographics, beliefs, and/or behaviours (Martin, 2011). It is commonly used in for-profit, consumer-driven industries yet remains largely unknown and underutilised outside of the marketing sphere (Maibach *et al.*, 2011) despite the strong potential to adapt it for other contexts such as resource management (van Riper *et al.*, 2012b). Although traditionally based on demographic traits such as age or sex, recent studies have

shown these variables to be ineffective predictors of climate change practices, instead suggesting a more promising approach reliant upon psychological variables such as values and beliefs (Maibach *et al.*, 2008), including place meanings via place attachment (operationalised as an attitudinal construct).

Widely used by marketing agencies to sell products, a similar approach can target groups of similar individuals via strategically assigned segments and messaging, thus improving the effectiveness of public engagement campaigns (van Riper *et al.*, 2012b). Furthermore, targeting these messages at the salient beliefs identified by the TPB may effectively influence the collective environmental behaviour of large groups of people (Ham *et al.*, 2009). For instance, if we know that a certain salient social norm can influence climate change behaviours among GBR residents, we can use this finding to frame messages, media outputs, or communication campaigns. Additionally, targeting climate change engagement strategies at specific population segments may be more effective than a one-size-fits-all approach which fails to distinguish between social positions and constraints to action (Sutton & Tobin, 2011). If researchers can identify how various messages produce different emotional and moral responses, under which conditions, and what subsequent behaviours result, then policy makers and resource managers will be better placed to talk about climate change in a way that is meaningful and relevant (Leitch, 2011). In other words, targeted communication directed at specific audiences may effectively empower people to change their behaviour (Maibach *et al.*, 2008), including the behaviours of a diverse population of Australian residents (van Riper *et al.*, 2012b). However, this social marketing framework for designing a behaviour change program is not without its critics.

Many studies have promoted the advantages of a social marketing approach (McKenzie-Mohr, 2000; McKenzie-Mohr & Smith, 1999), but others highlight its limitations (Corner & Randall, 2011; Eagle *et al.*, 2013). For example, individual values, beliefs and preferences may oppose each other or the broader goals of a communication campaign (Corner & Randall, 2011), leading to a counterproductive or unintended engagement outcome (O'Neill & Nicholson-Cole, 2009). Furthermore, broader changes to institutional and socio-political constructs may be required in addition to, or in lieu of, individual actions (Brulle, 2012; Scerri, 2009). However, although social marketing may have limited use in 'selling' climate change (Corner & Randall, 2011), similar marketing interventions have shown promise with the encouragement of behaviours taken in response to climate change (Maibach *et al.*, 2008). Along the GBR, a variety of messages encouraging hypothetical responsive behaviours may be targeted at individuals and user groups at both the mitigation and adaptation level (Table 2.1). However, prior to crafting the message, resource managers must first understand who the prospective audience is and how they feel about the specific issue or behaviour. Segmenting the audience into user group may help to identify key beliefs or opinions that can then be addressed via strategic engagement approaches. This segmentation approach is used in Chapters 5 and 6 to explore how attitudes and behaviours differ among several GBR stakeholder groups, e.g., tourists, tourism operators, and residents.

**Table 2.1: Climate change mitigation and adaption behaviours among GBR user groups**

User group	Mitigation		Adaptation	
	Individual	Industry/community	Individual	Industry/community
<b>Commercial fishers</b>	Purchase energy efficient boat motors	Establish a carbon neutral certification program for fishers operating along the Great Barrier Reef	Adjust business plans to reduce dependence on specific fishing locations	Establish and support social networks and organizations that collectively empower fishermen to engage with resource managers
<b>Tourism operators</b>	Purchase energy efficient boats	Establish an industry-wide commitment to reduce emissions by 25% by 2020	Diversify available tourism experiences	Create cross-sectoral marketing opportunities for promotion of the industry,

				both domestically and internationally
<b>Coastal community residents</b>	Install solar panels on residential properties	Form community groups that encourage the adoption of renewable energy and the support of policies to reduce local emissions	Amend personal financial plans to provide available resources for externalities	Establish an industry group to promote strategic planning and information exchange related to climate change impacts

## 2.6 Communicating behaviour change: approaches and applications

Urgent efforts are required to begin the transition towards a sustainable economy with adaptable and resilient communities. However, if we know that information alone is not enough to change behaviour, and we recognise that simply raising awareness and educating the public about the issue is not working, the question then becomes: How can we improve communication efforts to engage the public to act on climate change? Cultural cognition and message framing are two helpful considerations for resource managers.

### 2.6.1 Cultural cognition: subjective perspectives shape objective information

People interpret and act upon information differently, partially due to internal conflicts of interest between individual and societal benefits as well as individual needs versus group values (Kahan *et al.*, 2012). These perceptions, and the actions taken in response, are influenced by a variety of factors including perception of risk (Leiserowitz, 2005) and worldview (Kahan *et al.*, 2011). These psychological mechanisms shape perceptions of fact, causing people to selectively credit or dismiss evidence, and to create a myriad of beliefs and justifications based upon patterns that fit shared values (Kahan, 2010). Therefore, individuals presented with factual information based upon a specific issue may react differently to others, depending upon their already established viewpoints. For example, if resource managers present the same message to two tourism operators who hold different views of how the world functions, e.g. the world is a fair and just place versus the world is about survival of the fittest, two entirely different responses to the information may result, regardless of the facts.

One particularly salient psychological mechanism relevant to the context of climate change communication is cognitive dissonance, the idea that if a person knows various things that are psychologically inconsistent with one another, he/she will, in a variety of ways, try to make them more consistent (Festinger, 1962). Cognitive dissonance is helpful in understanding why facts and information alone are insufficient to change behaviour, highlights how conflicting beliefs pose a problem for the individual making decisions, and suggests a mechanism for resolving this conflict. Essentially, people tend to seek consistency in their beliefs and perceptions, and they experience tension or discomfort when their beliefs do not match their behaviours (Festinger, 1957). When a new belief conflicts with another previously held belief, something must change to eliminate or reduce the dissonance between the two beliefs. Festinger (1957) suggested the following methods: focus on supportive beliefs that outweigh the dissonant belief or behaviour, reduce the importance of the competing belief, or change the conflicting belief so it is consistent with other beliefs or behaviours. It then follows that simply providing additional facts about an issue is not always a viable means of influencing the decision-making process. In fact, providing more information may actually *increase* the polarization of opinion (Kahan *et al.*, 2009), leading to a reinforcement of belief rather than a reconsideration of it. In this research, I focus on documenting what people know about the GBR. Specifically, I detail the attitudes that people have about the GBR, the behaviours they take to address threats to the environment, and the relationship between the two. I measure these using large-scale surveys with 10-point scales as well as in-depth qualitative surveys.

Although the presentation of contradicting expert evidence is not enough to change people's minds (Kahan *et al.*, 2011), alternative approaches are feasible. For instance, an improved understanding of how individuals process information can help communicators to define problems and solutions in a manner that is personally, socially and culturally most relevant to the recipient (Langford, 2002), and hence more effective. Additionally, presenting information in a way that affirms individual values, perhaps via a diverse set of culturally acceptable experts, allows individuals to process new facts with an open mind (Kahan, 2010). Thus, the same facts will be interpreted differently depending on the messenger that presents the findings. For example, commercial fishers along the GBR have very low trust in government representatives, but they trust other commercial fishers (Tobin *et al.*, 2014a). The choice of messenger will thus influence how readily the information is accepted and acted upon. Essentially, people use their own value predispositions as perceptual filters with which to interpret information (Nisbet & Mooney, 2007) and then as a basis to act on those decisions (Moser & Ekstrom, 2010). As such, it is reasonable to rely upon a variety of distinct metaphors, stories and messages to frame science in a way that makes it more accessible (Moser, 2010).

### **2.6.2 Communicating behaviour change: approaches and applications**

Numerous messages are disseminated to the public in regards to sustainability, environmentalism, and climate change. However, environmental concerns are not often high priority (Leviston *et al.*, 2014) nor are they acted upon with regularity (Leviston & Walker, 2011b). Clearly, a gap exists between being aware of problems and the pro-environmental behaviours taken in response. Part of this problem is the inherent complexity of environmental issues. For example, climate change is largely out of sight, hard to understand, and difficult to manage (Moser, 2010). Additionally, when individuals apply conventional modes of understanding to climate change, they are often misled (Weber & Stern, 2011).

The way climate change is communicated, understood and addressed is influenced by a variety of interests, discourses and messages (Whitmarsh & Lorenzoni, 2010). Because complex, large-scale problems such as climate change are not easily internalised and addressed, how information is framed has a considerable impact on the way it is received (Spence & Pidgeon, 2010). For instance, different climate change frames can emphasise distinct values, morals, emotions, or psychographic focus (Moser, 2010). These frames can present key ideas in a way that resonates with individual ideals, allowing for impactful and rapid processing of the issue (Nisbet & Mooney, 2007). Message frames interact with pre-existing beliefs and values (Myers *et al.*, 2012b), and different frames result in different levels of engagement, support and action (Nisbet, 2009).

There is a wide diversity of applications within each of these frames. For example, certain individuals may respond most favourably to a political frame. In this way, members of political parties may selectively rely upon information from trusted ideological or partisan leaders (Hoffman, 2011). Thus, choosing the appropriate messenger is a critically important choice to convey information (Moser, 2010). A second relevant frame involves the uncertainty of risk (Leiserowitz, 2005). For example, reframing the debate from whether climate change is occurring to one focusing upon defining acceptable risk, shifts the debate from deliberation to decision-making (Pidgeon & Fischhoff, 2011). A third example frame relates to individual self-interest. Because self-interest may conflict with the welfare of society, the salience of individual values may counteract certain self-transcending motivations to act (Evans *et al.*, 2012). However, just as there are a variety of useful approaches for appropriately framing a message, there are also many ways to integrate these approaches to connect with a target audience. In this research, I document the attitudes people have about the GBR as well as the actions they take to protect it. This is a first step towards addressing the gap that exists between people being aware of environmental threats and taking responsive action.

### **2.6.3 Communicating effectively: Practical insights for managing change**

A major problem with creating pro-environmental messages, and with communication in general, is that the process is dynamic, changing through time as new events and ideas manifest. Thus, attitudes and ideas evolve, concurrently affecting the individual's beliefs, motivations, intentions and behaviours. However, as thoughts ultimately determine actions, the foundation of all aspects of climate change action is psychology (Swim *et al.*, 2011). In the four years since I began this PhD, the cultural and political landscape in Australia has changed very substantially, particularly with respect to climate change. For example, the Commonwealth Government changed (influencing various climate change policies and priorities for agencies such as the GBRMPA), various extreme weather events such as devastating droughts have been highlighted in media sources throughout the country, and international agreements have brought climate change to the forefront of global affairs. Additionally, a mass coral bleaching event occurred in 2016, killing more than 20% of the corals on the GBR. The resultant media focus, and the various campaigns about saving the GBR that were initiated, attracted widespread attention in Australia and throughout the world. Consequently, public perceptions about climate change, and the desires and opinions of the Australian populace about the need to take action, have changed over the past four years. Understanding how the public feels about climate change will be crucial to engagement efforts seeking to inspire change.

Psychological research provides a valuable complement for policies and programs seeking to influence climate change adaptation and mitigation (Gifford, 2008; Sterman, 2008; Stern, 2011). Psychology can also contribute to the way that climate change is understood, addressed, and communicated (Swim *et al.*, 2011). However, it is impossible to provide people with the appropriate information without knowing their thoughts on the issue and how they create, resolve, implement and evaluate climate-related choices (Fischhoff, 2007). Effective climate change communication must therefore consider several key questions, including what is the purpose of the communication, who is the audience, how is the issue framed, what content is highlighted, how it can be conveyed most usefully, who is delivering the message and what communication channels are used (Moser, 2010).

Overall, there is a need for research that is conducted “to advance our understanding of how communication can be used to shape public behaviour positively” (Abroms & Maibach, 2008, p. 229). For example, suppose that resource managers along the GBR want to encourage tourism operators to install solar panels on their boats. The TPB could help to clarify the individual attitudes, norms, and control beliefs related to this behaviour, offering useful insights to inform a behaviour change campaign. Comparing the beliefs of the compliers with the non-compliers can segment the target audience into distinctive groups, helping to identify the salient beliefs that differ between the two groups. These salient beliefs can then be targeted with strongly relevant messages that promote the target behaviour of installing solar panels on their vessels (Ham *et al.*, 2009). Additional research that clarifies trusted messengers, relevant message frames, and delivery mechanisms can further increase the effectiveness of the communication. For instance, if research shows that tourism operators have high trust in scientists, feel a strong responsibility to protect the GBR for future generations, and regularly read industry publications, resource managers can use these findings to design communication campaigns that most effectively engage and influence the target audience. If these behaviours and changes in beliefs are monitored through time, resource managers can adapt their approach, crafting new messages, objectives, and programs to strategically target specific groups of people with clear messages. This process is described in more detail in the next section.

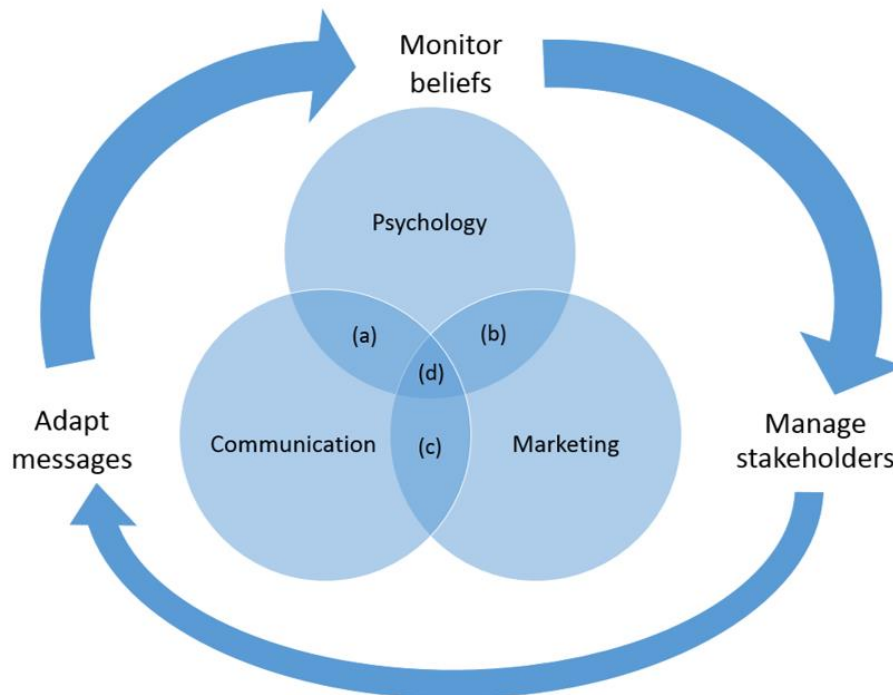
## **2.7 A multidisciplinary approach for stakeholder engagement regarding NRM**

A core assertion of this thesis is that behaviour change campaigns designed by natural resource managers would benefit from the strategic integration of principles and approaches adapted from psychology, marketing, and communication science. Each of these three disciplines offer unique ways to understand, engage, and influence stakeholders about conservation issues such as climate change.

As described above, psychological approaches, including the use of the Theory of Planned Behaviour, can provide valuable information about individual attitudes, perceptions, and beliefs, e.g., what people think about the world around them, why they connect to the environment, and how they evaluate and initiate behaviours. The techniques used in marketing can assist with evaluating the target audience, choosing methods of influence to change behaviour, and segmenting people into likeminded groups, allowing for the delivery of targeted messaging and strategic communication. Communication science provides insights into what message frames may most effectively influence the recipients, as well as what messengers and mediums are most appropriate to deliver those messages. The main supposition from this literature review is that seemingly disparate social science disciplines can be integrated into a cohesive approach for engaging stakeholders about natural resource management.

An underutilisation of psychology, marketing, or communication can have considerable implications on the effectiveness and efficiency of campaigns seeking to influence individual behaviour. In Figure 2.4, the areas that lack one area of research and integration are denoted with (a), (b), and (c). Section (d) successfully assimilates all three disciplines and represents the process proposed in this chapter and utilised as a framework throughout the thesis. These sections are described below in depth.

- In scenario (a), the communication and psychological research is well documented yet the marketing approach has not been adequately operationalised. In this scenario, although there is information available about the target audience, there is no way to adequately segregate or engage them in an effective and efficient manner. Consequently, there is likely to be no change in behaviour;
- In scenario (b), the audience segmentation has been done and the stakeholder beliefs related to attitudes/norms/perceptions of self-efficacy have been identified. Thus, clear objectives and prioritisation of the relevant beliefs for engagement approaches may occur, yet little is known about the messages or messengers that may most resonate with the audience. As a result, the engagement undertaken to influence stakeholder will be less effective and less efficient;
- In scenario (c), there is effective infrastructure in place related to marketing and communication, yet the target audience is poorly understood, i.e., their attitudes and beliefs about specific behaviours may not be clarified. As a result, despite the efficient outreach and the clear strategy and tactics for engaging the audience, the messages are unlikely to resonate, making the engagement extremely inefficient. Furthermore, because there are no distinctive messages to convey nor a strategy to create them, there is no way to adapt the communication process once the engagement interventions are underway;
- Scenario (d) utilises psychology, marketing, and communication science to focus engagement efforts in the most effective and efficient way. The integration of these three disciplines ensures the largest opportunity for widespread behaviour change and the best possibility of fulfilling the objectives of communication campaigns.



**Figure 2.1.** Schematic describing the multi-disciplinary approach proposed in this thesis. Sections (a), (b), and (c) represent hypothetical scenarios in which one of the three social science disciplines is lacking. Section (d) describes the process detailed in this literature review, successfully integrating psychology, marketing, and communication into the behaviour change process. The arrows around the Venn diagram represent three components commonly used by coral reef practitioners in the adaptive management process.

The arrows that surround the Venn diagram represent the adaptive management process commonly undertaken by resource managers. I have adopted this process to focus upon stakeholder engagement. Monitoring of individual attitudes and perceptions about sustainability and conservation is a key component, and one which is described in depth in Chapter 3 during my summary of the CSIRO’s social and economic long-term monitoring program. Monitoring of stakeholder beliefs can assist with the segmentation of stakeholders and the targeting of these groups with marketing approaches, e.g., social marketing, demographic analyses, etc. These marketing campaigns will then inform and assist with the delivery of strategic messages framed in compelling ways to influence and engage local stakeholders about conservation issues. Following this process, additional monitoring is done to evaluate the success of the campaign in influencing individual beliefs, particularly those that encourage and/or impede pro-environmental behaviours.

## **2.8 Conclusions from the literature review and implications for my thesis**

Urgent behaviour change is required to adequately address the cause of, and impacts resulting from a rapidly changing climate. Resource managers and policy makers play a substantial role in this process by encouraging the mitigation of greenhouse gas emissions and facilitating the adaptation of ecosystems and industries. A better understanding of the behaviours that need to be changed and, more importantly, the individuals that must do them, is therefore a critical consideration for resource managers. The use of scientifically robust, multi-disciplinary approaches and proven psychological theory may improve the way that resource managers design, consider, and promote behaviour change programs and climate change communication.



Understanding the attributes that influence the decision-making processes of key stakeholders is a key first step towards changing those behaviours. Marketing professionals have used a similar approach for decades, segmenting their target audience to deliver specific messages to similar groups of people. This approach is likely to be more effective than a 'one message fits all' information-based approach designed to influence an entire population. While there is no single, simple recipe for fostering behaviour change, stronger application of the social sciences – psychology and communication, in particular – can produce more informed, strategic, and influential messages (Pidgeon & Fischhoff, 2011) that can lead to changes in individual behaviours (Ham *et al.*, 2009).

The TPB, one of the most widely used psychological theories related to human behaviour, offers an effective and robust framework for identifying the key influences on behaviour. Attitudes, social norms, and control beliefs each play an important role in shaping individual intentions and behaviours. Understanding these attributes and the context in which they interact to influence decision-making processes, is an important step in changing behaviour, including those related to climate change and natural resource management. These changes may lead to an increase in political willingness to address climate change, a focused and more engaged general public, and a populace that is more effectively able to mitigate and adapt to climate change. Below, I build upon these ideas and propose novel research objectives and questions for my thesis. In particular, I describe how each chapter contributes to a multi-disciplinary approach exploring stakeholder beliefs and behaviours related to the long-term conservation and management of the GBR.

## **2.9 Thesis aim, objectives, and research questions**

The overall aim of the thesis is to advance an empirically-based understanding of what influences pro-environmental behaviours among key stakeholder groups of the GBR, thereby contributing to natural resource management and ongoing conservation initiatives. The specific objectives of this thesis are to:

- Document the contemporary national perceptions related to the GBR, including how and why Australians feel connection and concern for the GBR;
- Analyse how individual attitudes about the GBR relate to perceptions of responsibility to protect it;
- Explore and analyse the relationship between individual connection to the GBR and the actions people take to conserve the natural world around them;
- Using a case study approach, identify and document the perceptions, barriers, and ongoing efforts of tourism operators to engage their guests about climate change and to directly address climate change impacts via their own business practices;
- Collaborate with regional resource managers to identify key knowledge gaps and research questions, and ensure that the data and recommendations contained within this thesis are able to assist with the integration of the human dimension into ongoing management approaches.

This thesis contains eight chapters, each of which aim to address two or three research questions. The research questions, and the chapters that contain them, are as follows:

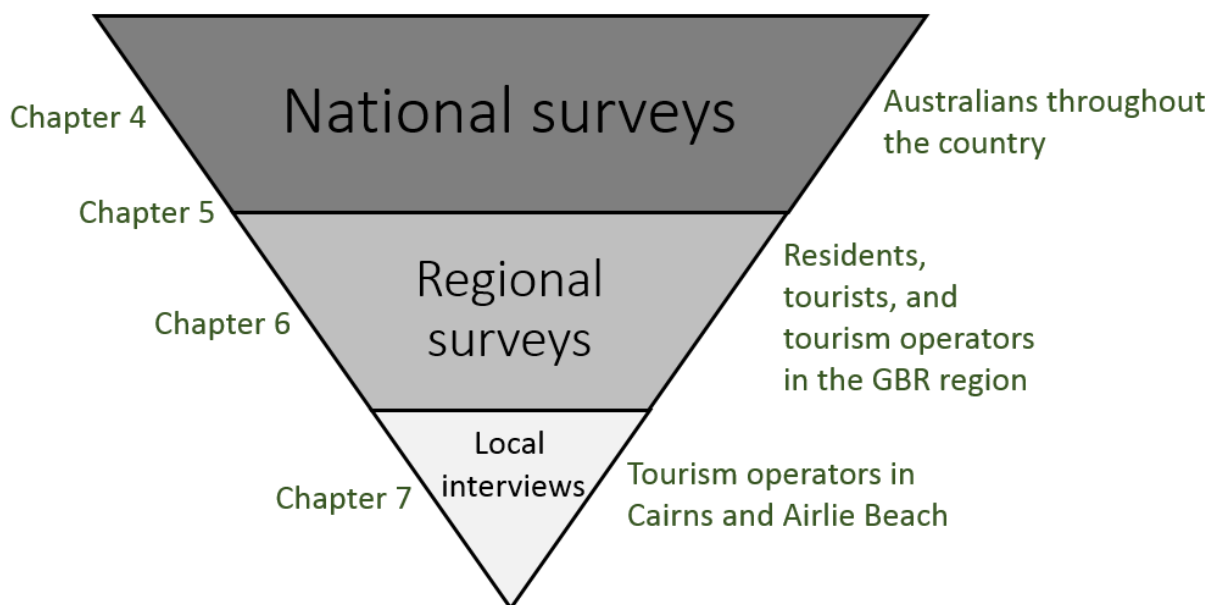
Here, in **Chapter 2**, I detailed the theoretical framework and background literature used to develop the thesis. Following an extensive review of literature from multiple disciplines, I explored two main research questions:

- What are the key influences of individual behaviour, particularly those related to the environment?
- Of the available approaches to change individual behaviours, which are the most robust and adaptable for use in a natural resource management context?

The research design of the thesis is explored in detail in **Chapter 3**. Specifically, this chapter reviews the methods used in three large data collection efforts, including:

- The justification for selecting the GBR as the study area;
- How and why a regional social and economic long-term monitoring program was initiated and managed;
- How three types of surveys were designed and administered online, via telephone, and face-to-face.

This thesis contains four data chapters, **Chapters 4 – 7**. These four chapters are arranged in a vertical hierarchy of nested GBR user groups: national residents; residents, tourists, and tourism operators in the GBR region; and tourism operators living and working in two key tourism hubs along the GBR coastline, Cairns and Airlie Beach (Figure 2.5).



**Figure 2.1.** Hierarchical diagram of the four data chapters included in my thesis. The right side of the figure lists the stakeholder groups surveyed in each of the three data collection efforts (national surveys, regional surveys, and local interviews). The left side of the figure lists where each of the four data chapters fits in terms of this vertical hierarchy, i.e., the type of data collection effort used and the stakeholder groups targeted. Note that chapter 5 contains information collected from both the national and regional surveys.

**Chapter 4** focuses on the relationship between Australians and the GBR. A more holistic understanding of the connection to, and concern for the GBR region is vital for resource managers seeking to understand and influence stakeholders to engage in conservation activities that protect the GBR. However, to comprehensively understand the perspective held by local stakeholders along the GBR, I first sought to understand the broader cultural context within which individual attitudes and behaviours were embedded. In this way, I explored the wider Australian psyche as a foundation upon which to clarify, compare, and contrast the regional and local perspectives about the GBR explored later in the thesis (i.e., Chapters 5 – 7). To clarify the wider Australian cultural connection to the GBR, I conducted the first ever nationally-representative survey about the GBR. **Chapter 4** reviews the main findings of this online survey, focusing on two overarching research questions:

- Why do Australians feel connected to the GBR?
- What issues are Australians most concerned about with regard to the GBR?

Attitudes influence the individual decision-making process, affecting how and why people decide to take action or shirk responsibilities. Attitudes also affect the actions that people take to protect the environment. **Chapter 5** explores the attitudes and responsibility that people feel for protecting the GBR, both throughout Australia but also within the GBR region. This chapter explores two main research questions:

- How does perceived responsibility to protect the GBR relate to attitudes about the GBR?
- Do attitudes about the GBR differ with respect to demographic differences such as gender and age?

The primary reason for engaging people about the GBR is to foster long-term conservation and sustainable use of the Marine Park, i.e., resource managers want stakeholders to take action to protect the GBR. The way people feel about the natural world around them affects the actions they take to protect it. **Chapter 6** explores this link. Specifically, I describe how individual attitudes about the GBR relate to the actions that people take to protect the environment. This chapter addresses the following research questions:

- Do people with greater connection to the GBR take more action to protect the environment than those who do not? Why or why not?
- How do attitudes about the GBR relate to the pro-environmental behaviours undertaken by GBR stakeholders?

A detailed investigation of a small sample, e.g., using a case study approach, can provide a deeper understanding of a situation, including how people respond to certain situations and why. I used this approach in **Chapter 7**, focusing on the way that marine tourism operators along the GBR address climate change, both in the direct ways they mitigate and adapt to climate change impacts with respect to their business, but also how they engage their guests and encourage tourists to take action. Specifically, this chapter focuses on four research questions:

- What do tourism operators perceive the threat of climate change to be across multiple scales?
- How do tourism operators believe they can most effectively take action to address climate change impacts on the GBR?
- How responsible do tourism operators feel about offering interpretation to their guests and what do they believe is the best way for them to communicate with their guests?
- What are the salient beliefs that prevent or encourage marine tourism operators in engaging their guests about climate change?

The concluding section, **Chapter 8**, summarises the key findings and significant outcomes of the thesis, describing how the research objectives described above were met. Specifically, this chapter reviews how each of the key objectives for the thesis were addressed, including an exploration of the cultural context related to the GBR, an analysis of individual attitudes about the GBR held by key stakeholders and how these influence the initiation of pro-environmental behaviours, and a review of how tourism operators take action on climate change. The final thesis objective, to ensure the data and recommendations are able to assist with integrating the human dimension into ongoing management approaches, is addressed in two parts. This chapter first examines the role of social science with respect to conservation efforts along the GBR, discussing key findings from each data chapter and how they can be applied to ongoing management activities. Special attention is then given to various government initiatives underway. **Chapter 8** highlights the role of social science in developing thorough, efficient, and effective community engagement programs along the GBR. Finally, this chapter concludes with a personal vision that details ways to build upon the work contained within this thesis. This includes a description of recommendations and future research questions that may assist resource managers to incorporate and operationalise key findings from this thesis in a conservation context.

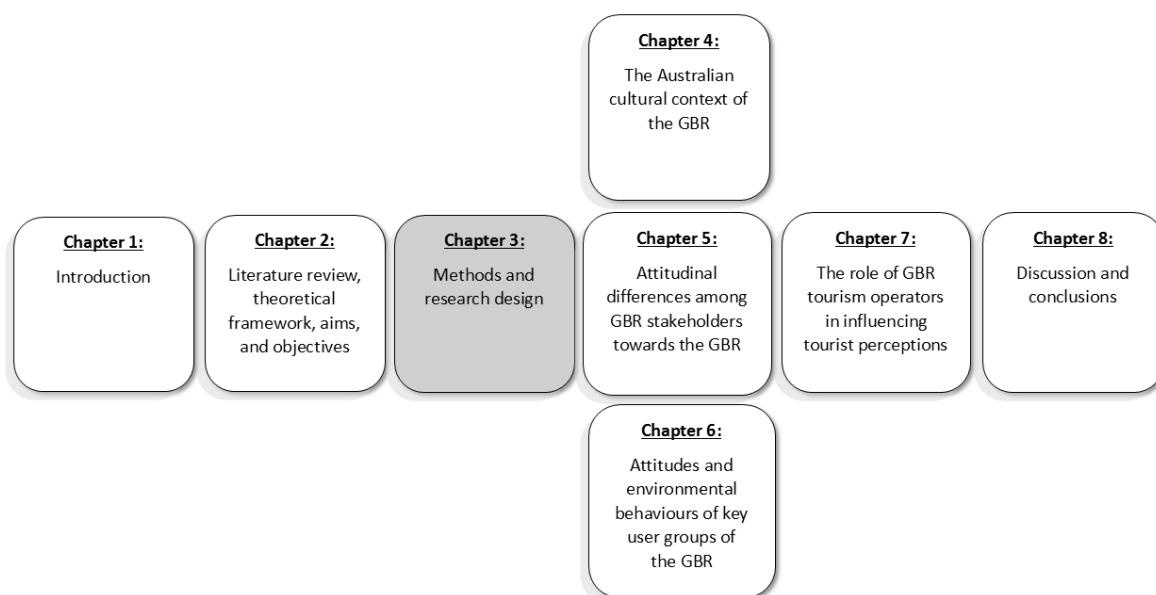
In the next chapter, **Chapter 3**, I detail the methods used to explore the attitudes, social norms, and control beliefs held by key stakeholder groups along the GBR. Specifically, I describe the face-to-face and telephone surveys conducted with residents living along the GBR, tourists visiting the GBR region, and marine tourism operators working on the GBR. I also describe the ways I planned and administered in-depth interviews with tourism operators working in Airlie Beach and Cairns, two of the most popular tourism hubs along the GBR. In describing the methods used in this thesis, I first begin with a review of socio-economic monitoring, including a brief explanation of the literature used to develop the various surveys. Following this, I describe the study area, survey design, survey administration, and data quality control and assurance protocols used to gather information about how stakeholders feel about the GBR.



## CHAPTER 3: METHODS

Resource managers along the Great Barrier Reef require social science data to enable and support decision-making frameworks that effectively protect and conserve natural resources. While considerable data exist on the ecological, environmental, and natural systems along the Great Barrier Reef, data related to the region's human dimension is significantly lacking, particularly social and economic research that directly supports management. An improved understanding of the social and economic components underlying the GBR ecosystem can improve both the evaluation of current management regimes as well as assist in the development of future policies and projects to enhance protection of the GBR.

In Chapter 3, I describe the methods used to collect the social science data used in this thesis. I begin with a description of the study area, giving background information about the GBR and describing the need for social and economic monitoring data. Next, I describe the mixed methods approach used to document broad patterns derived through large-scale quantitative sampling and small-scale qualitative research. This approach matched theory with practice, leading to the development and administration of three surveys. These surveys include a national survey of Australians throughout the country conducted online, face-to-face surveys of residents, tourists, and tourism operators, and a follow up study of tourism operators in Cairns and Airlie Beach. I conclude with a brief description of the data analyses and quality control and assurance procedures used to ensure the integrity of the information collected.



Source reference:

Marshall, N.A., Bohensky, E., Curnock, M., **Goldberg, J.**, Gooch, M., Nicotra, B., Pert, P., Scherl, L., Stone-Jovicich, S., and R. Tobin (2016) Advances in Monitoring the Human Dimension of Natural Resource Systems: An example from the Great Barrier Reef. *Environmental Research Letters*.

### 3.1 Study area

The Great Barrier Reef World Heritage Area (GBRWHA) lies along the continental shelf of coastal Queensland between 9°S and 24°S (Figure 3.1). The area is variable in width (from 50km in the north to more than 200km in the south) and depth (an inner shelf adjacent to the coast down to 20m, a middle shelf from 20-40m and an outer shelf from 40-100m) (Fernandes *et al.*, 2005). Of huge importance economically, the GBR provides more than 6 billion dollars annually to the Queensland state economy, including approximately 64,000 full-time jobs (Deloitte Access Economics, 2013). The GBR also plays a vital role in the lives of many people who rely upon it for recreational opportunities (Tobin *et al.*, 2014b).



Figure 3.1. A map of the Great Barrier Reef region.

### 3.2 Literature review

In the previous chapter, relevant secondary research from multiple disciplines was reviewed in order to provide a contextual framework, theoretical rigor, and positioning of the contribution made in this thesis. A diverse selection of literature was evaluated, including research from the fields of coral reef ecology, social science, climate change, psychology, behaviour change, marketing, and

communication. This literature review helped to inform the creation of key indicators of behavioural influences, intentions and actions, offering insights into the main determinants of individual behaviour (Ajzen, 1991; Armitage & Conner, 2001; Brown *et al.*, 2010; Godin & Kok, 1996), and environmental behaviour, in particular (Bamberg, 2002; Bamberg & Moser, 2007; Beedell & Rehman, 1999; Fielding *et al.*, 2008a).

### 3.3 Survey design

This PhD project relies upon three separate data collection efforts, each with two main components: design and administration. As highlighted in Chapter 2, each of these components fits into a vertically nested hierarchy, from national to regional and local scales (Figure 2.5). Below, I discuss each of the three surveys conducted:

1. *National survey*: An online survey of 2,002 residents throughout Australia was used to quantify the perceptions about the GBR held by the general public. These surveys documented the contemporary cultural context related to the GBR, including the ways that people connect to, and feel concern for the GBR;
2. *Regional surveys*: Face-to-face interviews of 3,181 coastal Queensland residents and 2,621 tourists, as well as telephone surveys of 119 tourism operators were used to document the relationship that key stakeholders have with the GBR. This included an exploration of various topics related to natural resource management, including perceptions of responsibility to protect the GBR, perceived threats to the GBR, barriers to action, etc. These sample sizes were opportunistically large and requested by resource managers. Future surveys may rely upon smaller samples without sacrificing the robustness of statistical tests;
3. *Tourism operator follow up study*: Semi-structured interviews with 19 tourism operators from Cairns and Airlie Beach identified and evaluated the perceptions, barriers, and ongoing endeavours underway to engage their guests about climate change. These interviews also helped to clarify how and why tourism operators directly address climate change through their own business practices, or why they choose not to take action.

Overall, each of these three surveys helped to ensure that key knowledge gaps were addressed, my research questions were answered, and, additionally, that the data and recommendations used within this thesis contribute to the integration of the human dimension into regional resource management approaches along the GBR. The full surveys are included in the appendices at the end of this thesis. The national survey can be found in Appendix 1. The regional surveys can be found in Appendix 2 (coastal residents), Appendix 3 (tourists), and Appendix 4 (tourism operators). The follow up survey conducted with a selection of tourism operators can be found in Appendix 5.

Aside from the tourism operator interviews conducted as part of Chapter 7, the data included in this thesis was collected in partnership with a large research project called the 'Social and Economic Long-Term Monitoring Program of the Great Barrier Reef' (SELTMP)<sup>3</sup>. The Commonwealth Scientific and Industrial Research Organisation (CSIRO), acting in partnership with the National Environmental Research Program, the GBRMPA, James Cook University (JCU), and the Great Barrier Reef Foundation, developed the SELTMP to address key knowledge gaps in the GBR region regarding the major users and stakeholders within the GBR Marine Park. The SELTMP program was designed to deliver an annual snapshot of the human dimension of the GBR region. Primary data were collected to address specific research questions identified by the program. Concurrently, secondary datasets were collated following an extensive annual review of publically available data, reports, and research outputs.

The project had two overriding objectives:

- To develop a long-term social and economic monitoring program to assist resource managers and industry groups in understanding the ongoing and anticipated changes to the GBR region;

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<sup>3</sup> More information about the SELTMP can be found here: <http://www.nerptropical.edu.au/project/seltmp>.



- To collect data across multiple years for each of the main stakeholder groups along the GBR (Marshall, 2012).

The SELTMP was a collaborative regional initiative that focused on understanding the major stakeholders and issues related to the GBR region. Twelve working groups, composed of representatives of government, industry, research and local communities, helped prioritise the objectives of the program and to formally identify data needs. Each working group was coordinated by a researcher from the CSIRO or JCU. The twelve working groups were: coastal communities, traditional owners, recreation, marine tourism, commercial fishing, aquaculture, catchment industries, ports and shipping, mining, wellbeing, drivers of change and economics. The size of each individual working group varied; some had a handful of members while others had up to 30. The SELTMP aimed to establish a world-class social and economic monitoring program that delivered the best available science to regional resource managers. Two key advisory committees were established to provide expert advice and scientific guidance throughout the development and implementation of the project:

- A smaller, resource manager-based steering committee provided oversight and focus on the broader and more strategic programmatic goals and direction;
- A larger, user-based science advisory committee consisting of expert researchers and key regional stakeholders provided focus upon the applicability and on-the-ground utility of the project.

### **3.3.1 Survey design: National survey**

Survey questions were chosen following consultation with the CSIRO, the GBRMPA, and JCU to identify ongoing knowledge gaps critical for resource management. These survey questions also explored key areas of inquiry not comprehensively addressed in the scientific literature. Four main areas were explored:

- *Perceptions of inspiration derived from important places* – Twelve Australian icons, both natural and manmade, were randomly ordered and provided to respondents to select their most inspiring icon and top three most inspiring icons. Among the remaining nine icons, respondents were asked to select whether each one was ‘inspiring’, ‘not inspiring’, or ‘don’t know’.
- *GBR visitation* – Respondents were asked to choose whether they had visited the GBR in the last 12 months, visited the GBR but not in the last 12 months, have never visited the GBR but would like to at some stage, or have never visited the GBR and do not intend to do so.
- *Perceptions about the threats to the GBR* – Respondents were provided with a randomly ordered list of 13 threats and asked to rank them on a 10-point scale, where 1 is equivalent to ‘not at all threatening’ and 10 is equivalent to ‘extremely threatening’.
- *Personal connection and attitudes related to the GBR* – Respondents were provided with eight randomly-ordered statements reflecting individual attitudes about the GBR. Some statements were negatively worded to guard against acquiescence. Respondents were asked to rate their agreement or disagreement on a 10-point scale where 1 = very strongly disagree and 10 = very strongly agree (Table 3.1). More information on the selection of scales can be found in section 3.4.4. The statements included in the national survey were:
  - I feel proud the GBR is a World Heritage area.
  - It is the responsibility of all Australians to protect the GBR.
  - The GBR is part of my Australian identity.
  - I am concerned about the impacts of climate change on the GBR.
  - I would *not* be personally affected if the health of the GBR declined.
  - I feel optimistic about the future of the GBR.
  - I feel confident that the GBR is well managed.
  - It is *not* my responsibility to protect the GBR.

**Table 3.1: Survey respondents were provided with eight statements related to their personal connection and attitudes about the GBR. These are the 11 available answers.**

Score	Meaning
Don't know	Don't know
1	Very strongly disagree
2	Strongly disagree
3	Disagree
4	Slightly disagree
5	Very slightly disagree
6	Very slightly agree
7	Slightly agree
8	Agree
9	Strongly agree
10	Very strongly agree

### 3.3.2 Survey design: regional surveys

The surveys were designed over several months via extensive consultation with stakeholders (e.g. the Association of Marine Park Tourism Operators), resource managers (e.g. GBRMPA), researchers (e.g. GBRF, NERP), as part of a larger survey (SELTMP). Approximately 25 iterations of the survey questions were completed, reviewed, and discussed by the internal SELTMP working team as well as numerous external reviewers. The final survey questions can be found in Appendices 2 – 4.

Survey questions focused upon several areas of inquiry related to the GBR, including individual perceptions of the Great Barrier Reef (including threats, management, the future, and responsibility to protect the GBR) as well as recreational usage, climate change beliefs, demographics, and individual conservation behaviours. These behaviours included primarily pro-environmental behaviours (e.g. recycling) although other conservation actions related to climate change adaptation were also included (e.g. the ability to plan for the future and/or purchase insurance for a business). Survey questions also explored both the prevalence of the behaviours as well as potential barriers (i.e. cost, time, lack of skills/knowledge, etc.) and social/moral pressures to perform them (i.e. social and personal norms).

Each survey included questions that were specifically tailored for each of three key user groups (tourists, residents, and tourism operators). Following a series of meetings with industry groups, management agencies and researchers, these three user groups were determined to be the most significant regional stakeholders and thus deemed most deserving of research attention. The residents and tourists are the most numerous of the key stakeholder groups, and the Tourism Operators are among the most influential, transporting most of the approximately two million annual visitors to the GBR. Further, the stratified sampling approach and large geographic range of survey effort helped to ensure a diverse and representative sample of respondent opinions and attitudes. Many of the same questions were included in all surveys, enabling direct comparisons between the user groups. Additionally, the eight questions included in the national survey were also included in the SELTMP surveys, allowing for a comparison across scales – national, regional, local residents, and local industries reliant upon the GBR for livelihood (e.g., tourism operators). One example statement that was included in all four surveys was: I feel optimistic about the future of the Great Barrier Reef. Survey questions were divided into three main sections:

- *Use of the GBR* – how, where and when people use the Reef, their activities and the importance and quality of those experiences;
- *Relationship with the GBR* – how the GBR relates to respondent personal identity, place attachment, values, perceptions of GBR health / management, perception of environmental

condition, satisfaction, stewardship, motivation to change, social norms, and personal efficacy and/or barriers;

- *Personal characteristics* – demographics, behaviours, perceptions of threats, environmental concern, networks, decision-making.

### **3.3.3 Survey design: Tourism operator follow up study**

To explore a key stakeholder group in depth and to collect more detailed information about their behaviours, I designed a follow up study of 16 marine tourism operators from the Cairns and Whitsundays regions, two of the most popular and iconic tourism destinations along the GBR. These tourism operators were managers and key decision-makers in businesses that take tourists out to interact directly with the GBR environment. The tourism operators were surveyed twice. Respondents were first interviewed as part of baseline surveys conducted by the SELTMP, as described above and in depth by Curnock *et al.* (2014a). The follow up surveys described here include the 16 operators previously contacted by the SELTMP, but also included three tourism operators not included in the original SELTMP surveys. Thus, the total sample size was 19 tourism operators. This data collection effort was funded by a \$1,500 Science for Management Award I received from the GBRMPA. I conducted all of the surveys, using a 10-point scale was used to assess the importance of interpretation topics, the perceived threat of climate change across multiple scales, and the ease and effectiveness of various activities in addressing climate change on the GBR. The remainder of the survey used open-ended questions to explore:

1. The interpretation materials and messages that GBR tourism operators provide to guests;
2. Perceptions of climate change threats, impacts, and responses among tourism operators;
3. Perceptions of the ease and effectiveness of activities that tourism operators can do to take action on climate change. Ten activities were specified, based upon priorities identified by the GBRMPA (Commonwealth of Australia, 2009; Great Barrier Marine Park Authority, 2012; Young & Mar, 2010; Young & Temperton, 2008):
  - Providing interpretation for tourists that promotes conservation and sustainable use of the GBR;
  - Use of fuel efficient engines;
  - Separation of waste by tourists for recycling;
  - Participation in industry best practices, via a code of practice or MOU;
  - Participation in GBRMPA's Eye on Reef program;
  - Use of green energy (e.g. solar);
  - Use of an emissions calculator;
  - Use of carbon offsets;
  - Use alternative fuels such as biodiesel and ethanol;
  - Providing interpretation such as best practice guidelines - to help their guests/passengers minimise their impacts on the Reef.
4. The role of government and tourism operators in addressing climate change impacts on the GBR, particularly the ways to overcome perceived obstacles to conservation and facilitating opportunities to encourage pro-environmental behaviours and engagement with guests.

### **3.3.4 Ten-point scales**

Researchers use questionnaires with rating scales to explore, explain, and predict individual behaviours (Weijters *et al.*, 2010). These scales are among the most widely used tools in market research and are regularly used to capture information from a variety of topics including attitudes, perceptions, and key messages (Dawes, 2008). Commonly used to measure attitudes by providing a range of responses to a question or statement (Jamieson, 2004), each scale format has its own advantages and disadvantages. While the use of scales is widespread, there is no consensus as to the best format. Thus, scale types vary depending upon the research questions and methods available. Some scales, e.g. semantic differential scales, use verbal statements such as “very good, good, bad,

and very bad.” Other scales, e.g., Likert scales, rely upon verbal response descriptors, e.g. “agree, slightly agree, neutral, slightly disagree, and disagree” or numerical descriptors whereby a number relates to a certain level of agreement, i.e. 5 = agree, 4 = slightly agree, etc. (Dawes, 2008).

These scales are intuitive, reliable, widely used, sensitive scale types that have been used in various research fields for more than sixty years (Cummins & Gullone, 2000). Importantly, the number of categories comprising a scale is important (Knapp, 1990) as the response format may affect the quality of the data as well as the response style (Weijters *et al.*, 2010). Five point scales are typically quite easy for the interviewer to read out, but these scales may not be sensitive enough to detect small differences, despite such deviations being highly meaningful (Cummins & Gullone, 2000). Thus, a scale with a greater number of response categories can be more useful because it provides greater variance in the data (Dawes, 2002). Further, the use of a greater number of scale categories, i.e. 10 or 11 options rather than 5 or 7, provides a greater variety of responses (Dawes, 2008) and increases sensitivity while not affecting reliability (Cummins & Gullone, 2000), kurtosis, or skewness of the data (Dawes, 2002, 2008). Indeed, a ten point format is also familiar for people comfortable with the idea of rating ‘out of ten’ (Dawes, 2008). The lack of a null mid-point prevented the assumption of the following responses: undecided, unknown, not sure, neutral, cannot be bothered, (Marshall, 2006). Thus, a 10-point scale may be appropriate for detecting small changes as it uses a rating metric commonly experienced by respondents and produces increased sensitivity of the measurement instrument (Cummins & Gullone, 2000).

### **3.3.5 Ethics**

Ethics approval was acquired from both the CSIRO and JCU. The national survey (#024/13) and the regional SELTMP surveys and the tourism operator follow up study (#014/13) were granted external approval by the JCU Human Resource Ethics Committee Chair, Dr. Anne Swinbourne. Additionally, Dr. Cathy Pitkin, CSIRO’s manager for Social Responsibility and Ethics, approved both projects.

## **3.4 Survey administration**

As mentioned above, three data collection efforts are included in this thesis: a national survey of Australians, regional SELTMP surveys of residents, tourists, and tourism operators, and a tourism operator follow up study. Each data collection was independent from the others, relying upon different methods and resources to gather information. Below, I discuss each component in separate sections, explaining how the studies were completed.

### **3.4.1 Survey administration: National survey**

Surveys were conducted online from March 26 to April 2, 2013 and from September 4-10, 2013 via Pollinate, a market research firm based in Sydney, Australia. Since 2007, Pollinate has conducted bi-annual surveys of more than 20,000 Australians via its ongoing Pulse Omnibus Survey<sup>4</sup>. Pollinate constructed the online format in collaboration with Lightspeed Research, a global provider of research panels and products related to advertising, consumer insights and market research. The survey sample was recruited from the Australian panel provided by Lightspeed Research<sup>5</sup>, in line with specified quotas that are nationally representative of the Australian population. Participation in these panels is voluntary and members join through certified recruiting partners including methodologies such as opt-in email, co-registration, traditional online banner placements, and internal and external affiliate networks. Each prospective panellist must provide basic demographic and household information during the initial registration survey. Prospective panellists are then required to pass

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<sup>4</sup> The Pulse omnibus is an ongoing, representative market monitor dedicated to understanding people’s attitude towards the environment, consumer behaviour, brand loyalty and corporate reputation. To date, some of Australia’s largest companies and NGO’s have utilised the data to form the foundations of successful green marketing, communications, new product development and corporate reputation platforms.

<sup>5</sup> The Australian research panel has 181,000 members.

through various data quality checkpoints, confirm their email address through a double opt-in registration process, and agree to the Lightspeed terms and conditions and privacy policy<sup>6</sup>. Survey panellists may opt out at any point without penalty or repercussion.

Panellists are incentivised to complete the survey via the Lightspeed Points program, earning credit for each survey completed depending upon survey length, complexity, and incidence rate. Credit may be accumulated and later redeemed for items such as gift certificates, music downloads, and DVDs. Survey panels are used solely for online market research purposes. That is, information related to personally identifiable information is confidential and is not shared. Lighthouse has sought and implemented localised legal recommendations in all countries where they operate consumer panels and all panels are compliant with all regional and national laws, including the *Children's Online Privacy Protection Act* and Safe Harbor.

The survey was sent to a random sample of nationally representative Australians (i.e. in terms of age, gender, location, etc.) from the Lightspeed Research panel. Prior to completing the survey, a short summary of the study was provided to each potential respondent. This summary provided a general description of the purpose of the survey and a brief summary detailing how the findings may be used. The text of this summary can be seen in Appendix 1. Each survey took approximately 15 minutes to complete. Surveys were conducted until the target sample size of 1,000 was achieved. A total of 2,002 surveys were complete, i.e., two surveys several months apart. All data was collected and collated confidentially via non-identifiable online survey responses and in line with the CSIRO/JCU ethics requirements.

### **3.4.2 Survey administration: Regional surveys**

Three separate regional SELTMP surveys were conducted: coastal residents, tourists, and tourism operators. Surveys were conducted face-to-face for tourists and coastal residents, and over the telephone for tourism operators.

#### **3.4.2.1 Pilot study and data collection**

Approximately two dozen CSIRO scientists and JCU students were surveyed as part of a pilot survey conducted in Townsville in May, 2013 to verify the reliability and validity of the survey protocol. Extensive feedback was solicited to refine the wording of survey questions as well as to reduce the overall length of the survey. Based upon the results of the pilot survey, questions were reframed, edited and/or amended for clarification purposes, as required. Additionally, response distributions were assessed to ensure that the survey questions secured a wide range of responses.

Approximately 25 individuals were employed by the CSIRO on temporary contracts to conduct the face-to-face surveys, enter the data and ensure quality control/assurance. Whenever possible, local residents were contracted in order to minimise travel expenses and to utilise local/regional contacts and networks. Two types of surveys were completed: field surveys and telephone surveys.

#### **3.4.2.2 Staff training**

A full day workshop was held in Townsville in May, 2013 to train survey staff and to provide them with background information on the survey design, protocol, and data collection methods. This workshop included an extensive question and answer session, and each staff member conducted a practice survey on a volunteer partner. The training day had six key areas of focus:

1. Description of coral reef management and the need for social science;
2. A background on the SELTMP, including its development, partners, and objectives;

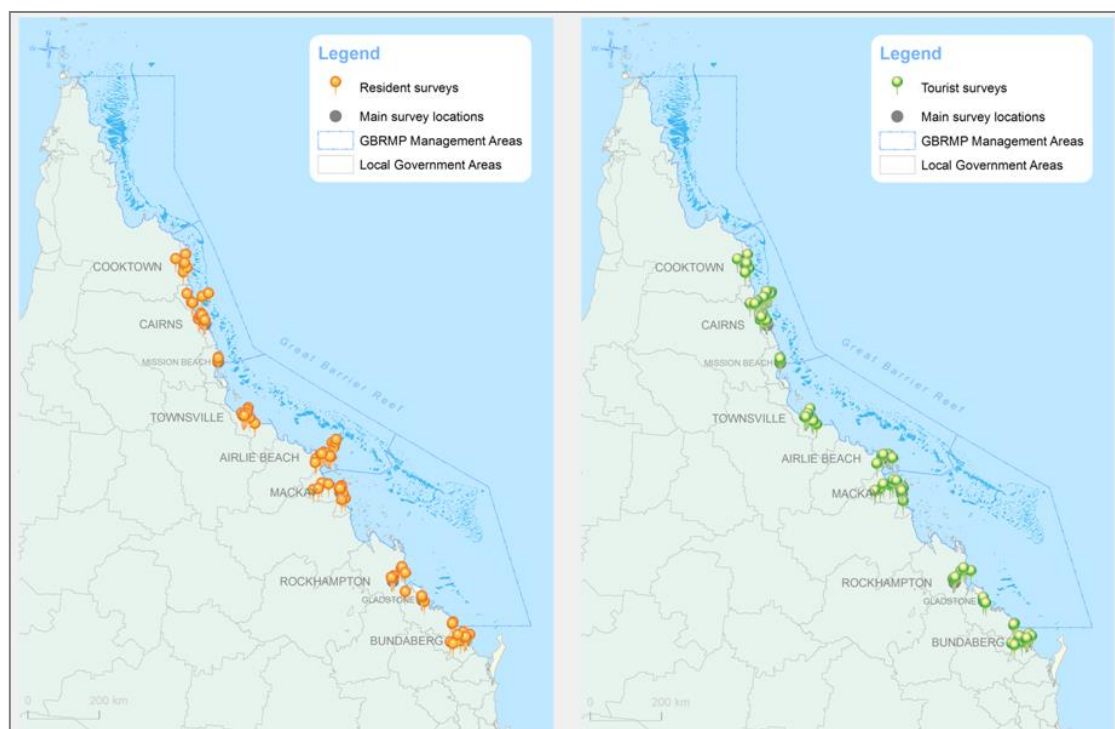
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<sup>6</sup> More information about the Lightspeed Research Panels can be found here: <http://www.lightspeedresearch.com/terms-of-use/>.

3. A thorough discussion of each survey question, including definitions of key words and background as to the importance and potential use of survey responses;
4. A discussion of 'lessons learned' from conducting previous surveys, including the most effective ways to increase response rates, connect with potential respondents, etc.;
5. A discussion on data collection protocols and staff expectations, including self-awareness, personality types, manners, etc.;
6. An overview on the expected team dynamics and operational rules whilst in the field and representing the CSIRO and JCU.

### 3.4.2.3 Field surveys

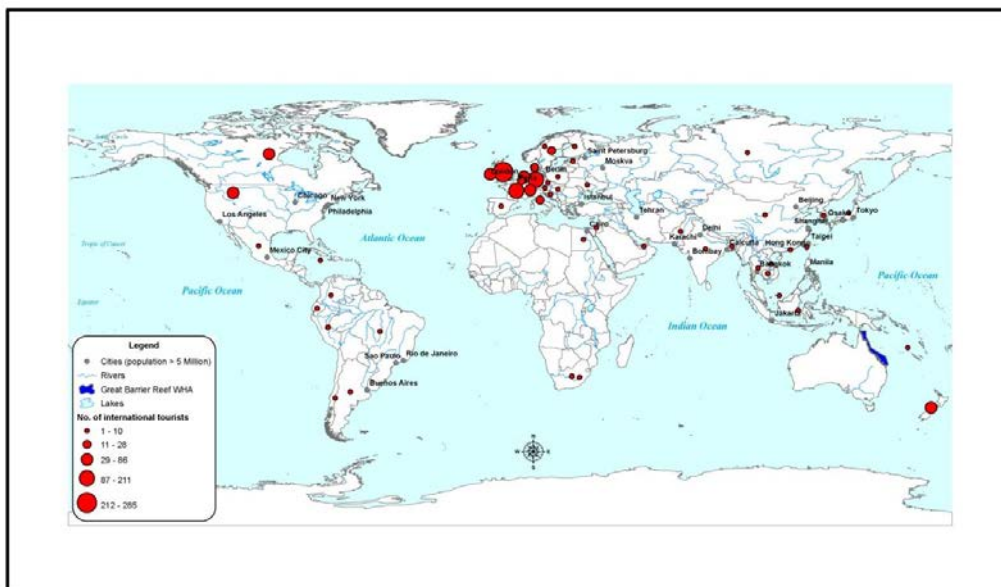
Face-to-face structured surveys of coastal residents and tourists were conducted from May to August, 2013 (Figure 3.2). For sampling purposes, the study area was stratified into four regions: Far North Queensland (Cairns, Cooktown, and Port Douglas), North Queensland (Townsville and Bowen), Central Queensland (Airlie Beach and Mackay) and South Queensland (Gladstone, Rockhampton, and Bundaberg). A target sample size was set at 1,250 total surveys per region, 625 residents and 625 tourists. A survey team of between five and 15 people was assigned to each of the four regions and a leader was assigned to each region. Dr. Matt Curnock (CSIRO) supervised South Queensland, Dr. Renae Tobin (JCU) was in charge of North Queensland, Dr. Petina Pert (CSIRO) supervised Far North Queensland, and I managed the research team in Central Queensland. Key survey locations were the same for each region and included airports, hotels, hostels, caravan parks, shopping centres, community markets, and ports/marinas. For safety purposes, surveyors worked together in pairs at each location. Surveys were conducted between 7am and 7pm.



**Figure 3.1.** Geographical distribution of where the resident and tourist surveys were collected. Each survey team member was provided with an iPad Mini with the survey loaded onto an application called iSurvey<sup>7</sup>, a professional market research tool. When not connected to the Internet, the iSurvey application stored the survey responses on the iPad Mini and uploaded them when an internet connection became available. This allowed for surveys to be conducted in remote and rural areas along the Queensland coast. Data was hosted in a Rack Space data centre based in Wellington, New

<sup>7</sup> More information about the iSurvey application is available here: <https://www.isurveysoft.com/>.

Zealand and was regularly backed up to a secure offsite storage facility. Data were downloaded as Microsoft Excel spreadsheets and checked for quality control and assurance. A total of 3,182 coastal residents and 2,877 tourists were surveyed, including residents from throughout the world (Figure 3.3). A mix of 'convenience sampling' and 'quota sampling' (Bryman, 2012) was used to survey a representative population across categories such as age, gender, ethnic background, and occupation. Potential respondents were approached by survey staff holding an informational pamphlet. Survey team members then read out a standardised preamble (please see Appendix 2 for more detail). If a group was intercepted, all members of the group were surveyed, wherever possible. Group members were taken aside so as to not bias responses for their companions. The response rate was 57%. A limitation of my sampling was a bias towards English-speaking people. Key survey locations were the same across each region and included airports, information centres, hotels, hostels, caravan parks, shopping centres, community markets, and ports/marinas.



**Figure 3.2.** Geographical distribution of the countries of origin of the tourist respondents.

#### 3.4.2.4 Telephone Surveys

Tourism operators were identified and contacted in collaboration with CSIRO's SELTMP working groups. The Yellow Pages, the Association of Marine Park Tourism Operators, the GBRMPA and other local experts were also consulted to ensure a comprehensive list of tourism operators. Further, an extensive internet search was conducted to help identify any other tourism operators currently working within the GBR region (Birtles *et al.*, 2001). The internet search was based upon methods used by Rose *et al.* (2003) and Rose *et al.* (2005), including the use of search engines and specific terms. Key words and filters used in this Google search included terms related to the types of activities or operations as well as locations throughout the GBR (Table 3.2). A total of 213 tourism businesses were identified and invited to be included in the survey. Of these, 34 declined, 57 were unresponsive, 122 accepted, and 119 were surveyed from June to September, 2013. The owner of each business was invited to participate in the survey. If the owner declined, a key decision maker was asked to participate in his/her place. Operation types included 46 reef tour companies (dive/snorkel/day trips/live-aboard), 28 charter fishing, 14 island resort/accommodation, 7 water sports/equipment rental, 7 inshore cruise tour, 6 flights/helicopter, 6 general charter and 5 bareboat charter operators. Island resorts within the GBRWHA were also included in the search, but not resorts on the mainland. Some islands have several resorts, e.g. Magnetic Island or Hamilton Island.

**Table 3.1:** Google search word list used for the tourism operator telephone survey

<b>Filter 1 (GBR) – not always necessary</b>	<b>Filter 2 activity / operation type</b>	<b>Search town/location *islands with known resorts</b>
Great Barrier Reef	dive, diving, snorkel, fishing, fish, resort, charter, sail, tour, flight, helicopter, sightseeing, kayak, bareboat, SCUBA, live-aboard, cruise, whale watching, glass bottom boat, semi-submersible, water sports, fish feeding, mangrove tour, wildlife viewing, photography, holiday	Cape York, Haggerstone Island*, Raine Island, Lizard Island*, Far Northern, Lockhart River, Princess Charlotte Bay, Ribbon Reef, Cooktown, Cape Tribulation, Agincourt Reef, Port Douglas, Daintree River, Snapper Island, Low Isles, Cairns, Half Moon Bay, Yorkeys Knob, Trinity Bay, Green Island*, Michaelmas Cay, Fitzroy Island, Frankland Island, High Island, Innisfail, Mission Beach, Dunk Island*, Bedarra Island*, Cardwell, Port Hinchinbrook, Hinchinbrook Island*, Lucinda, Orpheus Island*, Palm Island, Townsville, Magnetic Island*, Alva Beach, Yongala, Bowen, Hideaway Bay, Dingo Beach, Airlie Beach, Whitsundays, Shute Harbour, Daydream Island*, South Molle Island*, Long Island*, Hamilton Island*, Whitsunday Island, Whitehaven Beach, Hook Island*, Lindeman Island*, Brampton Island*, Keswick Island*, Hook Reef, Mackay, Hay Point, Sarina, Marble Island*, North Keppel Island*, Great Keppel Island*, Keppel Bay, Rockhampton, Yeppoon, Heart Reef, Kinka Beach, Gladstone, Curtis Island, Tannum Sands, Heron Island*, Lady Musgrave Island*, Lady Elliot Island*, Seventeen Seventy, Agnes Water, Bundaberg, Burnett Heads, Bargara, Elliot Heads, Outer Reef

### 3.4.3 Survey administration: tourism operator follow up study

In December, 2014 and January, 2015, I designed and conducted semi-structured interviews with 19 owners and managers of businesses that provide tourists with a firsthand experience of the GBR Marine Park, including charter fishing operations as well as those that provide snorkel and SCUBA dive trips, either single or multi-day excursions. Most interviews were conducted in person - although I conducted two over the phone - and interviews were recorded to ensure accuracy in data capture and analysis. Data was transcribed with partial assistance from Digital & Audio Transcription Services (DAATS), an Australian-owned company specialising in the transcription of interviews, meetings, and focus groups. The average length of the interviews was 33 minutes, ranging from 24 to 60 minutes in length. The tourism operators interviewed in this survey had spent considerable time in the tourism industry and the GBR region. Most respondents were middle-aged men (16 out of 19 tourism operators were male, with an average age of 47), who were heavily reliant on GBR tourism for their livelihoods. Respondents worked in businesses that were highly variable in size: Three businesses had more than 150 employees and six had less than 10 employees.

I used a semi-structured approach to enable the collection of nuanced and contextual information to complement the quantitative data collected during the previous SELTMP surveys (Biggs, 2011). Qualitative responses to the semi-structured questions were coded using a thematic analysis (Bryman, 2012), with codes defined as, “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based data” (Saldaña, 2015, p. 3). Codes were pre-tested by having an independent coder code the same section of interview using the same defined codes. Following this, codes were examined, discussed, and revised based on the recommendations in Gorden (1992) for coding categories to be both “all-inclusive and mutually exclusive.” Means and standard errors were calculated using the quantitative responses to the various statements that used 10-point Scales.



### 3.5 Data quality control and assurance

All SELTMP survey responses were downloaded into a Microsoft Excel spreadsheet using the iSurvey application. A CSIRO student intern was hired to review the database and conduct quality control and assurance checks. Incomplete surveys were eliminated from data analyses. Due to the large sample size, any respondents who did not answer more than three questions were marked as incomplete and eliminated from the database.

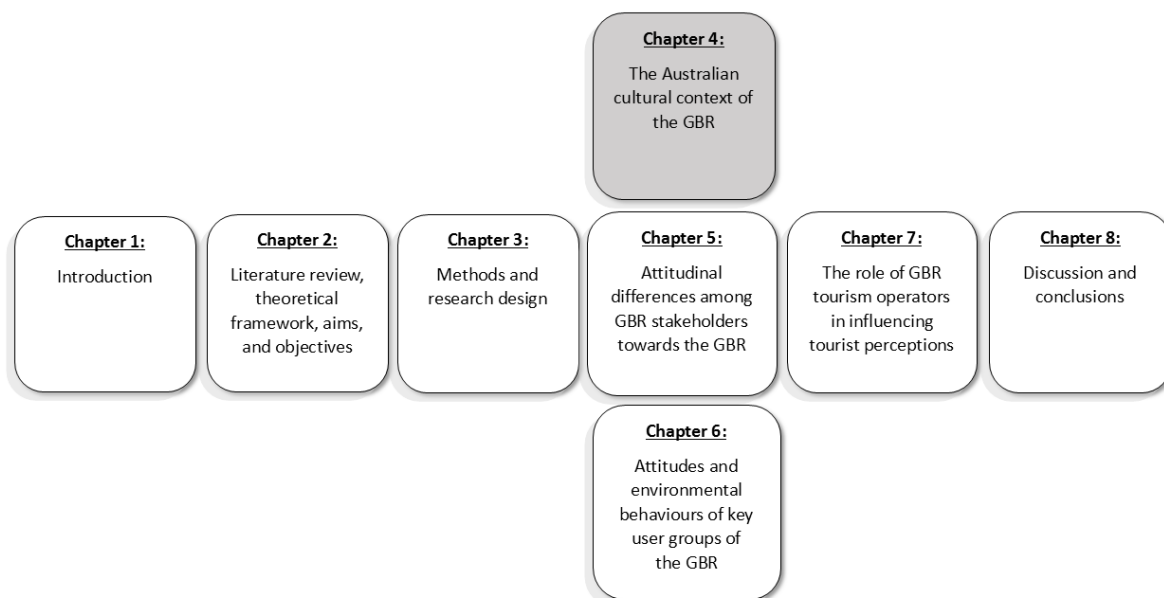
The datasets generated and analysed during this study are publically available for download in the eAtlas repository: <http://seltmp.eatlas.org.au/seltmp/survey-data>. All data collection and storage conforms to the ethical requirements detailed in the JCU and CSIRO approvals.

The next chapter, **Chapter 4**, describes the first of four data chapters that explore the connection that people have with the GBR. Relying upon data collected from the first nationally representative survey conducted about the GBR, this chapter describes the connection that Australians have with the GBR, including the attitudes and beliefs they hold about the threats to the GBR, the responsibility they hold to protect it, and the pride, identity, optimism, and personal affection they feel for the GBR.



## CHAPTER 4: THE AUSTRALIAN CULTURAL CONTEXT OF THE GREAT BARRIER REEF

Resource managers engage local and regional stakeholders in activities, programs, and projects that protect the GBR. Specifically, they attempt to foster conservation ethos in local communities and industries, encouraging people to act sustainably and in the best interest of the natural world around them. Culture, as described in the scientific literature, can influence the environmental attitudes of local stakeholders as well as the actions they take in response to environmental threats. An enhanced understanding of the perspectives and beliefs held by stakeholders is thus a critical component in developing communication campaigns that educate and motivate people to help to ensure the long-term preservation of the GBR. Here, in Chapter 4, I clarify the broader cultural context about the GBR that exists within Australia, with particular focus upon the connection and concern that Australians have for the GBR.



### Source References:

**Goldberg J.**, Marshall N., Birtles A., Case P., Bohensky E., Curnock M., Gooch M., Parry-Husbands H., Pert P., Tobin R., Villani C. and B. Visperas (2016) Climate change, the Great Barrier Reef, and the response of Australians. *Palgrave Communications*, 2: 15046.

**Goldberg, J.**, Marshall, N., Curnock, M., Stone-Jovicich, S., Bohensky, E., Gooch, M, Parry-Husbands, H., Pert, P., Tobin, R., Villani, C., and B. Visperas (2014). SELTMP 2013: A National Survey of the Great Barrier Reef (pp. 43): CSIRO.

**Goldberg, J.**, Marshall, N., Curnock, M., Stone-Jovicich, S., Bohensky, E., Gooch, M, Parry-Husbands, H., Pert, P., Tobin, R., and B. Visperas (2015). SELTMP 2013: A National Survey of the Great Barrier Reef (pp. 46): CSIRO.

#### 4.1 Chapter Summary

Inspiration, aspirations, attitudes, and perception of threats play a pivotal role in the way that individuals associate themselves with natural environments. These sentiments affect how people connect to natural places, including their behaviours, perceived responsibility, and the management interventions they support. World Heritage Areas like the GBR hold an important place in the lives of people who visit, aspire to visit, or derive a sense of security and wellbeing from their existence. Yet, the connection between people and special places is rarely quantified and policymakers find it difficult to incorporate these human dimensions into decision-making processes. Here I describe the personal concern and connection that Australians have with the GBR and discuss how the results may help with its management. I utilise a statistically representative sample of Australian residents ( $n= 2,002$ ) and show empirically that climate change is perceived to be the biggest threat to the GBR, and that the GBR inspires Australians, promotes pride, and instills a sense of individual identity and collective responsibility to protect it. An increased understanding of the high levels of personal connection to iconic natural resources may help managers to enhance public support for protecting climate-sensitive systems within Australia and around the world.

#### 4.2 Introduction

Widely regarded as the most extraordinary places on the planet, World Heritage Areas are important icons that possess an exceptional cultural and/or natural significance that transcends national boundaries and merits protection for the international community (United Nations Educational, 1972). However, climate change impacts and economic development are affecting the environmental and social systems (Cardinale *et al.*, 2012; Great Barrier Marine Park Authority, 2009) associated with World Heritage Areas, including the benefits derived from these areas such as quality of life, spirituality, and recreational opportunities (Adger *et al.*, 2013; Corvalan *et al.*, 2005). Whilst the preservation of the 'outstanding universal value' of World Heritage Areas is an obligation of governments seeking to maintain the designation and associated benefits derived from World Heritage status, the resource management response at many locations has been insufficient (Badman *et al.*, 2009). A lack of trust between stakeholders (Gragson & Grove, 2006), conflicts of interest between short and long-term decision-making, and misunderstandings about the associated social, economic and human dimensions (Hughes *et al.*, 2010) can threaten the international status of these Areas, prompting governments to revisit the benefits that can be derived from these places in order to better manage conflict between stakeholders. Natural resource managers have thus sought new ways to understand the role of World Heritage Areas in the lives of the community and to promote natural resource conservation while concurrently facilitating the social and economic benefits provided by these special areas (Dobbs *et al.*, 2011).

Crucial to the process of managing international icons is the incorporation of the human dimension into management at local, regional, and international scales (Lal *et al.*, 2002). However, an ongoing lack of understanding about the connection that people have with World Heritage Areas, among other factors such as lack of adequate resources, occasionally inhibits the integration of the human dimension into decision-making related to natural resource management. Consequently, at some iconic World Heritage sites such as the GBR, community stewardship is at risk of failing (Scheffer *et al.*, 2015). Although officials are often determined to incorporate evidence-based policy, decisions that balance environmental considerations with socio-economic concerns remain thin on the ground (Juntti *et al.*, 2009) and many environmental policies are developed with a lack of scientific and research evidence (Owens *et al.*, 2006). The integration of social science is crucial to develop new partnerships, divergent thinking, and meaningful contributions to research (Viseu, 2015) and resource management.

The objective of this study was to examine the connection that people have with an iconic place, with the intention that the insights obtained could be used to support management and improve decision-

making processes. Clarifying the perceptions that underlie and affect this connection is a crucial first step. I refer specifically to the case of the GBR and build upon the findings of Wynveen *et al.* (2012), who called for research describing the meanings that more and different types of stakeholders ascribe to the GBR. Such meanings are particularly important as a greater concern and acknowledgement of stakeholder interests may help build institutional trust in management agencies (Wynveen & Sutton, 2015). The incorporation of stakeholder attitudes and perceptions into planning is thus vital for the management of natural resources (Larson *et al.*, 2013), increasing the likelihood of successful and sustainable conservation activities (McCook *et al.*, 2010).

#### **4.2.1 Previous research: Why places matter to people**

There is a need to better understand the role that nature plays in the lives of people, including concepts such as resource condition and aesthetics (Larson *et al.*, 2013). In a recent review of 40 years of literature, Lewicka (2011) noted that people feel attached to a place for a variety of reasons including social factors, religious symbolism, physical assets, recreational options, and economic and emotional connections. This attachment can influence perceptions of the environment, including risk, emotional bonds with nature, and the use of public spaces (Scannell & Gifford, 2010). Thus, conceptualisations of place attachment consider multiple underlying dimensions of the human-place bond, providing a general representation of why stakeholders value a landscape (Wynveen & Kyle, 2015). As people recognise more and stronger meanings related to a place, their attachment to that place increases (Wynveen *et al.*, 2012). This attachment can take the form of symbolic or socially constructed attributes of places and may influence individual evaluations of change, including how people choose to support or oppose environmental decision-making (Devine-Wright, 2009) such as renewable energy projects (Devine-Wright & Howes, 2010).

Disconnection from nature is central to ongoing socio-ecological crises (Zylstra *et al.*, 2014), and understanding the level of connection between people and iconic places may provide opportunities to enhance public support for managing climate-sensitive systems such as the GBR (Johnson & Marshall, 2007). One way to understand stakeholder attitudes towards a natural environment is to document the meanings they associate with that setting (Wynveen *et al.*, 2010). Place meanings can be explored in large groups of respondents via close-ended survey items, offering a broad understanding that can provide insight into why places are important to people (Wynveen & Kyle, 2015). Following a multi-disciplinary review of the literature and discussions with local resource managers, I proposed that this connection can partially be described by assessing the (i) Inspiration, (ii) Aspirations, (iii) Personal connection and attitudes, and (iv) Perceptions of threats in relation to these special areas.

Australia's natural surroundings have long been a source of inspiration and the connection they provide can play a major role in influencing environmental attitudes (Curtis, 2009). Inspiration is a broad yet familiar emotional construct used to enhance programs in various disciplines such as business (Souitaris *et al.*, 2007), management (Dess & Picken, 2000), and education (Tjas *et al.*, 1997). Importantly, inspiration implies motivation, including the ability to energise and direct behaviour (Elliot, 1997). Although the natural world is capable of evoking an inspiration that is both motivational and energising, little attention has been given to understanding the impact of this inspiration and where the motivation is directed (Thrash & Elliot, 2003). In other words, an important knowledge gap exists between understanding where inspiration arises and how that inspiration is utilised.

Aspirations to visit are important to include in a description of the human dimension of World Heritage Areas because visitation influences individual knowledge and attitudes about a location, including the perceptions of social and environmental problems within that setting (Manning *et al.*, 2000). Aspirations to visit protected areas have steadily increased in recent decades (Ham *et al.*, 2009) and these visits influence individual knowledge and attitudes about the locations, including the

perceptions of social and environmental problems within that setting (Manning *et al.*, 2000). Personal experience also helps to inform perceptions of risk, awareness, and behaviours (Weinstein, 1989). Furthermore, the level of connection that one feels towards a place may influence the development of pro-environmental behaviours (Vaske & Kobrin, 2001) such as those that maintain or enhance valued attributes of that setting (Stedman, 2002). For example, people are more willing to fight to protect places they are closely associated with and that they perceive to be in less-than-optimal condition (Stedman, 2002). Thus, personal experiences with nature can shape opinions about resource protection as well as influence behaviours taken in response to perceived environmental degradation (Devine-Wright & Clayton, 2010).

Understanding how and why an individual connects with a place is potentially an important concern for conservation (Halpenny, 2010), particularly due to influences on social resilience and adaptive capacity. For example, resource-dependent industries such as farmers along the GBR will be required to adapt to a range of climate risks in order to maintain viable businesses (Marshall *et al.*, 2012). Transformations initiated by threats to local socio-ecological systems are analogous to the situation required to initiate pro-conservation behaviours among members of the general public. That is, if a small subgroup of members of the public (i.e., farmers) can demonstrate transformative capacity through a change in behaviour, it may be possible for others as well. Thus, the role of attitudes in mediating behaviours toward the natural world has important practical implications for the development of mechanisms that can foster protective environmental policies (Clayton & Opatow, 2003). From a broader standpoint, the public must transition away from harmful and unsustainable environmental practices in order to help protect the GBR from climate change (Beeden *et al.*, 2014a).

Attitudes are particularly relevant to consider because they affect behaviour (Armitage & Conner, 2001) and environmental attitudes, in particular, influence individuals' environmental behaviours (Kaiser *et al.*, 1999). People connect with special places, and personal experiences and links with nature can affect resource protection, including the development of pro-environmental behaviours taken in response to perceived environmental threats (Vaske & Kobrin, 2001). As attitudes can shape the individual decision-making and behavioural response (Lindell & Perry, 2012), perceptions of environmental risk are a key component of behavioural intentions to address associated environmental issues (O'Connor *et al.*, 1999). For example, residents living near the GBR differ in their attitudes about climate change (Tobin *et al.*, 2014b); some recognise the importance of taking action or feel morally obligated to act, while others are less concerned (van Riper *et al.*, 2012b). Documenting and analysing these individual attitudes is important for developing appropriate solutions to threats to the GBR such as climate change (Ehrlich & Kennedy, 2005), particularly as attitudes help people perceive and evaluate the consequences of undertaking a behaviour (Vallerand *et al.*, 1992).

Environmental threats, and the attitudes that individuals associate with them, increasingly impact the general public (Schwartz *et al.*, 1985) as well as the ongoing sustainability measures (Steg & Vlek, 2009) and environmental policies (Wandersman & Hallman, 1993) that affect them. Perceptions of environmental threats not only correlate with behaviour (Seguin *et al.*, 1998), but they also influence the expected collective benefits of taking action (Lubell, 2002). That is, people who perceive that certain activities threaten the environment are more likely to take action to address those threats (Perkins, 2010), thus ensuring long-term sustainability. Individual perceptions offer insights into existing behaviours as well as potential new behaviours that address climate change impacts on World Heritage Areas and other iconic places (van Riper *et al.*, 2012b). Thus, individual attitudes related to environmental threats are important attributes for managers to consider (Csutora, 2012).

### **4.3 Methods**

This study involved three key components: survey design, survey administration, and survey analysis. These are described below.

#### **4.3.1 Survey design**

Following meetings to secure a partnership with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and a market research firm based in Sydney, Australia, I initiated this national survey to provide a broader context in which to embed the regional findings provided by the SELTMP study. Survey questions were developed in collaboration with the CSIRO, the GBR Marine Park Authority and James Cook University. Additional information about the design of the survey can be found in Chapter 3, Section 3.3.

Surveys that utilise single-item measures may be viewed as suspect or inadequate due to their vulnerability to random measurement error, ambiguity, and biases in meaning and interpretation, yet their validity has been proven and they are encouraged for research (Hoepfner *et al.*, 2011). Indeed, carefully crafted single-item measures may be sufficient, making multiple item measures unnecessary (Bergkvist & Rossiter, 2009). However, single items do not always perform better. For example, Kwon & Trail (2005) showed that multiple items had better reliability and explained more variance than single items. Nonetheless, single item measures may be used cautiously in certain situations such as studies with large sample sizes (Diamantopoulos *et al.*, 2012).

Although other research methods such as qualitative interviews have proven useful in exploring community perceptions of coral reefs (Mohamed, 2012) as well as behaviours taken in response to climate change (Bohensky *et al.*, 2012), these methods and research questions were beyond the scope of this study. Here, I document a nationally representative perspective of what Australians think about the GBR.

#### **4.3.2 Survey administration**

An online questionnaire was conducted by Pollinate, drawing on a sample (i.e., stratified by age, gender and location) of 2,002 Australian residents recruited from a research panel of more than 180,000 residents. Panel recruitment and sampling methods were in line with specified quotas that were nationally representative of the Australian population. Four areas were explored that are proposed to constitute the connection that people may have with special places: Inspiration, aspiration, personal connection and attitudes, and perception of threats (Figure 2). Additional information about these areas of focus, pilot testing, and the survey administration are described in Chapter 3, Section 3.4.

#### **4.3.3 Survey analysis**

Survey data were coded and analysed using Q, a qualitative analysis software program specifically designed for use with large datasets related to market research. I tried to provide a simple and straightforward analysis of the data and did not test the influence of place on the individual variables. Consequently, as only raw data were presented, the data were untreated and, thus, control variables were not applicable in this instance. The survey sample included respondents in all major metropolitan and capital cities, including rural and remote areas throughout Australia. Just over half were female (51%). Most respondents were employed, either full-time (35%) or part-time (21%), with the remaining respondents being students, unemployed, retired, or focused on home duties. Many respondents had some University education (32%) or had studied at a technical institution or completed an apprenticeship (27%). Respondents' annual incomes were dispersed, with about 60% earning less than \$100,000 and 27% earning less than \$50,000 per annum.

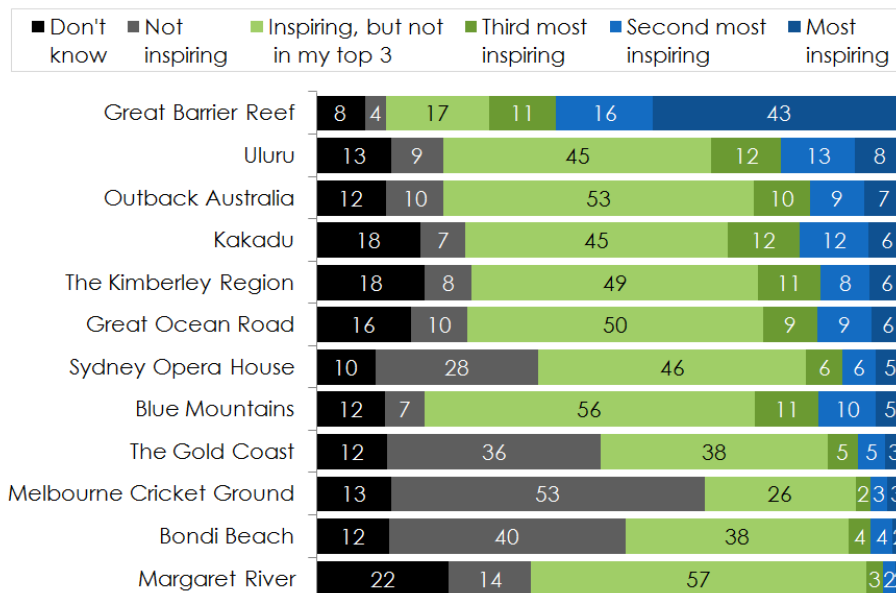
### **4.4 Results and Discussion**

#### **4.4.1 The connection that people have with the GBR**

Effectively managing climate change impacts is crucial to ensure the long-term survival of the GBR (Great Barrier Marine Park Authority, 2009), and if the GBR is to be adequately managed into the

future, substantial political attention will be required and considerable resources will need to be invested. The support of the public will be paramount. Targeted communication and social change strategies at both small and large scales will be necessary to transition stakeholders towards a sustainable future (Jamal *et al.*, 2015). This transition must include a variety of individual and collective actions, including the use of renewable energies and more efficient land management practices that reduce coastal pollution. However, relatively little is known about the connection that Australians have with the GBR or what support they have for its management. Although some studies have documented regional perceptions (Nilsson *et al.*, 2010; Sutton & Tobin, 2011; van Riper *et al.*, 2012b), there are limited data available from a national Australian perspective. Information is especially lacking about the personal concerns that people have for the GBR and their perceptions of responsibility to protect it. Understanding how Australians feel about the GBR, and what they think of the threats and ongoing management, offers insights into the types of regulations and policies they may support (Hughes *et al.*, 2007; van Riper *et al.*, 2012b).

Australians have a strong connection with the GBR, including the inspiration they derive from it. Australians were strongly inspired by the GBR, with 43% of people in this study listing it as the most inspiring Australian icon, more than five times the level of the second most inspiring icon, Uluru (8%; Figure 4.1). Additionally, 88% of respondents believed the GBR was inspiring, and 71% included the GBR in their list of the top three most inspiring Australian icons. This collective inspiration may suggest the existence of a widespread and shared emotional connection that could be utilised in profound ways, fostering political support for resource protection, for example, or stimulating resource managers to act boldly in addressing the threat of climate change. It is likely that decision-makers have been unable to fully and formally utilise this connection, and that quantifiable evidence may hopefully encourage a more intrepid decision-making process, particularly with respect to climate change.



**Figure 4.1.** Perceived inspiration related to 12 popular Australian natural and cultural icons. The 2,002 survey participants were asked to evaluate the inspiration derived from each of 12 national icons. They ranked their top three most inspiring icons, and then assessed the remaining nine as either 'inspiring', 'not inspiring', or 'don't know'. The numbers represent the proportion of respondents within each category.

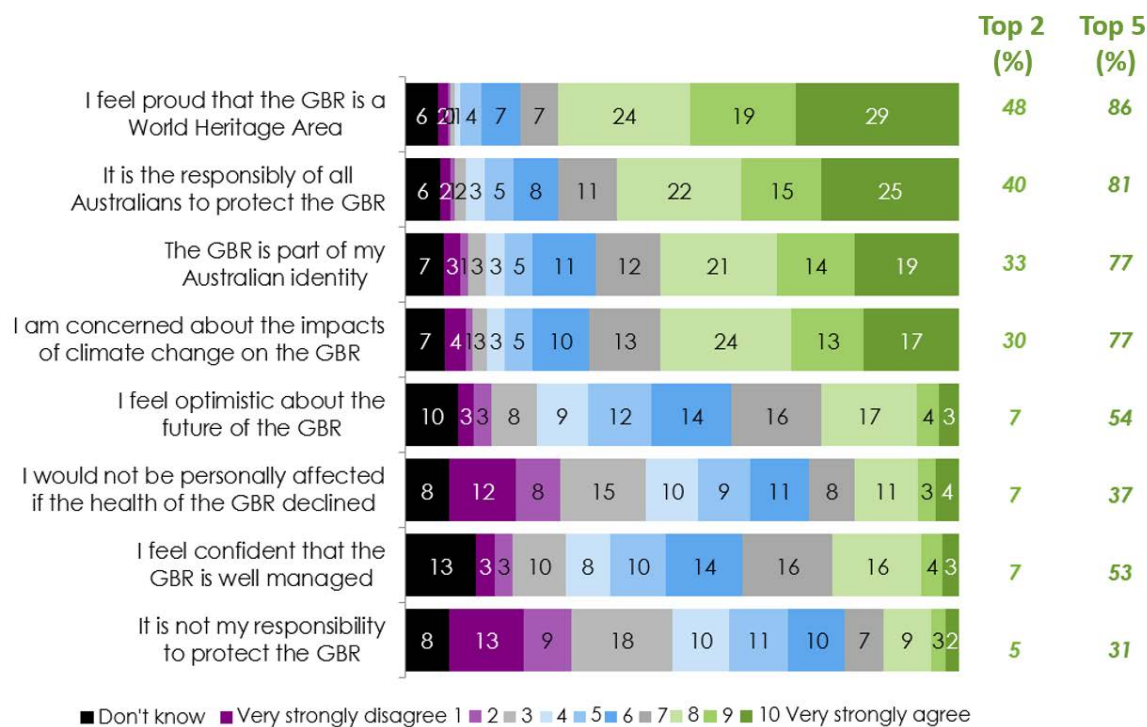
Millions of Australians have had a direct experience with the GBR. Results from this study suggest that 44% of Australians have visited the GBR and 8% visited recently, i.e., within the year prior to survey. Nearly half of the respondents (49%) had never been to the GBR but would like to at some



stage, while 7% had never been and do not intend to visit the GBR. People want to experience the GBR and when doing so, they indirectly provide considerable support to the regional economy. Tourism activities on the GBR contribute 5.2 billion dollars to Australia's economy each year, including approximately 64,000 full-time jobs (Deloitte Access Economics, 2013). Visits to the GBR also affect the way that Australians feel about it, as people who visit the GBR are more connected to it (Goldberg *et al.*, 2014) and express greater concern about its management (Moscardo, 2008). Simply aspiring to visit the GBR has also been shown to have profound effects. Individuals planning to visit the GBR have a correspondingly higher desire to protect it than those who do not wish to visit (Rolfe & Windle, 2012).

The GBR is part of Australian society, influencing how individuals identify themselves and how they feel about the natural world around them. I found, for example, that 77% of respondents felt the GBR was part of their identity as Australians (Figure 2). Pride and feelings of responsibility are also important indicators of the connection that may exist between people and special places. Eighty-six percent of Australians in this study were proud that the GBR is a World Heritage Area, and most agreed that it was the responsibility of all Australians to protect it (80%), while 61% believed it was their individual responsibility to protect the GBR. This connection may support a widely recognised – but as yet undocumented and therefore underutilised – sentiment that there is a social norm around appreciating and protecting the GBR (Cialdini & Goldstein, 2004), i.e., protecting the GBR is part of what it means to be Australian or, conversely, that degradation of the GBR is un-Australian (Phillips & Smith, 2000). Iconic ecosystems like the GBR are much more than just a place, an economic incentive or a tourist attraction. Rather, my results suggest that they are a source of inspiration and pride, as well as a key contributor to personal identity that also encourages collective responsibility. As such, iconic ecosystems may have the potential to unify seemingly disparate factions of a population around a common goal, e.g., the long-term management and preservation of an internationally significant natural resource.

Many Australians, regardless of where they live, suggested that they will be impacted by a decline in the condition of the GBR. My results showed that 54% of Australians would be personally affected if the health of the GBR declined and 77% were concerned about the impacts of climate change on the GBR (Figure 4.2). These findings offer an opportunity to highlight and promote widespread public agreement on climate change. Leveraging these similar individual attitudes into a cohesive collective may affect political will around the management of the Reef, supporting new and improved resource management approaches such as the recently declared ban on the disposal of capital dredge material in the GBR Marine Park. Such action may be well aligned with public concerns as just 53% of Australians in this study were confident that the GBR is well managed and 55% were optimistic about its future. As such, social and environmental impacts that affect the GBR, while potentially considerable, are also significant opportunities to unify individuals, to reconsider ecosystem use, to reframe environmental impacts as personal impacts, and to initiate change, both individual and collective (Perry *et al.*, 2010). If individuals are concerned about the threats to an important icon that they are personally connected to, there is a strong potential to utilise this relationship to encourage a responsive political response (Axelrod & Lehman, 1993). I suggest, like others, that the relationships between individuals and environments that make an ecosystem iconic (i.e., an inspirational environment, high personal connection, a strong aspiration to visit and protect it, etc.) can be leveraged to help conserve its associated iconic resources (Reser & Bentrupperbaumer, 2005).



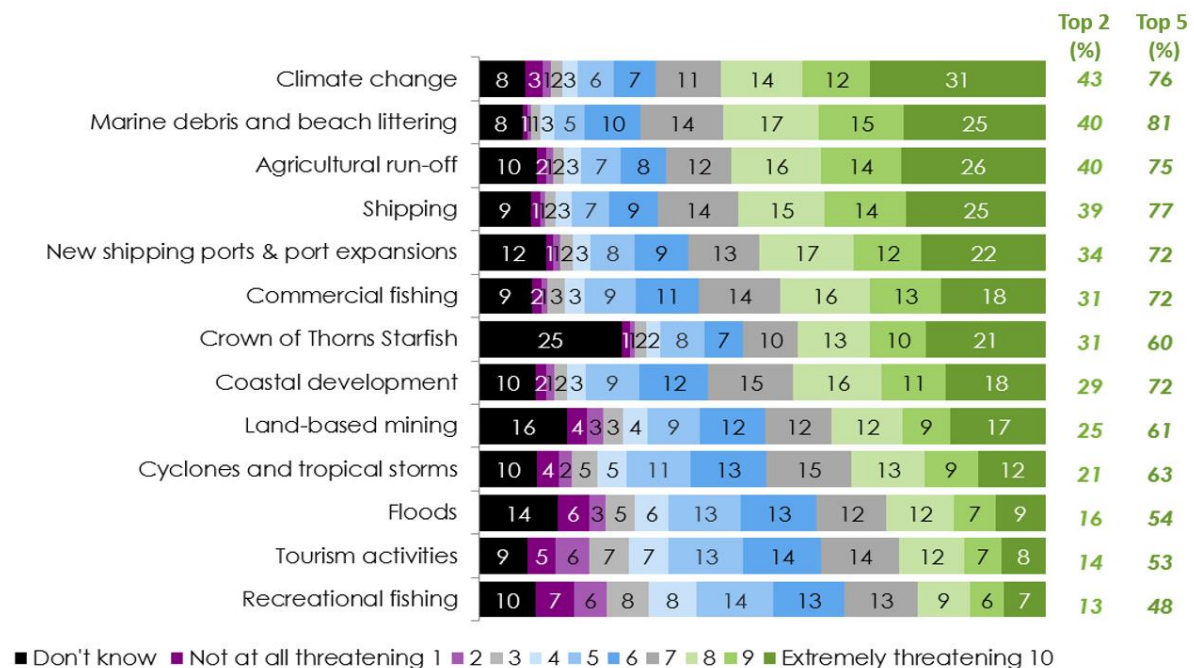
**Figure 4.2.** Respondent attitudes about the GBR as scored on a 10-point scale (1 = very strongly disagree and 10 = very strongly agree). The ‘Top 2’ refers to the percentage of respondents who selected a 9/10 or 10/10. The ‘Top 5’ refers to the percentage of respondents who agreed with each statement (i.e., selected a score of 6, 7, 8, 9, or 10).

Australians believe that climate change is the biggest threat to the GBR, with responses in this study being strongly skewed toward an extreme threat rather than a minor threat (Figure 4.3). Overall, 89% of Australians believed that climate change is a threat to the GBR. These findings are congruent with the widely recognised scientific opinion that climate change is the biggest long-term threat to coral reefs around the world, including the GBR (Great Barrier Marine Park Authority, 2009). However, translating these attitudes about climate change into a pragmatic community response that benefits local ecosystems will require a rapid and widespread reaction, both at the individual and societal level (Whitmarsh & Lorenzoni, 2010). For example, there is an immediate need to transition to renewable energies in order to curb the effects of climate change on marine tourism enterprises (Odeku, 2013). Unfortunately, social change is notoriously problematic to create, particularly with respect to climate change policy. Societal innovation may require the erosion of the status quo, new social arrangements for crafting public policy, and radical innovations that disrupt existing research paradigms (Shove, 2010). While difficult, initiatives led by government or industry may provide the initiative required to foster widespread behaviour change needed to address pressing environmental threats such as climate change (Ockwell *et al.*, 2009; Zeppel, 2012b).

#### 4.4.1 Incorporating the human dimension into resource management

The iconic status and precarious future of the GBR appears to affect a large majority of the Australian population. My results suggest that the GBR is one of Australia’s most inspiring and most personally significant national icons. It is also among the most vulnerable, and Australians overwhelmingly recognise that there are many diverse and severe threats to the GBR, particularly climate change. These results do not directly assess public support for management or legislation, yet they indicate that Australians may be open to stronger policies for protecting the GBR, particularly those that are aligned with their own beliefs (Ward & van Vuuren, 2013). While some of my findings address novel

areas of inquiry, such as the inspiration derived from Australian icons, other results support previous studies highlighting climate change awareness within Australian communities (Nilsson *et al.*, 2010) and concern about climate change impacts along the GBR (Sutton & Tobin, 2011; van Riper *et al.*, 2012b)



**Figure 4.3.** Respondent perceptions of threats to the GBR as scored on a 10-point scale (1 = not at all threatening and 10 = extremely threatening). The ‘Top 2’ refers to the percentage of respondents who selected a 9/10 or 10/10. The ‘Top 5’ refers to the percentage of respondents who selected a score of 6, 7, 8, 9, or 10).

An exploration of the national psyche provides preliminary context for assessing support for existing management policies and ongoing communication and engagement frameworks. For example, the broad recognition that climate change is a major threat to the GBR may instil greater confidence in managers and policy makers to engage the public in discussions about a more robust management response. The GBR Marine Park Authority has proactively initiated a variety of forward-thinking projects including a vulnerability assessment and a multi-year action plan to address climate change impacts on the GBR. However, clarifying individual perspectives will help managers to synchronise these outputs with community intentions as well as evaluate the ongoing efficacy of existing arrangements.

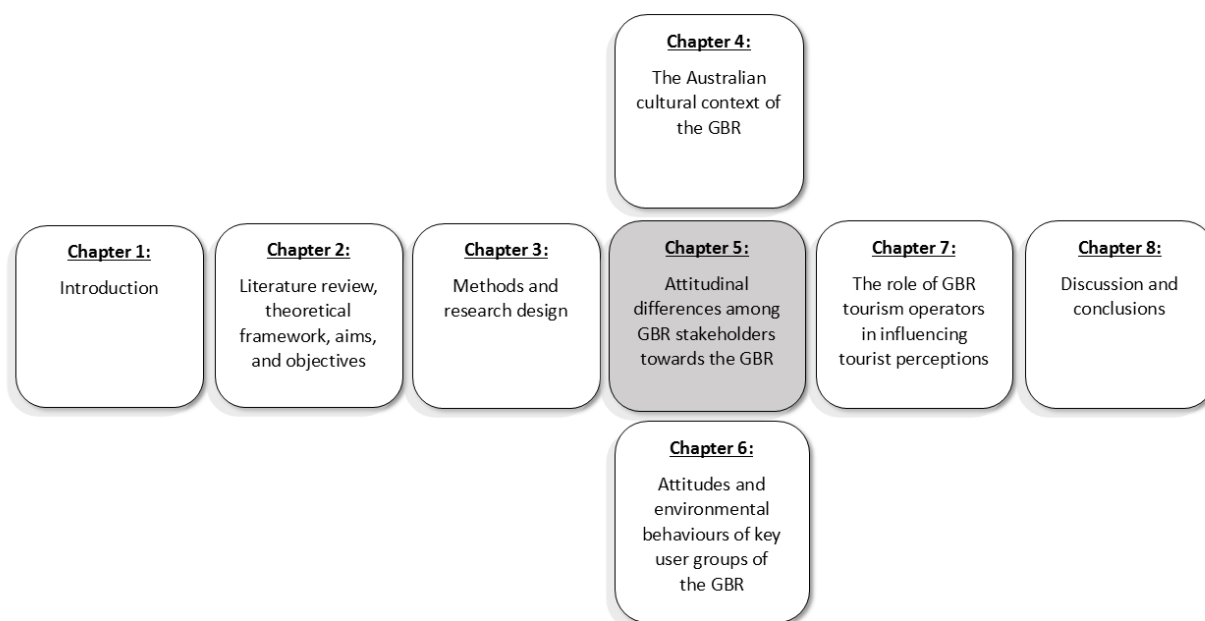
The GBR is one of the most widely recognised and valuable ecosystems on the planet, but economic and environmental arguments have not been sufficient to protect it from major threats such as climate change. However, such arguments may be more effective and impactful if they are communicated in a way that reflects the influential attributes that connect individuals to the GBR. Effective resource management depends upon the policies and regulations in place, but also upon how resource users perceive environmental conditions, regulations, and management effectiveness. A strong majority of Australians are deeply concerned about and connected to the GBR, and they feel a responsibility to protect it. These relationships may provide the necessary leverage to facilitate community support for enhanced management and protection of the GBR. The socio-ecological impact resulting from the loss of the GBR would be inconceivably large, but so too is the existing opportunity to galvanise the social and cultural values it instils in us to ensure its future preservation.

In the next chapter, I expand on this idea, describing how a perceived responsibility to protect the GBR may assist resource managers in engaging the public to take action to protect the long-term health of the GBR. Specifically, I use the data collected from the SELTMP regional surveys to analyse how various attitudes and beliefs influence the individual and collective responsibility that people feel to protect the GBR.



## CHAPTER 5: ATTITUDINAL DIFFERENCES AMONG GREAT BARRIER REEF STAKEHOLDERS TOWARDS THE GREAT BARRIER REEF

In the previous chapter, I discussed how the GBR is part of the Australian psyche, affecting the identity that people derive from the GBR as well as the pride, optimism, and personal affection they feel for it. Australians throughout the country also demonstrated a strong and widespread responsibility to protect the GBR, recognised as both a personal obligation but also as a collective commitment from all members of society as well. However, the results from the previous chapter are broad in scale and potentially difficult to interpret in light of local and/or regional differences among stakeholders. Other researchers have not been able to contribute much to this area of inquiry, particularly the reasons that people take action to protect the GBR. Here, in Chapter 5, I set out to address this knowledge gap, conducting an in-depth exploration of the responsibility that stakeholders feel to protect the GBR. I do this by comparing the key findings from the national survey described in Chapter 4, with 5,802 face-to-face surveys conducted among residents and tourists within the GBR region. Specifically, I investigate how responsibility to protect the GBR relates to other concepts, concerns, and attitudes that people associate with the GBR. Further, I expand the analyses to compare how these perceptions differ across spatial scale, contrasting the beliefs of residents and tourists along the GBR to those held by Australians throughout the country. I conclude with a discussion of the main implications for resource managers working to protect the GBR.



Source reference:

**Goldberg, J.,** Bonin, M., Marshall, N., Birtles, A., Bohensky, E., Case, P., Curnock, M., Pert, P., Stone-Jovicich, S., and R. Tobin (in preparation) Who cares about the Great Barrier Reef? *Ambio*.

### 5.1. Chapter Summary

Managers of Protected Areas often promote environmental stewardship and ecosystem protection by appealing to stakeholders' conservation ethos. Specifically, an enhanced sense of individual and collective responsibility to protect environmental assets can lead to greater support for conservation measures, and better conservation outcomes. Surprisingly little scholarship has focused on the factors that influence stakeholder sense of responsibility so as to support resource managers who try to enhance community engagement and the conservation of natural areas. Here, I focus on each of the following factors as potential influences on feelings of responsibility: pride, identity, optimism, and personal affection for an iconic ecosystem. Using the Great Barrier Reef (GBR) as a case study, I surveyed three distinct groups of Australian stakeholders. National residents (n=2,002), local residents of the GBR coastline (n=3,181), and tourists visiting the region (n=2,621) perceived responsibility to protect the GBR in significantly different ways. High levels of perceived individual and collective responsibility to protect the GBR were widespread, yet attitudes about the GBR varied considerably between user groups. Perceptions of responsibility to protect the GBR were correlated with attitudes about the GBR, including the level of personal identity an individual feels, pride in the status of the GBR as a World Heritage Area, optimism about the future of the GBR and concerns about a decline in the health of the GBR. A more comprehensive consideration of the attitudes that influence sense of responsibility may lead to more successful management interventions, increasing stewardship, resilience, and support for conservation activities in linked socio-ecological systems such as the GBR.

### 5.2. Introduction

Ecosystems around the world are degrading due to a variety of human impacts (Bellwood *et al.*, 2004; Vorosmarty *et al.*, 2010), and many environments are expected to further deteriorate in coming years as threats such as climate change become more severe (Anthony *et al.*, 2011; Joshi *et al.*, 2011; Nicholls *et al.*, 2011). Urgent behaviour change is required if the ecosystems that human populations depend on are to be sustained in the long-term (Moser, 2010). In this chapter, I attempt to contribute to the growing scholarship around pro-environmental behaviour change by more deeply examining how people connect to nature and utilise natural resources (Eden, 1993; Safford *et al.*, 2014; Steg & Vlek, 2009).

An improved understanding of the connections between ecosystems and individuals can help resource managers to enhance the resilience of socio-ecological systems (Adger *et al.*, 2005). Factors that contribute to resilience change across multiple scales of space and time, affecting the function and stability of linked socio-ecological systems as well as the people who rely upon these systems for their livelihoods and wellbeing (Bohensky, 2008; Folke *et al.*, 2010). The individual level scale is important to understand because individual actions that enhance resilience can be encouraged and promoted. Furthermore, it is ultimately the collective actions of individual ecosystem users that determine the fate of an ecosystem. For example, the attachment that an individual has to a place can be used to assess the resilience of resource users (Marshall & Marshall, 2007) and to improve decision-making processes related to natural resource management (Cvitanovic *et al.*, 2014). There are several facets of the relationship between individuals and ecosystems that are potentially important for managing the resilience of natural environments. Here, I focus on the sense of responsibility to take action (O'Malley, 2010), including the decisions people make during difficult circumstances (Biggs, 2011) and the way they respond to environmental threats such as climate change (Sutton & Tobin, 2011).

When natural resources such as coral reefs are regulated by government, management arrangements may shift rights and responsibilities from government to local resource users (Berkes, 2002). Depending upon the socio-political setting, government structures may be incompatible with those required to support environmental practices promoting socio-ecological resilience (Tompkins & Adger, 2004). In developed countries such as Australia, governments increasingly promote the

concept of responsibility to engage stakeholders in resource management strategies (Bergsma *et al.*, 2012), particularly those relating to the capacity of individuals to react and adapt to changing environmental conditions (Grothmann & Patt, 2005; Myers *et al.*, 2012a). It has become evident in recent years that environmental conservation requires the development of strategies that foster public responsibility for resource protection (Parisi *et al.*, 2004).

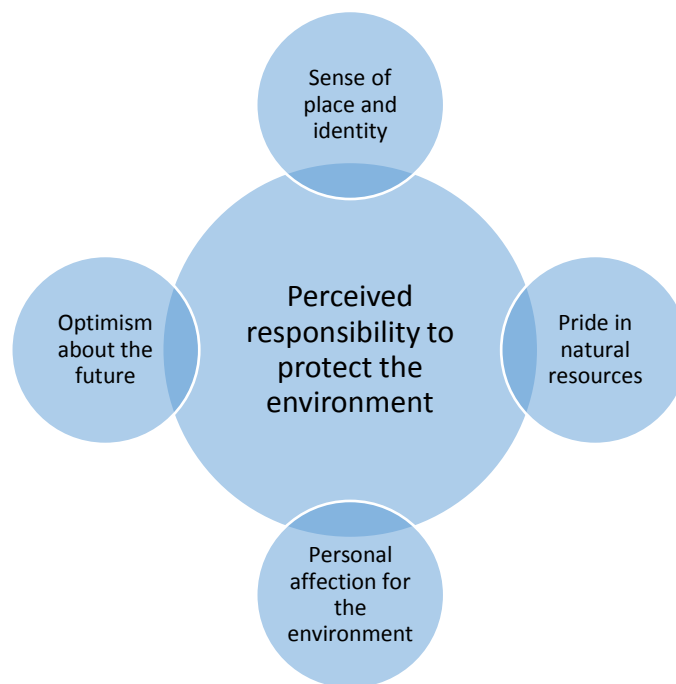
This promotion of responsibility is important because it can bring people together to act collectively, complementing regulations that may be unable to adequately address the complex and diverse nature of environmental threats (Weber, 2000). Consequently, at an individual level, personal responsibility has been promoted for decades to encourage environmentalism, green consumerism, and the initiation of sustainable behaviours (Eden, 1993). This process often involves the development of targeted messages that emphasise the importance of responsibility while concurrently attracting attention from diverse audiences and promoting deeper thinking (Rickard *et al.*, 2014). Unfortunately, not all governments or political systems emphasise responsibility, scope of action or provide the option to participate in a political process. However, in areas where political and social conditions are amenable to such actions, deliberate thought has been shown to lead to strong and lasting changes in perceptions about individual responsibility as well as the initiation of pro-environmental behaviours taken in response (Ham *et al.*, 2009; Ham, 2007). Although an enhanced sense of personal and collective responsibility to protect natural resources may indicate a greater desire to be involved in their management and long-term care (McKinley & Fletcher, 2010), very little research has explored the factors that influence stakeholder sense of responsibility for protecting natural areas.

Protected area managers use a variety of education, outreach, and awareness-raising programs to communicate and influence local stakeholder behaviour (Evans, 2011). Unfortunately, they often lack comparable data about key differences between stakeholders, particularly perceptions of responsibility and others such as identity that may influence individual behaviour (Fielding *et al.*, 2008a; Fielding *et al.*, 2008b). This lack of information makes it difficult to understand the levels of stewardship and responsibility that exist among key stakeholder groups, limiting the ability of protected area managers to understand the drivers and motivations of the individuals they seek to influence. A more holistic understanding of stakeholder perceptions may help protected area managers to communicate more effectively, leading to enhanced stewardship and more effective conservation programs and intervention approaches (Maibach *et al.*, 2008; van Riper *et al.*, 2012b). For example, understanding how and why an individual connects with a place is an important concern for conservation as the connection a person has to a natural resource, including concerns about its future, can influence individual intentions and environmentally responsible behaviours taken in response (Halpenny, 2010; Vaske & Kobrin, 2001), e.g., a reduction of litter in national parks (Brown *et al.*, 2010) and improved rates of kerbside recycling (Nigbur *et al.*, 2010). Thus, a better understanding of individual attitudes and behaviours associated with the environment can help protected area managers to manage environmental threats more effectively (Scannell & Gifford, 2013).

Several factors are likely to influence a person's sense of responsibility to protect the environment within which they live and work (Figure 5.1). I list some of the key factors here: A sense of place is likely to be important because a better understanding of how and why people connect with these places may provide opportunities to enhance public support for managing these areas (Halpenny, 2010; Johnson & Marshall, 2007). One way to understand the connection that people have for a place is to document the meanings they associate with that setting (Wynveen *et al.*, 2010). Personal involvement with nature can influence opinions about resource protection and behaviours taken in response to perceived environmental threats (Devine-Wright & Clayton, 2010). Pride in local resources can affect these decisions and act as an important influence in environmental activities such as the establishment of marine protected areas (Ballantine, 1995) and the development of community



engagement programs that promote conservation of natural resources (Jenks *et al.*, 2010). Optimism about the future could be an important influence on responsibility as optimism is a way to measure the level of risk seeking or risk aversion that an individual feels (Hochschild *et al.*, 2012). A positively-biased view of local environmental conditions may affect local actions taken in response, e.g., impacting on perceived urgency, creating considerable challenges for behaviour change campaigns if biased assessments of the local environment exists (MacDonald *et al.*, 2015). For example, it may be difficult to encourage people to take action or demand change if they do not recognise existing threats to local natural resources (Novacek, 2008). Identity associated with a natural resource or place has been linked in other studies to how people cope with change and adapt (Marshall *et al.*, 2012), including the pro-environmental behaviours they undertake (Raymond *et al.*, 2011). Understanding the role of identity in mediating behaviour toward the natural world thus has serious practical implications for the development of protective environmental policies and behaviours (Clayton & Opatow, 2003). It is likely that identity may also be an important influence on how people develop a sense of responsibility, influencing their attitudes towards human impacts on the environment (Wynveen *et al.*, 2014). The extent to which a person might be personally affected by the loss of nature (Adger *et al.*, 2011) may also be attributed to the responsibility they feel to protect it.



**Figure 5.1.** Four factors are likely to influence the perceived responsibility that an individual feels to protect the environment: optimism about the future, personal affection for the environment, pride in natural resources, and a sense of place and identity derived from the environment.

The aim of this study is to explore the attitudes held by people in Australia about an iconic coral reef ecosystem, the GBR, and to describe how and why perceptions of responsibility to protect it differ among three key user groups: national residents, local residents, and tourists. I address four main research questions:

1. How do attitudes about the GBR (e.g. pride in its status as a World Heritage Area, optimism about its future, the contribution of the GBR to individual identity, and how personally affected an individual would be by a decline in reef health) differ for each user group?

2. How do attitudes about the GBR relate to individual perceptions of responsibility to protect it?
3. What is the sense of responsibility to protect the GBR felt by key user groups of the GBR?
4. How does the perceived responsibility to protect the GBR differ for each user group?

### **5.2.1. Case study: the Great Barrier Reef**

The GBR is a useful case study to explore how the connection an individual has to an iconic landscape influences the perceived responsibility to protect it. Understanding how people connect to the environment is a key first step towards creating resource management programs that encourage pro-environmental behaviours (Vaske & Kobrin, 2001), including those that maintain or enhance valued attributes of that setting (Stedman, 2002). However, very little is known about the responsibility that local stakeholders feel for protecting the GBR, or how attitudes about the GBR differ between local residents and other residents living throughout Australia. Thus, resource managers and conservation practitioners lack information that could assist ongoing efforts to develop targeted engagement approaches for key stakeholder groups. For example, national residents are an important constituency for supporting government decision-making and policies yet significant knowledge gaps exist about how the wider Australian community connects to the GBR (Young & Mar, 2010). Because little is known about how national residents feel about the GBR and why they connect to it, it is difficult to develop effective communication campaigns that promote conservation activities. Similar problems exist with local residents and tourists, two other important stakeholder groups where comparable information is lacking. Local residents depend heavily on the GBR for recreation and livelihood opportunities and would be affected by changes in resource condition (Tobin *et al.*, 2014b), while tourists are a vital component of commercial marine tourism, the most significant use of the GBR in terms of economic value and employment (Great Barrier Marine Park Authority, 2014). Both user groups consist of millions of individuals who can be engaged and informed about the threats to the GBR.

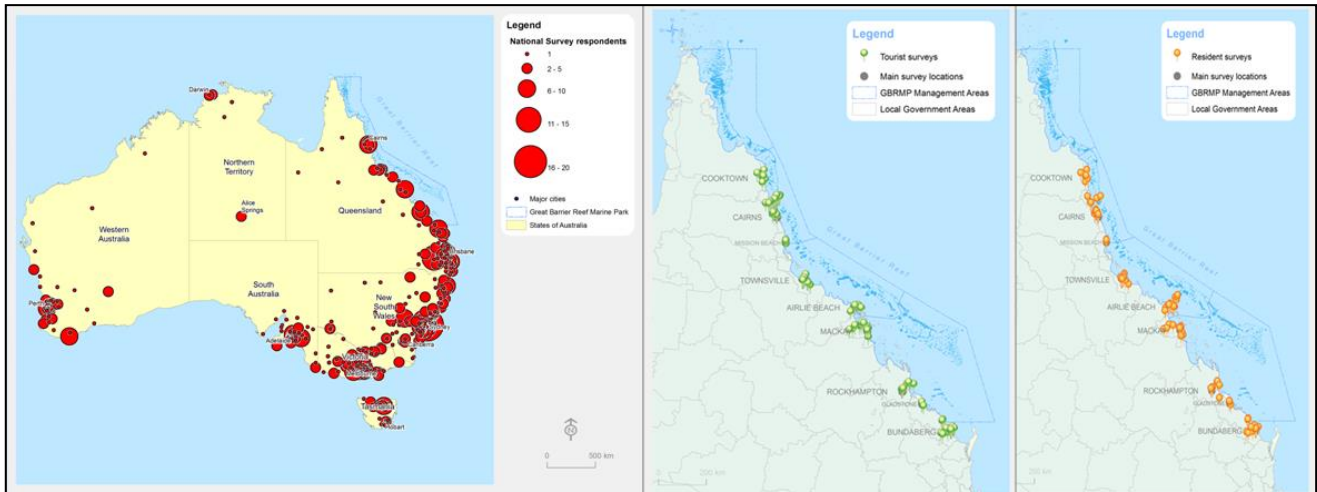
### **5.3. Methods**

This research involved two main components: an online national survey of Australian residents (Goldberg *et al.*, 2014), and face-to-face regional surveys of coastal Queensland residents (Tobin *et al.*, 2014b) and tourists (Curnock *et al.*, 2014a). Each survey had two phases: survey design and survey administration. These surveys are described in detail in Chapter 3 and summarised briefly below.

#### **5.3.1. Survey design and administration**

Information gaps were identified and indicators established via a participatory stakeholder process. A template was then used to develop three separate surveys that targeted the main user groups of the GBR: national residents (i.e. Australians living outside of the GBR region), coastal residents living along the GBR, and tourists visiting the GBR region. Survey questions were presented as statements and were based on previous regional studies (Marshall *et al.*, 2009; Marshall, 2010; Moscardo, 2008; van Riper *et al.*, 2012b; Young & Mar, 2010). The surveys were designed following extensive consultation with local stakeholder groups (e.g. tourism industry representatives), protected area managers (e.g. GBRMPA), researchers (e.g. JCU) and various funding agencies. Survey questions were identical across all three surveys except for one. I anticipated that most national residents had never visited the GBR (Goldberg *et al.*, 2014) while most local residents and tourists would have visited the GBR (Curnock *et al.*, 2014a; Tobin *et al.*, 2014b). Tourists and local residents were thus asked to rank their agreement with “The GBR is part of my identity,” while national residents were asked to respond to “The GBR is part of my Australian identity.” These two statements are included to reflect and assess the differences between self-identity, i.e., personal identity, and social identity, i.e., an identity associated with belonging to a group or collective. The national survey was conducted online from March 26 to April 2, 2013 (n = 1,000) and from September 4-10, 2013 (n = 1,002). The survey sample (n = 2,002) was recruited from a major Australian research panel, in line with specified quotas that were

geographically and demographically representative of the Australian population. Face-to-face regional surveys of coastal residents (n=3,181) and tourists (n=2,621) were conducted from May to August, 2013 (Figure 5.2). Detailed information about the survey design and administration can be found in Chapter 3.



**Figure 5.2.** Geographic distribution of the local resident, tourist, and national surveys conducted across Australia and along the GBR region.

### 5.3.2. Data analyses

Answers to negatively worded statements (i.e. survey statements 2 and 4) were reversed prior to analysis. To investigate whether perceived responsibility to protect the GBR differed between stakeholder groups, I compared the level of agreement to statements 1 and 2 between local residents, national residents, and tourists visiting the GBR region. Examination of the data revealed significant deviations from normality, and therefore non-parametric Kruskal-Wallis tests were used to compare between the user groups.

To address research question 2, attitudinal differences in pride, identity and personal connection to the GBR between groups were also explored using independent-samples Kruskal-Wallis one-way ANOVA tests, due to deviations in normality in the raw survey data. Differences in optimism and identity were explored using a P-P plot to test for normality, and a one-way analysis of variance (ANOVA).

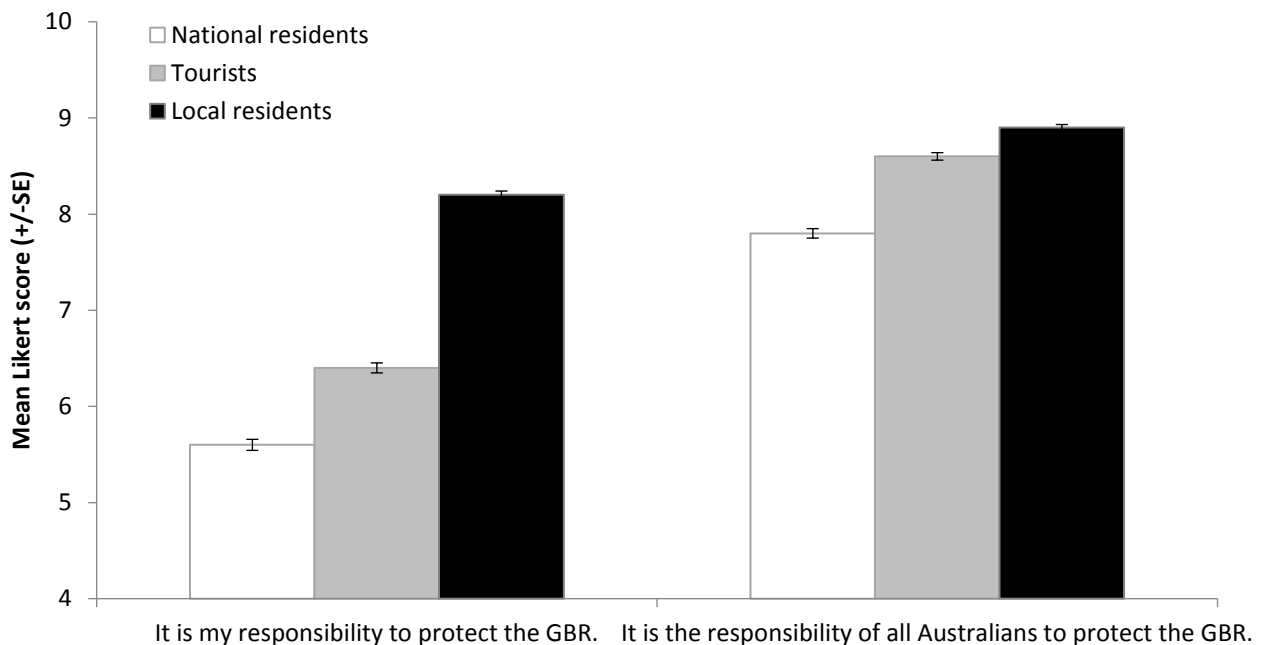
To address research question 3, contingency tables were used to test for associations between attitudes about collective responsibility (Statement 1) and personal responsibility to protect the GBR (Statement 2) and other perceptions about the GBR (i.e. Statements 3-6). For these analyses, the 10-point scale response data for each statement were placed into three categories: Strongly Disagree (1-3), Slightly Agree/Slightly Disagree (4-7), and Strongly Agree (8-10). For each pair of survey statements, a 3 x 3 contingency table was constructed using the observed frequency of responses to the two statements that fell into these categories. Pearson's chi-square was then used to compare this table of observed frequencies to a 3 x 3 table of the frequencies that would be expected if there was no association in the responses to the two statements. A significant p-value for the chi-square would indicate that the responses to the two statements were significantly associated, i.e. a person's response to one statement was influenced by their response to the other. When significant associations between responses were found, standardised Pearson's residuals were calculated in order to interpret the nature of that association. Larger values of the residuals indicated a stronger degree of association and the sign (+ or -) indicated whether the frequency of observed responses was

higher (+) or lower (-) than expected. Because these contingency analyses involved multiple significance tests, post-hoc Bonferroni corrections were used to control the Type I error rate (0.0042 for Table 2 and Table 3).

## 5.4. Results

### 5.4.1. Perceived responsibility to protect the GBR

All three user groups showed relatively high levels of agreement that an individual and collective responsibility to protect the GBR exists (Figure 5.3). Local residents of the GBR coastal region had the highest levels of agreement, significantly higher than tourists and national residents (Table 5.1). Tourists agreed significantly more than national residents that there was an individual and collective responsibility to protect the GBR. National residents had the lowest levels of agreement regarding their personal responsibility to protect the GBR, and also that it was the responsibility of all Australians to protect the GBR. However, all three user groups had a strong and widespread agreement, indicating a collective responsibility to protect the GBR existed.



**Figure 5.3.** Mean levels of agreement with two statements concerning personal and collective responsibility to protect the Great Barrier Reef. Responses are shown for three user groups: National residents, local residents, and tourists. Survey responses were gathered on a 10-point scale where 1 = very strongly disagree and 10 = very strongly agree.

### 5.4.2. Attitudinal differences between GBR user groups

National residents had the highest agreement that the GBR was part of their identity (Figure 5.4), significantly higher than local residents and tourists (Table 5.1). Tourists had the lowest level of agreement that the GBR was part of their identity. Mean optimism levels about the future of the GBR were similar across all three groups, although national residents had significantly lower agreement than local residents and tourists that they were optimistic about the future of the GBR. Local residents and tourists did not have significantly different levels of optimism about the future of the GBR.

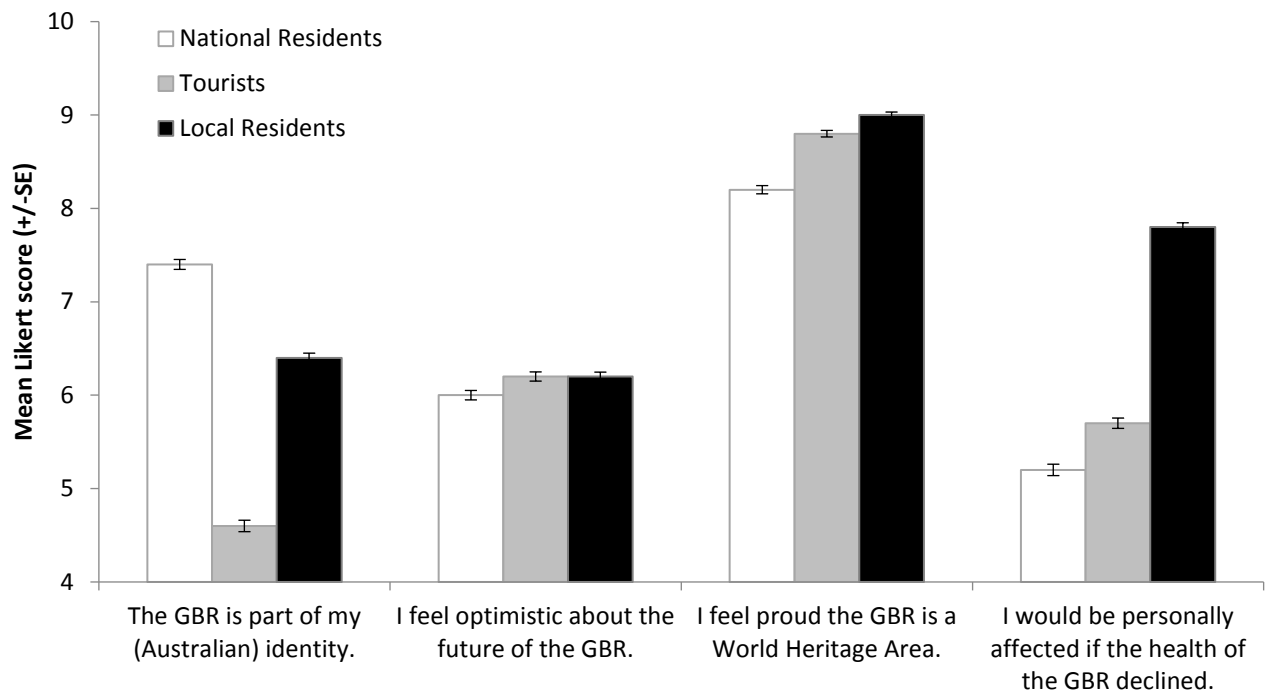
**Table 5.1: The mean, standard deviation, sample size and percentage of respondents who agreed with each of six statements about the GBR**

Statement	National residents				Local residents				Tourists			
	Mean	SD	Sample size	% who agree <sup>1</sup>	Mean	SD	Sample size	% who agree	Mean	SD	Sample size	% who agree
I feel proud the GBR is a World Heritage Area †.	8.2***	1.91	1,885	86	9.0***	1.77	3,044	94	8.8***	1.76	2,507	93
It is the responsibility of all Australians to protect the GBR †.	7.8***	2.13	1,876	81	8.9***	1.76	3,007	94	8.6***	1.94	2,537	92
It is my responsibility to protect the GBR †.	5.6***	2.39	1,844	61	8.2***	2.24	3,069	88	6.4***	2.61	2,514	79
The GBR is part of my (Australian) identity ††.	7.4***	2.30	1,862	77	6.4***	2.77	3,032	64	4.6***	2.96	2,320	37
I feel optimistic about the future of the GBR ††.	6.0**	2.62	1,810	54	6.2	2.62	3,065	61	6.2	2.46	2,507	61
I would be personally affected if the health of the GBR declined †.	5.2***	2.62	1,843	54	7.8***	2.54	3,071	82	5.7***	2.77	2,491	69

<sup>1</sup> Responded with a score of 6 or higher out of 10.

\*\* p < 0.01 \*\*\* p < 0.001 †Kruskal-Wallis tests ††One-way analysis of variance (ANOVA)

National residents had the lowest level of agreement that they were proud of the World Heritage Area status of the GBR (Figure 5.4). Tourists and local residents held significantly higher levels of agreement than national residents that they were proud of the GBR status as a WHA (Table 5.1). Local residents had the strongest agreement that they would be personally affected if the health of the GBR declined (Figure 4). National residents and tourists showed significantly lower agreement that they would be personally affected by a decline in the health of the GBR (Table 5.1).



**Figure 5.4.** Attitudes about the GBR segregated by user group. Responses are shown for three user groups: National residents, local residents, and tourists. Survey responses were gathered on a 10-point scale where 1 = very strongly disagree and 10 = very strongly agree.

### 5.4.3. Attitudes and perceptions of responsibility to protect the GBR

Attitudes about the GBR were significantly correlated with individual perceptions of responsibility to protect it (Table 5.2 and Table 5.3). All three user groups showed significant relationships between the perceptions of individual and collective responsibility to protect the GBR and their perceptions of identity, pride, optimism, and connection to the health of the GBR.

#### 5.4.3.1. Influences on collective responsibility

Agreement with a collective responsibility to protect the GBR was significantly associated with attitudes about pride, optimism, identity, and personal connection to the health of the GBR across all three user groups (Table 5.2). An inspection of the standardised residuals indicated two key findings:

1. Among local and national residents, those who strongly disagreed there was a collective responsibility to protect the GBR also strongly disagreed that the GBR was part of their identity and that they were proud the GBR was a World Heritage Area.
2. National residents who strongly agreed that it was the responsibility of all Australians to protect the reef also felt strongly optimistic about the future of the GBR, whereas those that did not consider reef protection to be a collective responsibility of all Australians tended to be more pessimistic about its future.

**Table 5.2: Perceptions of collective responsibility and attitudes about the Great Barrier Reef.**  
Significance values include the application of a conservative Bonferroni correction.

Statement	Local residents			National residents			Tourists		
	$\chi^2$	Sample size	p-value	$\chi^2$	Sample size	p-value	$\chi^2$	Sample size	p-value
The GBR is part of my (Australian) identity	165.24	2,962	p = 0.000	692.98	1,836	p = 0.000	122.41	2,276	p = 0.000
I feel proud that the GBR is a World Heritage Area	249.44	2,978	p = 0.000	918.96	1,859	p = 0.000	188.11	2,455	p = 0.000
I feel optimistic about the future of the GBR	58.80	3,027	p = 0.000	144.57	1,794	p = 0.000	53.34	2,469	p = 0.000
I would not be personally affected if the health of the GBR declined	182.39	3,033	p = 0.000	213.74	1,818	p = 0.000	92.74	2,452	p = 0.000

\* Pearson's Chi-square: p < 0.05.

#### 5.4.3.2. Influences on individual responsibility

Attitudes about pride, optimism, identity and personal connection to the health of the GBR were significantly correlated with feelings of personal responsibility to protect the GBR across all three user groups (Table 5.3). An inspection of the standardised residuals indicated four key findings:

1. Local and national residents who strongly agreed it was *not* their personal responsibility to protect the GBR were more likely to disagree the GBR is part of their identity. Conversely, those who disagreed it was *not* their personal responsibility to protect the GBR (i.e. they felt personally responsible to protect it) were more likely to agree the GBR was part of their identity.
2. Local residents who strongly agreed there was *not* a personal responsibility to protect the GBR were significantly more likely to disagree they were proud the GBR is a WHA.
3. Among all three user groups, attitudes about personal responsibility to protect the GBR were strongly dependent on levels of optimism about the future of the GBR. Individuals who strongly agreed that they do *not* have a personal responsibility to protect the GBR were more likely to be strongly optimistic about the future of the GBR, while those that felt a stronger personal responsibility to protect the reef were significantly less optimistic about its future.
4. Individuals in all three user groups who strongly agreed that they do *not* have a personal responsibility to protect the GBR were significantly more likely to agree that they would *not* be personally affected by a decline in the health of the GBR. Furthermore, those who strongly disagreed that they do *not* have a personal responsibility to protect the GBR were more likely to also strongly disagree that they would *not* be affected by a decline in GBR health.

**Table 5.3: Perceptions of individual responsibility and attitudes about the Great Barrier Reef.**  
Significance values include the application of a conservative Bonferroni correction.

Statement	Local residents			National residents			Tourists		
	$\chi^2$	Sample size	p-value	$\chi^2$	Sample size	p-value	$\chi^2$	Sample size	p-value
The GBR is part of my (Australian) identity	141.95	2,963	p = 0.000	239.25	1,812	p = 0.000	80.63	2,273	p = 0.000
I feel proud that the GBR is a World Heritage Area	92.31	2,973	p = 0.000	177.64	1,830	p = 0.000	61.63	2,437	p = 0.000
I feel optimistic about the future of the GBR	80.66	3,027	p = 0.000	151.15	1,772	p = 0.000	58.88	2,450	p = 0.000
I would not be personally affected if the health of the GBR declined	659.32	3,039	p = 0.000	495.77	1,804	p = 0.000	381.46	2,447	p = 0.000

\* Pearson's Chi-square: p < 0.05.

## 5.5. Discussion

This study aimed to describe the attitudes held by people in Australia about an iconic coral reef ecosystem, the Great Barrier Reef (GBR), and to elucidate how and why different groups of people hold differing perceptions of responsibility to protect the GBR. I observed that national survey respondents, local residents along the GBR coastline, and tourists visiting the GBR region felt a strong and widespread responsibility to protect the GBR, as shown by the high ratings given. This responsibility is significantly positively correlated with the attitudes respondents have about the GBR, including the perceptions of pride, identity, and optimism they associate with the GBR. Here, I discuss the connection that three major stakeholder groups have with the GBR and the implications of these findings for natural resource management, particularly with respect to community engagement and stewardship.

Each region of the tropical world has its own unique challenges, opportunities, and barriers for resource management and community engagement. These issues include corruption, inadequate enforcement, and limited stakeholder participation in management (Aswani *et al.*, 2015; Wilkinson & Salvat, 2012). Further, over 400 million people in developing countries live within 100 km of a coral reef, and many of these people directly depend on reefs for livelihood and food security (Donner & Potere, 2007), including over a quarter of the world's small-scale fishers (Teh *et al.*, 2013). Whilst my study focused on natural resource management within an industrialised, developed and democratic country with strong and reliable enforcement, I believe that the results are applicable to a wider international audience. Specifically, I suggest that the relationship between attitudes and responsibility is closely linked, affecting how and why stakeholders connect to a resource. Although these connections may differ depending upon social, political, and economic circumstances, they are nonetheless relevant factors for planning and implementing resource management programs and projects. In Australia, this is especially relevant as stakeholders can, and often do, collaborate with



resource managers in various aspects of conservation. How these individuals think and feel about the resource is thus a crucial part of the ongoing collaborative process.

#### **5.5.1. Differences in perceived responsibility to protect the GBR between user groups**

Most national residents, local residents, and tourists agreed that it is the responsibility of all Australians to protect the GBR, which is suggestive of a widespread recognition of the need for public accountability and collective support for the conservation of the GBR. This underlying yet unifying ethos held by both Australians and visitors to Australia supports previous findings suggesting the GBR inspires and concerns people from all over the world (Curnock *et al.*, 2014a; Prideaux *et al.*, 2015). However, collective responsibility is ultimately tied to the support of individual action (Roberts, 2014). Although most respondents in all three user groups strongly believed it was the responsibility of everyone to protect the GBR, they felt significantly less strongly that it was their own personal responsibility to do so. Local residents felt the strongest agreement in a personal responsibility to protect the GBR, likely due to their reliance on the GBR for economic and recreational opportunities (Tobin *et al.*, 2014b). Proximity to the GBR may also influence perceptions of responsibility to protect it. Tourists and national residents who live outside the region had significantly lower levels of agreement than local residents that they felt personal responsibility to protect the GBR. These user groups may feel psychologically distant from the GBR (Scannell & Gifford, 2013), holding more superficial connections to the area compared to the strong attachments found in individuals residing locally (Hay, 1998). Future studies that clarify the connections that people have with the GBR would make valuable contributions to intervention methods that encourage responsibility, particularly if researchers can quantify why visitors form ties to natural resources and how these associations affect their views regarding the management of these locations (Kaltenborn & Williams, 2010). Research that helps transform widespread collective responsibility into individual action would also greatly benefit ongoing natural resource management approaches.

#### **5.5.2. Differences in attitudes about the GBR between user groups**

In comparison to national residents and tourists, local residents had the strongest personal connection to the GBR, as measured by the responsibility, pride, optimism, and identity they associate with the GBR. This connection is most likely related to their dependence on the GBR for their livelihoods and leisure. Tobin *et al.*, (2014) showed that 95% of local residents have visited the GBR for recreation at least once, and that 25% of local residents were reliant on the GBR for at least some of their income. Further, local residents hold higher levels of optimism about the future of the GBR and a greater sense of responsibility to protect it than their counterparts living outside of the region (Young & Mar, 2010; Young & Temperton, 2008). National residents, however, showed the strongest agreement that the GBR was part of their identity, although this may be an artefact of how the question was phrased, i.e., “The GBR is part of my identity” versus “The GBR is part of my Australian identity.” The GBR is thus part of how Australians view themselves, yet further research is needed to clarify exactly how and why national residents identify so strongly with the GBR and how these beliefs can change. This clarification may assist in developing engagement and communication outputs that influence stakeholders, as perceptions of identity can be a crucial influence on individual behaviour (Fielding *et al.*, 2008a; Fielding *et al.*, 2008b; Nigbur *et al.*, 2010). Tourists had a relatively detached connection with the GBR compared to local and national residents, potentially due to a combination of geographic and psychological attributes.

Residency proximity can affect the different emotional, symbolic, and functional connections that groups have with a place or setting (Budruk *et al.*, 2011). That is, people generally care more about nearby surroundings than they do about places that are far away (Nyaupane & Graefe, 2008), despite believing that distant environmental problems are worse than local ones (Gifford *et al.*, 2009). Thus, tourists may perceive themselves as temporary visitors to the region, and despite a sense of responsibility to protect the GBR, they appear to feel disconnected and/or unable to affect the state

of the resource or contribute towards efforts to improve it. However, social trends of increasing mobility may lead individuals to develop stronger attachments to faraway places (Devine-Wright, 2013), thus affecting the behaviours they undertake to protect them (Vaske & Kobrin, 2001). Although tourists may lack a strong personal responsibility to protect the GBR, the arousal or creation of positive memories on their trip, e.g., a once-in-a-lifetime experience to the GBR, may lead to a greater proportion of positive beliefs (Bagozzi, 1996) and a subsequent elicitation of positive evaluations, i.e. “a halo effect” (Oh *et al.*, 2007). Combining exceptional experiences with effective interpretation may reinforce proactive behaviours, influencing tourists to behave more responsibly in protected areas (Ham *et al.*, 2009).

### **5.5.3. The link between GBR attitudes and perceived responsibility to protect it**

Perceived responsibility to protect the GBR is closely tied to the attitudes and opinions that people associate with the GBR. Individuals in all three user groups who strongly agreed they had a personal and collective responsibility to protect the GBR held significantly different connections to the GBR than individuals who strongly disagreed that such responsibility exists. Additionally, people responded differently about individual and collective responsibility to protect the GBR, conceptualising them in non-uniform ways. That is, the way an individual perceived his/her own obligation to protect the GBR was different to the opinion held about collective action to protect it. Natural resource managers who seek to encourage stewardship must thus be explicit about the goals of engagement campaigns they design, developing different communication approaches depending on the outcome they desire, be it personal impacts or societal change. The use of targeted communication will be crucial as different interventions result in different interpretations, depending on the audience (Moser, 2010). For example, strategic communication that emphasises individual responsibility may attract more attention from diverse audiences and promote deeper thinking about the issue (Rickard *et al.*, 2014). Such tools have been used for decades to assist with audience segmentation, message framing, and to initiate broad-scale change (de Velde *et al.*, 2010; McKenzie-Mohr & Smith, 1999; Nisbet, 2009; Rokeach & Mclellan, 1972). Although additional research is required to develop and determine the impacts of specific message frames on public perceptions of responsibility and behaviour (de Velde *et al.*, 2010), this research complements previous work by Nilsson *et. al* (2010) and helps to clarify future research questions. For example, national residents who held an optimistic view about the future of the GBR were less likely to feel a personal responsibility to protect the GBR, perhaps due to a lack of perceived urgency (Reddi & Carpenter, 2000). However, it is unclear how these variables interact, in which direction, and to what extent external messages may affect these beliefs and the actions that follow. Additionally, future research should follow up with respondents to measure their actual behaviours through time (Wynveen *et al.*, 2015), as well as how multidimensional measures of place attachment relate to these behaviours (Wynveen *et al.*, 2014).

### **5.5.4. Implications for natural resource management**

Resource managers have spent considerable resources to understand and enhance the socio-ecological resilience of the GBR (Great Barrier Marine Park Authority, 2009; Hughes *et al.*, 2010), ensuring that resource-dependent industries such as tourism are better able to adapt to impacts on natural resources such as climate change (Marshall, 2010). If social resilience erodes, then ecological resilience may also deteriorate as people attempt to minimise further impacts to themselves at the expense of the resource (Marshall & Marshall, 2007). Hence the concept of managing for resilience is a serious consideration for resource managers (Steneck *et al.*, 2009), and a key component of that resilience involves the capacity of individuals to take responsibility to respond appropriately and proactively (Welsh, 2014). How that responsibility manifests, and why people connect to a place, will affect the actions people take to protect the environment.

An enhanced awareness of the connection and responsibility that people feel for the GBR may lead to improved stakeholder engagement about the actions required to address threats to the GBR. In particular, a more holistic understanding of the differences between groups of people is vital for the development of communication and engagement approaches that seek to influence conservation outcomes in the GBR region (van Riper *et al.*, 2012b). Such disparities in beliefs between user groups may form the basis of independent communication campaigns that reach different audiences in strategic ways. Engagement approaches that target specific segments of the population may be more effective than a broad one-size-fits-all approach to messaging that does not distinguish between individual attitudes (Sutton & Tobin, 2011). For example, a nationwide campaign to encourage GBR protection may focus on what it means to be Australian while a local engagement program may be more effective focusing on the personal impact of a decline in the GBR on livelihoods, recreational opportunities and GBR-associated industries.

Attitudes influence individual actions, including environmental behaviours (Howell, 2013; Nigbur *et al.*, 2010) yet attitudes can be altered by strategic communication and marketing (Eagle *et al.*, 2013; McKenzie-Mohr, 2000). In other words, delivering specific messages to explicit audiences may empower people to change their behaviours (Maibach *et al.*, 2008), including the actions of Australian residents that affect the GBR (van Riper *et al.*, 2012b). The use of targeted communication approaches to engage different user groups along the GBR thus deserves additional and significant research attention, particularly as the presentation of information in a more compelling way may also help remove barriers to behaviour change (Young & Mar, 2010). These methods are commonly used in marketing spheres but have rarely been formally integrated into resource management despite the strong potential to do so (Eagle *et al.*, 2013; McKenzie-Mohr, 2000) as well as the considerable implications for policymakers, planners, and managers (Budruk *et al.*, 2011). Studies that explore and elucidate the use of strategic engagement approaches to influence individual and collective responsibility to conserve natural resources would be especially valuable for protected area managers seeking to promote behavioural change.

## 5.6. Conclusion

Understanding how and why people relate to environmental icons like the GBR may assist in the development of targeted engagement campaigns that promote conservation activities. Here, I observed that national residents, local residents, and tourists differed in the ways they connect to the GBR and the manner in which they perceived individual and collective responsibility to protect it. A more comprehensive consideration of the attitudes that drive behaviour may lead to more successful management interventions, increasing stewardship and support for vital international icons. Protected area managers and conservation practitioners might consider the various differences between and within the user groups they seek to influence, particularly when designing community engagement and stewardship campaigns and especially in light of how people relate to natural resources in different ways.

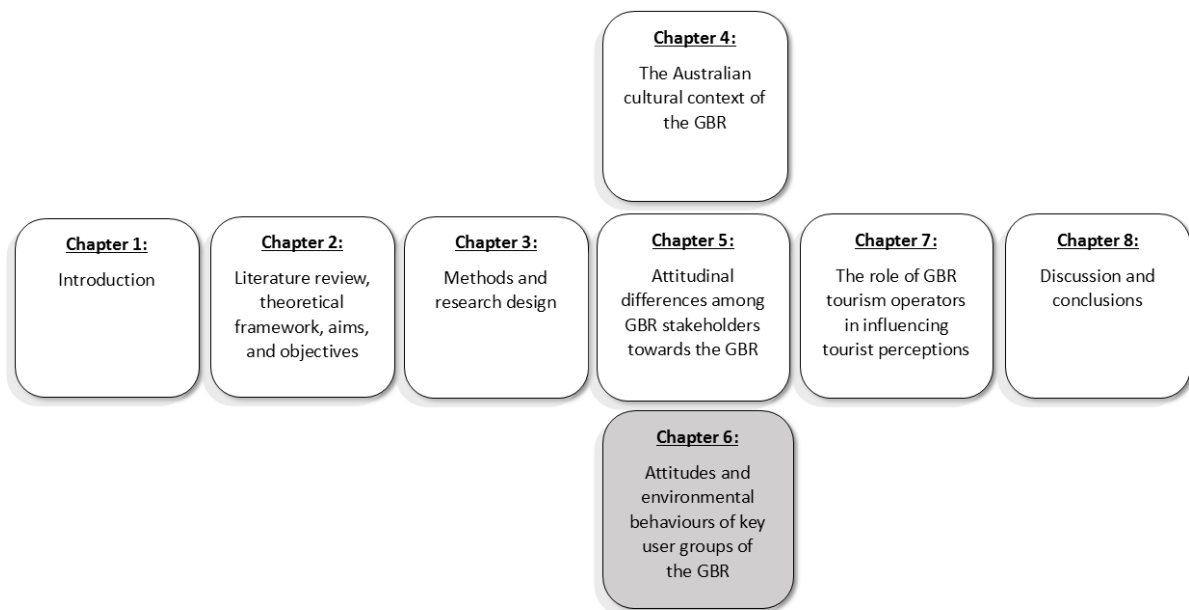
The data presented above in **Chapter 5** demonstrate the considerable variability in attitudes that exists between GBR user groups. These findings are important for the subsequent phase of my research study and I expand on them in the next chapter, evaluating how the attitudes about the GBR held by key user groups relate to the pro-environmental behaviours they undertake. Specifically, I explore the link between the pride, identity, optimism, and responsibility that people feel for the GBR, and compare them to behaviours such as recycling and climate change mitigation. Following this analyses and discussion, I propose ways that resource managers may use this information to guide engagement programs designed to encourage conservation activities. In subsequent chapters, including the in-depth interviews conducted with marine tourism operators along the GBR and synthesised in **Chapter 7**, I expand on this idea, discussing why different message frames are necessary

to target communication related to pro-environmental behaviours and then suggesting ideas to inform their development.



## CHAPTER 6: ATTITUDES AND ENVIRONMENTAL BEHAVIOURS OF KEY USER GROUPS OF THE GREAT BARRIER REEF

The previous chapter demonstrated that groups of stakeholders along the GBR connect to it in different ways. I also showed how these connections relate to individual and collective perceptions of responsibility to protect the GBR, potentially affecting the pro-environmental actions people take. Here, in Chapter 6, I research those linkages directly, specifically exploring the relationship between responsibility, pride, identity, and optimism that people associate with the GBR, and pro-environmental behaviours such as recycling, involvement in conservation groups, and the initiation of various climate change mitigation activities. Attitudes have long been linked to behaviour, and researchers have devoted considerable attention in recent years to investigating the impact of individual perceptions on pro-environmental behaviours. While the use of multi-disciplinary approaches to foster behaviour change is becoming more widespread (and is also leading to sound conservation outcomes), research along the GBR is lacking. In particular, little is known about how regional stakeholder attitudes influence the actions they take to protect the natural world around them. Following a discussion of the relationship between GBR stakeholder attitudes and behaviours, I describe how an enhanced understanding of these components may contribute towards the protection and conservation of the GBR. I conclude by reviewing how these findings may impact resource management.



Source reference:

**Goldberg, J.,** Marshall, N., Birtles, A., Case, P., and M. Curnock (revised and resubmitted) Environmental attitudes are linked to the behaviours of key Great Barrier Reef user groups. *Ecology and Society*.

## 6.1 Chapter Summary

Urgent action is required to address threats to ecosystems around the world. Coral reef ecosystems, like the Great Barrier Reef (GBR), are particularly vulnerable to human impacts such as coastal development and climate change. Resource managers and policymakers along the GBR have consequently initiated a variety of programs to engage local stakeholders and promote conservation activities to protect the environment. However, little is known about how and why stakeholders feel connected to the GBR nor how this connection affects the pro-environmental behaviours they undertake. Here, I present the results of 5,891 surveys and show that the attitudes that residents, tourists, and tourism operators have about the GBR are closely tied to the behaviours and activities they take to protect the environment. My findings suggest that the responsibility, pride, identity, and optimism that people associate with the GBR are significantly correlated to several pro-environmental behaviours, including recycling, participation in conservation groups, and certain climate change mitigation activities. Respondents who feel the strongest connection to the GBR take the most action to protect the environment. Tourism operators who strongly identify with the GBR take more action to protect the environment than those who do not. Encouraging individual identification with the GBR via targeted messages and engagement campaigns may assist not only in GBR conservation, but a wider sustainability movement as well. A better understanding of the individual attitudes and beliefs held by local stakeholders is a key first step towards effective communication to influence conservation activities.

## 6.2 Introduction

Ecosystems around the world are degrading due to human impacts such as unsustainable agricultural practices and environmental degradation (Perry *et al.*, 2010; Vorosmarty *et al.*, 2010). For example, global marine fisheries catches are in decline (Pauly & Zeller, 2016), supplies of freshwater for agriculture are shrinking due to climate change (Grayson, 2013), and an expansion of road networks is drastically intensifying habitat loss and excessive resource extraction (Laurance *et al.*, 2014). Tropical habitats such as coral reefs are particularly vulnerable to human impacts (Anthony *et al.*, 2011; Frieler *et al.*, 2012) and changes to the ecology of these systems are projected to have widespread and negative influences on reliant communities, individuals, and industries (Great Barrier Marine Park Authority, 2014). Substantial impacts have already been documented on the Great Barrier Reef (GBR), and it has been estimated that 50% of the live coral cover on GBR has been lost over the last 30 years (De'ath *et al.*, 2012; Lewis *et al.*, 2009). Anthropogenic threats such as climate change and poor water quality, as well as cyclones and outbreaks of coral-eating starfish are considered to pose the greatest challenges for the future management of the GBR (Johnson & Marshall, 2007; McCook *et al.*, 2010). Urgent action is required to sustain the integrity and productivity of the GBR (Hughes *et al.*, 2010), particularly with the recent severe mass coral bleaching event on more than 1,000 km of the GBR (Terry Hughes 2016, pers. comm., 6 April).

The way that people associate with nature can influence their opinions about resource protection and the behaviours they take in response to environmental threats (Devine-Wright & Clayton, 2010). Here, I discuss some key factors that are likely to affect the way that people connect to the GBR, including the pride, identity, personal affection, and levels of optimism they feel for the GBR. Pride in local resources may affect support for management decisions, including environmental activities such as the creation of marine protected areas (Ballantine, 1995) and the advancement of community engagement programs that promote conservation of natural resources (Jenks *et al.*, 2010). Identity derived from a natural resource or place has been shown to influence the actions people take to cope with change in their circumstances resulting from altered environmental conditions (Marshall *et al.*, 2012). Understanding the role of identity in facilitating behaviours that affect the natural world also has serious practical implications for the development of protective environmental policies and behaviours (Clayton & Opatow, 2003). Additionally, the extent to which a person might be personally affected by the loss of nature may be attributed to the responsibility they feel to protect it (Adger *et*

*al.*, 2011). An emphasis on individual responsibility may promote deeper thinking about environmental threats (Rickard *et al.*, 2014), higher levels of public participation in management decision-making, and greater benefits for marine environments (McKinley & Fletcher, 2010). Perceptions of optimism about the future affects the level of risk-seeking or risk aversion that an individual feels (Hochschild *et al.*, 2012), affecting the actions they take in response to those risks.

Positively-biased assessments of local environmental conditions may create considerable challenges for behaviour change campaigns (MacDonald *et al.*, 2015), making it difficult to encourage people to take action or demand change if they do not recognise existing threats to local natural resources (Novacek, 2008). For example, those who believe in the risk of climate change are more likely to take action to address it (Whitmarsh, 2008). If we do not examine how people perceive climate change, we will be unable to develop effective responses as a society (Clayton *et al.*, 2015). People are able to recognise and adapt to climate variability, but these behaviours partly depend on their individual perceptions of the problem (Howe & Leiserowitz, 2013). Consequently, I have included a statement related to climate change perceptions in this study.

The initiation of pro-environmental behaviours can also be affected by perceived barriers to action, e.g., a lack of financial resources. Changing behaviours towards environmental conservation requires that people overcome perceived obstacles, including internal perceptions related to self-efficacy (Gifford & Nilsson, 2014; Kollmuss, 2002; Lorenzoni *et al.*, 2007; Van Der Linden, 2015; van Riper *et al.*, 2012b), defined as “a person’s estimate of his or her capacity to orchestrate performance on a specific task” (Gist & Mitchell, 1992, p. 183). This perceived control can influence the level of behavioural response, potentially preventing a person from taking an action. For example, a resident who wants to recycle their waste may not do so if the conditions are perceived to be impractical (i.e. it is too expensive to recycle), improbable (e.g., they are too busy with other household tasks to devote time to recycling), or irrelevant to their worldview (e.g., they do not know what recycling is or why it is important; adapted from van Riper *et al.* 2012). In other words, the available time, knowledge, and skill related to a behaviour may influence an individual’s decision to act. This is important because the level of perceived ability required to carry out a behaviour facilitates the transition from intentions to action (Armitage & Conner, 2001), and is a strong predictor of the behaviour itself (Moser & Dilling, 2004). Thus, if individuals believe that they can undertake pro-environmental behaviours and they also feel they have the required skills and abilities, they are more likely to do them.

Another potentially important factor that can affect the success of strategies aiming to influence pro-environmental behaviours includes demographic traits such as gender and age. While a majority of Australians agree that the community has a role to play in the protection of the GBR, beliefs can vary considerably depending on variables such as gender (Young & Mar, 2010). Women express greater concern for the environment than men (Sundström & McCright, 2013) and gender has been shown to be a reliable predictor of environmental attitudes, intentions and behaviours (Arnocky & Stroink, 2010; Mobley & Kilbourne, 2013). Previous research has also shown correlations between age and environmental concern and action (Buttel, 1979; Honnold, 1984), specifically that younger people express more concern for the environment than older individuals (Fransson & Garling, 1999). These findings have also been confirmed within the GBR region (Nilsson *et al.*, 2010). Yet, resource managers remain uncertain about how best to utilise the different demographics between stakeholder groups to develop and refine key communication approaches such as strategic message frames. Understanding the relationship between demographic variables and environmental attitudes may help support a variety of conservation activities such as activism, empowering a collective effort among all individuals to improve the health and future of the environment (Zelezny *et al.*, 2000).

The aim of this study is to explore the attitudes held by local stakeholders about an iconic coral reef ecosystem, the GBR, and to describe how and why these attitudes relate to the pro-environmental



behaviours they undertake. Previous research has demonstrated close and meaningful connections between individual attitudes and behaviours (Ajzen & Fishbein, 2005; Devine-Wright & Howes, 2010; Halpenny, 2010). However, due to external influences such as social norms and institutional barriers, there is also evidence to suggest that attitudes may not necessarily be the main drivers of individual behaviour (Griskevicius *et al.*, 2008; Moser & Ekstrom, 2010). Along the GBR, there has been little work done to clarify why stakeholders undertake specific pro-environmental behaviours. Stakeholder groups vary in the ways they use, connect, and care for the GBR (Curnock *et al.*, 2014b; Tobin *et al.*, 2014a; Tobin *et al.*, 2014b). Consequently, clarification of the links between attitudes and pro-environmental behaviours would be a beneficial first step for practitioners seeking to promote conservation activities in the GBR region.

The examination of the socio-ecological system of the GBR is thus a useful case study to explore new ways of connecting with stakeholders about the sustainable use and long-term preservation of the GBR. This is especially important as there is considerable interest from conservation groups and government agencies to ensure that management is as efficient and effective as possible (Beeden *et al.*, 2014a; Beeden *et al.*, 2014b; Dobbs *et al.*, 2011; McCook *et al.*, 2010). Of particular interest are the obligations of the Australian Government to protect the outstanding universal value of the GBR as part of the World Heritage Convention (Lucas *et al.*, 1997) as well as the promotion of pro-environmental behaviours that address climate change impacts (Wynveen & Sutton, 2015). Research that clarifies the ways that stakeholders feel about the conservation of the GBR is likely to be well received and operationalised in a resource management context. The GBR thus offers a valuable opportunity to test how and why stakeholder attitudes about an environmental icon relate to the behaviours they undertake to protect it.

Here, I explore four research questions related to the pro-environmental behaviours undertaken by individuals within three key GBR user groups (residents, tourists, and tourism operators). These user groups represent the vast majority of people who use the GBR. Understanding the ways they connect to the environment and take action to protect it will thus have the greatest impact on the long-term sustainability of the GBR. Other stakeholders such as farmers and fishers are undoubtedly important but are beyond the scope of this study. The four research questions I explored are:

1. Are attitudes about the GBR correlated with taking action to protect the environment? That is, do individuals that undertake certain pro-environmental behaviours have different levels of connection to the GBR than individuals who choose not to take action?
2. What barriers prevent GBR stakeholders from undertaking pro-environmental behaviours?
3. Do people who believe more strongly in the severity of climate change take more action to protect the environment?
4. Are there differences between different groups of GBR stakeholders and their likelihood of taking action to protect the environment?

## **6.3 Methods**

### **6.3.1 Study area**

The GBR is the world's largest coral reef ecosystem, spanning more than 344,000 km<sup>2</sup> (Great Barrier Marine Park Authority, 2009), including more than 3,000 individual reefs and stretching for more than 2,000 km along the Queensland coast in north-eastern Australia. It also provides substantial employment and economic contributions to Australia (Bohensky *et al.*, 2014; Tobin *et al.*, 2014a), particularly the tourism industry, which contributes about 64,000 full-time jobs and more than \$5.2 billion to the Australian economy each year (Deloitte Access Economics, 2013). Additional information about the use of the GBR as a study area is detailed in Chapter 3.

### 6.3.2 Data collection and analysis

To address the research questions above, I conducted face-to-face surveys of two key user groups, residents and tourists in the GBR region, as well as telephone surveys with tourism operators. These data collection efforts had three parts: Survey design, survey administration, and data analysis.

#### 6.3.2.1. Survey design

A survey template was developed that included all of the data needs in a generic survey form that could be adapted and customised for each of the three targeted user groups: coastal residents living along the GBR, tourists visiting the GBR region, and tourism operators working within the GBR Marine Park. Survey questions were presented as statements and based upon previous regional studies where possible (Marshall et al., 2009; Marshall, 2010; Moscardo, 2008; van Riper et al., 2013; Young & Mar, 2010). In this paper, I focus on nine statements that relate to the individual connection and concern individuals have about the GBR. These statements can be found in Tables 2 and 4. I sought to compare key stakeholder groups and correlate attitudes with respondents' beliefs about climate change. Thus, respondents were also asked to identify which of five statements best described their belief about climate change. If respondents felt that these five statements did not adequately describe their belief, they were able to skip the question. These statements were taken from previous regional studies (Young & Mar, 2010; Young & Temperton, 2008):

- a. Climate change is an immediate threat requiring action.
- b. Climate change is a serious threat, but the impacts are too distant for immediate concern.
- c. I need more evidence to be convinced of the problem
- d. I believe that climate change is not a threat at all
- e. I do not have a view on climate change

Finally, respondents were asked about the frequency with which they participate in a variety of pro-environmental behaviours (Table 6.1). These behaviours were selected from resource management policies and programs most relevant to climate change, tourism, and the GBR (Great Barrier Marine Park Authority, 2007, 2012; Young & Mar, 2010; Young & Temperton, 2008), and reflect a broad suite of responses such as consumer purchases, community activism, climate change mitigation, and participation in conservation activities. Residents and tourists were also asked to rate how often they perform these behaviours, i.e., never, sometimes, often, or always. Tourism operators were asked whether or not they undertake each of ten behaviours related to environmental conservation. Many of these behaviours related to the manner in which they ran their business and thus required an evaluation of presence or absence rather than frequency. More information about the survey design can be found in Chapter 3.

Respondents rated their agreement or disagreement with these statements using a 10-point response scale, ranging from 1 – very strongly disagree to 10 – very strongly agree. Further details about the survey methods, design, and administration can be found in (Bohensky et al., 2014; Curnock et al., 2014b; Tobin et al., 2014b). The final survey versions can be found in the Appendices at the end of this thesis.

**Table 6.1: The pro-environmental behaviours included in each survey**

<b>Resident behaviours</b>	<b>Tourist behaviours</b>	<b>Tourism operator behaviours</b>
Recycle	Recycle	Separate waste created by tourists for recycling
Bring own bags to the supermarket	Prioritise environmentally friendly products when shopping	Use an emissions calculator to plan business operations
Engage in environmental community programs	Use carbon offsets to counter emissions	Use carbon offsets to counter emissions

	Choose accommodation based on 'green' credentials	Use green energy, such as solar panels, for any part of the business
	Choose a tour operator based on 'green' credentials	Use alternative fuels such as biodiesel and ethanol
		Participate in industry best practices, via a code of practice or MOU
		Participate in GBRMPA's Reef Guardian Program
		Participate in GBRMPA's Eye on The Reef Program
		Provide interpretation for tourists that promotes conservation or sustainable use of the GBR
		Have fuel efficient engines

### 6.3.2.2 Survey administration

An initial version of the survey was pilot-tested within each user group to ensure survey questions were clear and unambiguous. Following revision, face-to-face surveys of coastal residents (n=3,181) and tourists (n=2,621) were conducted from May to August, 2013. Tourism operators were surveyed via telephone following the creation of a database that identified all GBR tourism businesses currently in operation (Curnock et al., 2014a). More information about the survey administration can be found in Chapter 3.

### 6.3.2.3 Data analyses

A behaviour score was calculated for every respondent in each user group depending upon how often (tourists and residents), or whether or not (tourism operators), they completed the behaviour. Individuals who behaved in a more pro-environmental manner (and for residents and tourists, those who did these behaviours more often) received higher scores than those who did not (Table 6.2). Although these scoring systems are different for each user group, they allow for comparisons to be made between different segments of the population within each user group, e.g., to compare individuals who are doing a lot to protect the environment and others who are not. Thus, despite the different allocation of points and discrepancies between the maximum and minimum scores *between* user groups, the scoring system allowed comparisons of individuals *within* each user group. Following tests of normality, Spearman's rank correlation coefficients or H tests were used as a measure of dependence between the behaviour scores and a series of statements, including six statements related to GBR attitudes (Table 6.3); one statement related to climate change belief (Table 6.4); three statements related to barriers to action (Table 6.5), and the demographic variables of age and gender (Table 6.6).

**Table 6.2: The scoring system used to quantify a behaviour score for each respondent.**

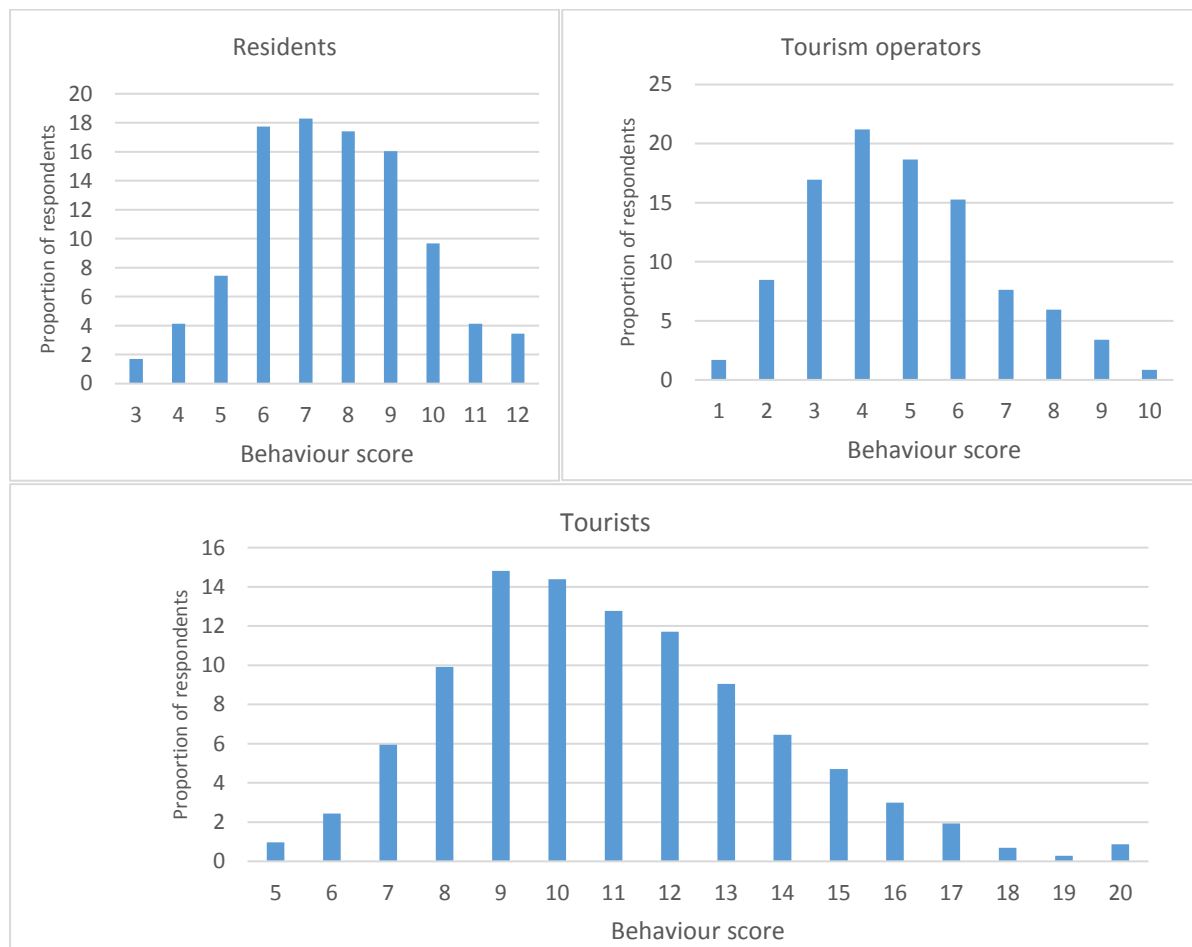
User group	Number of behaviours	Scoring system	Minimum score	Maximum score
Tourism operators	10	Yes – 1 point No – 0 points	0	10
Tourists	5	Never - 1 point Sometimes – 2 points	5	20
Residents	3	Often – 3 points Always – 4 points	3	12

## 6.4 Results

Behaviour scores were calculated for all individuals within the three main user groups. I describe these below, as well as the correlations between these scores and respondent attitudes about the GBR, their belief in climate change, perceived barriers to action, and demographic traits of age and gender.

### 6.4.1 Behaviour scores

The behaviour scores of stakeholders within each GBR user group had an approximately normal distribution (Figure 6.1). Most respondents received scores that were approximately in the middle of the scoring range. Less than 10% of respondents within each user group received the two highest or lowest possible scores, e.g., the highest possible scores for residents were 11 or 12 out of 12, while the lowest possible scores were a 3 or 4. Approximately 69% of residents scored 6, 7, 8, or 9 out of a maximum of 12, 72% of tourism operators had scores of 3, 4, 5, or 6 out of 10, and 53% of tourists scored a 9, 10, 11, or 12 out of 20.



**Figure 6.1.** The distribution of behaviour scores among survey respondents across three user groups of the GBR: Tourists (n = 2,621), residents (n = 3,151), and tourism operators (n = 119). The y-axis shows the proportion of respondents within each user group that received each score.

### 6.4.2 Behaviour scores and attitudes about the GBR

Resident behaviour scores were significantly correlated with all six statements related to the GBR, including optimism, pride, identity, responsibility, and the personal connection they have to the health of the GBR ( $p < 0.01$ ; Table 6.3). The behaviour scores received by tourists were significantly correlated with five of the six statements related to the GBR. The level of optimism that tourists felt

about the future of the GBR was not significantly correlated with their behaviour score. Among tourism operators, behaviour scores were significantly correlated with only one statement, 'The GBR is part of my identity'.

**Table 6.1: Correlation coefficients and p-values between six attitudinal statements about the GBR and the behaviour scores of tourism operators, tourists, and residents. Attitudinal statements relate to optimism about the future of the GBR, personal affects due to a decline in the GBR health, pride in the World Heritage status of the GBR, identity derived, and individual and collective responsibility to protect the GBR.**

		I feel optimistic about the future of the GBR	I would NOT be personally affected if the health of the GBR declined	I feel proud that the GBR is a World Heritage Area	The GBR is part of my identity	It is NOT my responsibility to protect the GBR	It is the responsibility of all Australians to protect the GBR
Tourism operators	R-value	-0.091	-0.092	0.091	0.254	-0.091	-0.076
	P-value	0.329	0.325	0.326	.006**	.331	.419
	Sample size	116	116	118	117	117	116
Tourists	R-value	-0.011	-0.141	0.123	0.242	0.136	-0.144
	P-value	.583	.000**	.000**	.000**	.000**	.000**
	Sample size	2,288	2,286	2,290	2,147	2,377	2,299
Residents	R-value	0.105	-0.165	0.143	0.170	0.172	-0.190
	P-value	.000**	.000**	.000**	.000**	.000**	.000**
	Sample size	2,979	2,964	2,912	2,903	2,968	2,966

\*\* Significant at the 0.01 level (highlighted also in grey shading)

### 6.4.3 Behaviour scores and belief in climate change

Respondent perceptions about the cause and severity of the climate change threat were significantly correlated with behaviour scores across all three user groups (Table 6.4). Respondents who strongly believed that climate change was a severe threat requiring action were more likely to be undertaking pro-environmental behaviours than respondents who believed less strongly in climate change, i.e., those who required more evidence to be convinced of the problem or those who did not believe climate change was a threat.

**Table 6.2: Correlation coefficients and p-values between climate change beliefs and the behaviour scores of tourism operators, tourists, and residents. The climate change belief statements are described in the Methods.**

		Climate change belief
Tourism operators	R-value	-0.316
	P-value	.000**
	Sample size	118
Tourists	R-value	-0.204
	P-value	.000**
	Sample size	2,377
Residents	R-value	-0.194
	P-value	.000**
	Sample size	2,994

\*\* Significant at the 0.01 level (highlighted also in grey shading)

#### 6.4.4 Behaviour scores and barriers to action

Tourist and resident behaviour scores were significantly correlated with their perceptions of various barriers to action, including a lack of appropriate knowledge and skills, an insufficient amount of time available to do the behaviour, and insufficient financial resources (Table 6.5). The behaviour scores of tourism operators were not significantly correlated with any of the statements related to perceived barriers to action.

**Table 6.3: Correlation coefficients and p-values between three statements related to reducing impact on the GBR and the behaviour scores of tourism operators, tourists, and residents. The three statements relate to the knowledge and skills required, the time and opportunity available, and the financial commitment necessary to reduce individual impacts on the GBR.**

		I have the necessary knowledge and skills to reduce any impact I might have on the GBR	I do NOT have the time and opportunity to reduce any impact that I might have on the GBR	It is too expensive for me to reduce any impact I might have on the GBR
Tourism operators	R-value	0.125	-0.150	-0.100
	P-value	0.179	0.108	0.288
	Sample size	118	116	114
Tourists	R-value	0.187	-0.136	-0.077
	P-value	.000**	.000**	.000**
	Sample size	2,291	2,258	2,159
Residents	R-value	0.172	-0.138	-0.151
	P-value	.000**	.000**	.000**
	Sample size	2,955	2,940	2,880

\*\* Significant at the 0.01 level (highlighted also in grey shading)

#### 6.4.5 Behaviour scores and demographics

Age and gender were significantly correlated with the behaviour scores received by tourists and residents (Table 6.6). Older people stated they were engaged in more of the pro-environmental indicators than younger individuals, and women were doing more than men. The behaviour scores of tourism operators were not significantly correlated with the age or gender of respondents.

**Table 6.4: Correlation coefficients and p-values between two demographic variables and the behaviour scores of tourism operators, tourists, and residents. The two demographic variables relate to the age and gender of the respondent.**

		Age	Gender
Tourism operators	R-value	-0.016	0.036
	P-value	0.867	0.699
	Sample size	117	118
Tourists	R-value	0.104	0.123
	P-value	.000**	.000**
	Sample size	2,289	2,377
Residents	R-value	0.207	0.117
	P-value	.000**	.000**
	Sample size	2,995	3,024

\*\* Significant at the 0.01 level (highlighted also in grey shading)

## 6.5 Discussion

I found significant correlations between the way that people think about the GBR and the actions they take to protect the environment. Specifically, the data indicated pro-environmental behaviours were correlated with the ways people perceived barriers to reducing their impact on the GBR, how connected they felt to the GBR, how they perceived the severity of the climate change threat, and demographic characteristics such as age and gender. In other words, when people believe they are *a part of* the environment, not *apart from* the environment, they may be more likely to protect that environment and behave in ways that conserve it. I discuss these key findings below, as well as the implications for resource managers working to ensure the long-term sustainability of the GBR.

### 6.5.1 Behaviours and attitudes about the GBR

A majority of respondents within each GBR user group were not undertaking pro-environmental behaviours to the maximum possible extent. Only a small proportion of respondents participated in pro-environmental behaviours at a high level. Just 7.5% of residents received the two highest behaviour scores possible, with similar findings for tourism operators (4.2%) and tourists (1.2%). However, strong non-participation was also rare, with just 5.8% of residents having the two lowest scores, compared to 10.2% of tourism operators and 3.4% of tourists. Thus, most people were taking some action with respect to pro-environmental behaviours, yet many could do more. My findings show that there is widespread interest and ongoing action with respect to pro-environmental actions. Consequently, I believe the ongoing actions that stakeholders are currently taking to protect the environment represent a solid foundation upon which to build greater individual involvement in conservation activities. For example, Kollmuss (2002) showed that external factors such as behavioural incentives and feedback can influence why people display pro-environmental behaviours. If resource managers can identify effective ways to maintain ongoing behaviours of local stakeholders and motivate them to do more, they may inspire greater action among community members already working to protect and sustain their local environment.

Pro-environmental behaviours across all three user groups were significantly correlated to the sense of identity that respondents derived from the GBR. That is, people who agreed that the GBR was part of their identity were more likely to be taking action to protect the environment, regardless of user group. This finding supports the conclusions from previous studies along the GBR (Wynveen *et al.*, 2012, 2014) and deserves follow up, particularly as identity has been shown to affect resource management concerns such as decision-making related to climate change (Adger *et al.*, 2011; Scannell & Gifford, 2013). These findings support previous research showing that personal connection to natural places can shape opinions about resource protection and influence behaviours taken in response to perceived environmental threats (Devine-Wright & Clayton, 2010). Thus, facilitating individual connections with nature and enabling people to connect with the environment may have practical implications for resource management and conservation outcomes (Halpenny, 2010), particularly with respect to influences on social resilience and adaptive capacity (Marshall *et al.*, 2012).

In addition to identity, pro-environmental behaviours of residents and tourists were significantly correlated with the pride, optimism, and responsibility they derived from, or associated with the GBR. That is, respondents who felt more closely connected to the GBR were more likely to be taking various pro-environmental actions to ensure the conservation and preservation of the natural world around them. Thus, my findings support previous research showing the way that people connect with nature may provide insight into the way they treat the environment (Nisbet *et al.*, 2009). However, I have demonstrated this finding in a novel way, showing that such connection holds for respondents like tourists who live far away from the resource or who may be visiting for the first time. This is important because the relationship a person has with nature is fundamentally linked to the concern they have for environmental problems, including the ways in which they may choose to protect the environment

(Schultz, 2000). That is, people who value nature and feel concern for it will be more inclined to protect it (Howard, 1997).

### **6.5.2 Behaviours and belief in climate change**

Respondents who acknowledged and appreciated the severity of climate change were more inclined to take action to protect the environment. Specifically, individual belief in climate change was significantly correlated with the pro-environmental behaviours undertaken by respondents across all three user groups. Specifically, respondents who strongly agreed that climate change was an extreme threat were doing more to protect the environment and address climate change than respondents who believed that climate change was a less serious threat. Thus, it appears that my results suggest that threat acknowledgment is a key first step towards generating an effective response (Milliken, 1987). If people do not understand or appreciate the potential impact of climate change on themselves and on the environment, it is difficult to convince them to take responsive action to address this threat (Grothmann & Patt, 2005). Responsive actions may occur via a variety of behaviours including mitigation activities, community activism, and making better choices as a consumer. However, it may also be that the correlation between climate change attitudes and pro-environmental behaviour is not causal. Correlations are never able to point out causality, and it may be that people who are inclined to be less active with respect to their environmental behaviour may also be less inclined to learn about environmental phenomena such as climate change. In this way, those with less knowledge about threats to the GBR such as climate change may also be less interested in the actions they can take to protect it. Regardless, effectively responding to climate change will take a widespread change in both attitude and behaviour (Shove, 2010), and threat perceptions related to climate change appear to be related to the actions that GBR stakeholders take to protect the environment.

### **6.5.3 Behaviours and barriers to action**

Individual pro-environmental behaviours among residents and tourists included in this study were significantly correlated with several perceived barriers to action, including external constraints and internal beliefs related to a lack of knowledge, time, and money. Specifically, respondents who perceived barriers to reducing their impact on the GBR were less likely to undertake pro-environmental behaviours such as recycling or the purchase of carbon offsets. These findings support previous research that showed those who perceived barriers to action were less likely to act (Gist & Mitchell, 1992; O'Neill & Nicholson-Cole, 2009). Individual self-efficacy has also been shown to be a key component of the decision-making process that can impede or encourage certain behaviours depending upon individual perceptions (Gist & Mitchell, 1992). However, pro-environmental behaviours of tourism operators were not significantly associated with barriers related to a lack of time, money, or knowledge. This may be due to the behaviours being related to a business enterprise rather than personal choices, or it may be that the tourism operators face unique barriers depending on their own available finances, corporate structure, etc... For example, some operators may lack specific knowledge about a behaviour yet others may lack funding to implement necessary changes. In this way, each behaviour may illicit different barriers for different businesses rather than preventing widespread application due to one specific obstacle. Thus, the pro-environmental behaviours of tourism operators may vary depending on the existing state of their business. Although respondents in all three stakeholder groups recognised the threat of climate change, felt connected to the GBR, and accepted a personal responsibility to protect it, they appear to face various barriers required to reduce their impact on the GBR. More research is required to tease out the explicit reasons for these barriers and how to overcome them.

### **6.5.4 Behaviours and demographics**

Older residents and tourists took significantly more action to help protect the GBR than younger individuals. These results conflict with previous research showing that young people, i.e., aged 18-24,



are generally more supportive of environmental activism and sustainability than older age groups (Buttel, 1979; Connell *et al.*, 1999; Fransson & Garling, 1999; Honnold, 1984). However, the influence of age on pro-environmental behaviour is complex. When young people are asked about the relative importance of issues, they tend to rank the environment as a fairly low priority (Partridge, 2008). Additionally, and depending on the context, younger people may be significantly less likely to engage in pro-environmental behaviours than older individuals (2006). My findings support this for reasons as yet unknown. It may be that the behaviours I investigated were easier or more appropriate for an older demographic, e.g., older residents may have more time to engage in environmental programs while older tourists may have more financial freedom to invest in carbon offsets or environmentally-friendly products.

I also learned that women took significantly more action to protect the environment than men. However, I express caution with this finding as it may be that women undertake more domestic-related tasks than men and may consequently be more likely to say they recycle or purchase environmentally-friendly products. Regardless, my findings support previous research that showed that gender may be an influential indicator of environmental concern and behaviour (Mobley & Kilbourne, 2013; Sundström & McCright, 2013). Women may thus be a more receptive and actively engaged audience with which to discuss environmental activities or solicit support for management decisions. Resource managers may also utilise this finding to inform the development of strategic messaging or selection of messengers used to convey information related to the sustainable use of the GBR. The choice of messengers is a critical element of successful engagement, and people are more inclined to accept and trust messages received from individuals with similar views, e.g., women with children may be more easily convinced by women in similar life situations (Malka *et al.*, 2009). Indeed, a finer understanding of the messenger and the audience will help to ensure that the information conveyed and the dialogue between them meets the desired goals of the interaction (Moser, 2010).

#### **6.5.5 Implications for management and engagement**

Clarifying and understanding the differences between user groups is a vital first step in developing programs and projects that are able to influence individual pro-environmental behaviours of key stakeholders. The attitudes that people have about the GBR are correlated with pro-environmental behaviours and, consequently, resource managers have an opportunity to use this connection to encourage people to become advocates for change. However, the initiation of behavioural change is not simply a process whereby resource managers can communicate generally to a wide audience. Previous research has shown that effective engagement does not work that easily and that segmentation of the audience may be appropriate (Maibach *et al.*, 2011). Different types of individuals make up these different user groups. Some may be very enthusiastic about making a difference to the environment, while others may be more apathetic. Clarifying these similarities and differences will be an important step to developing successful engagement and interpretation programs.

#### **6.5.6 Conclusions**

Coral reefs like the GBR are vulnerable to climate change and other anthropogenic impacts. These impacts are likely to cause severe disruptions in the lives of stakeholders who rely upon the GBR for recreational and economic opportunities. Consequently, resource managers seek to implement a variety of programs and policies that help minimise the degradation of the GBR while maximising the conservation response from key stakeholder groups. Understanding why and how the GBR affects the attitudes and actions of local stakeholders can help resource managers plan projects more effectively, including those that protect the GBR, conserve natural resources, and address climate change. I found that strong connections to the GBR are significantly correlated with a greater tendency to take actions that protect the environment. GBR residents connect to the GBR because of the pride, identity,

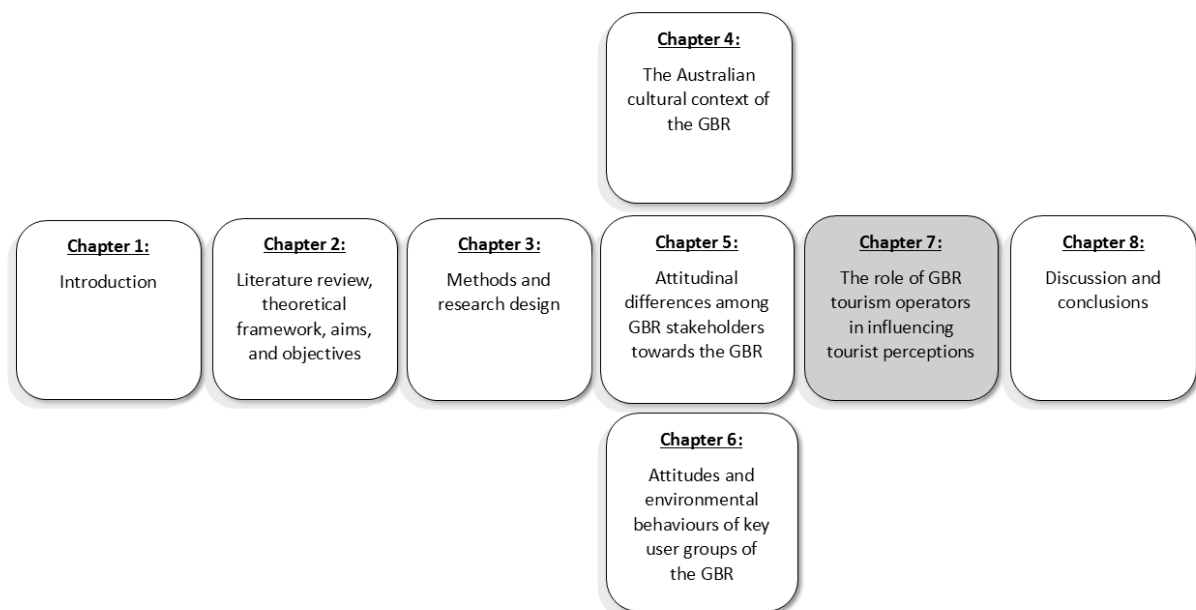
personal affection, and optimism they derive from it. Tourists follow a similar pattern. Tourism operators who strongly identify with the GBR are taking the most action to protect the environment. Overall, individuals in each user group who feel the strongest connection to the GBR are the ones taking the most action to protect the environment.

Encouraging individual identification with the GBR via targeted messages and engagement campaigns may assist not only in GBR conservation, but a wider sustainability movement as well. Importantly, a more holistic understanding of the connection that people have with the local environment may assist with the development of community engagement approaches that encourage people to take action to protect these very special places. Because different stakeholder groups connect with the environment in different ways, as described in depth in **Chapter 4** and **Chapter 5**, individual studies that target specific stakeholders may help to clarify the reasons people take action to protect the GBR. In the next chapter, I describe the connection that one key user group, marine tourism operators, has with the GBR. Specifically, I synthesise 19 in-depth interviews I conducted to evaluate and analyse how tourism operators address climate change with their guests and also within their day to day business operations. Exploring perceptions of self-efficacy, one of the key constructs of the Theory of Planned Behaviour detailed in **Chapter 2**, I also describe the various barriers marine tourism operators face with respect to climate change mitigation behaviours currently available to them. I conclude the chapter by describing how these barriers may be overcome, relying upon the ideas and recommendations provided by the tourism operators themselves.



## CHAPTER 7: THE ROLE OF GBR TOURISM OPERATORS IN INFLUENCING TOURIST PERCEPTIONS

Chapter 6 explored the link between individual attitudes and behaviours. This chapter concluded that an enhanced understanding of stakeholder actions and attitudes related to the GBR can help resource managers make decisions. I showed that strong connections to the environment can influence the pro-environmental behaviours taken by user groups in response to ecological threats. For example, I found that tourism operators that strongly identify with the GBR take the most action to protect the environment. However, I did not explore why certain behaviours were done more than others, nor did I investigate the obstacles or barriers to action that prevent stakeholders from taking action to protect the GBR. Among tourism operators of the GBR, little is known about how they perceive the threat of climate change nor is much known about what actions they believe are most effective and appropriate to address it. Here, in my final data chapter, I analyse 19 semi-structured interviews conducted with tourism operators in the Cairns/Port Douglas and Airlie Beach regions, two of the most popular tourism hubs along the GBR. I explore the perceptions that tourism operators have about climate change, and I investigate why they choose to discuss or ignore the issue when engaging with their guests. I also compare these findings with the literature to develop a more comprehensive understanding of how and why tourism operators take action to protect the GBR. Finally, I clarify barriers that prevent action, and discuss solutions to these barriers described by tourism operators, e.g., government subsidies, collaborations with resource managers, etc.



Source reference:

**Goldberg, J.,** Birtles, A., Marshall, N., Case, P., and M. Curnock (revised and resubmitted) Changing behaviours in a changing climate: The role of Great Barrier Reef tourism operators in influencing tourist perceptions. *Journal of Sustainable Tourism*.

## 7.1 Chapter Summary

Urgent action on climate change is needed to sustain coral reefs into the future. The projected decline in reef health will have huge repercussions on millions of stakeholders who depend upon these ecosystems for food, recreation and livelihood opportunities. Stakeholders like tourism operators have a considerable interest in protecting coral reefs and a pivotal role to play in taking action to ensure the long-term sustainability of these ecosystems. Marine tourism operators have long been recognised as stewards of the GBR and they are taking many actions to protect it, both with their own business practices but also by strategically engaging their guests with interpretation and targeted messages about marine conservation. However, little is known about how marine tourism operators along the GBR perceive climate change, or what actions they believe are the most effective to address climate change impacts on the GBR. Information related to climate change mitigation behaviours is especially deficient. Here, I report on semi-structured interviews conducted with 19 tourism operators in Airlie Beach and Cairns, the two most popular tourism destinations along the GBR. I observe that tourism operators recognise the threat of climate change and strongly support increased action to help protect the GBR. However, most tourism operators are hesitant to engage their guests about climate change despite acknowledging an interest, expertise, and responsibility to do so. Understanding the barriers that prevent tourism operators from addressing climate change is an important first step towards helping them, and the tourists who visit the GBR, to take action to protect the GBR.

## 7.2 Introduction

Climate change threatens and is already affecting ecosystems around the planet (Nicholls *et al.*, 2011; Wolf *et al.*, 2009) and projections of the impact of climate change are grave (Joshi *et al.*, 2011; Solomon *et al.*, 2009). Climate models predict widespread negative impacts on biodiversity and species abundance (Field, 2014; Van Der Wal *et al.*, 2013) and severe negative consequences for industries and individuals who rely upon coral reefs for food, wellbeing, and livelihood (Adger *et al.*, 2013; Marshall, 2010; Nielsen & Reenberg, 2010). Widespread behaviour change is urgently required to address the impacts of climate change (Abroms & Maibach, 2008; Corner & Randall, 2011). Crucial to this process is effectively communicating the threat, impacts, and responses available for the general public to take action (Moser, 2010; Moser & Dilling, 2004). However, climate change has become a highly political issue (Whitmarsh, 2011) and large numbers of people remain confused or unsure about the severity of the threats (Leviston *et al.*, 2012), both to themselves and important natural areas (Young & Mar, 2010).

One of the most inspiring and important natural icons on the planet (Great Barrier Marine Park Authority, 2014), the GBR provides vital economic contributions to Australia (Bohensky *et al.*, 2014; Tobin *et al.*, 2014a). GBR tourism is particularly important, contributing some 64,000 full-time jobs and more than \$5.2 billion to the Australian economy each year (Deloitte Access Economics, 2013). Additionally, the GBR attracts millions of visitors per year from throughout Australia (Curnock *et al.*, 2014a), the majority of whom are strongly connected to - and concerned about - the GBR (Goldberg *et al.*, 2014). More than 1,000 active permits have been granted to tourism activities such as snorkelling, fishing, whale watching, and SCUBA diving, and visitors regularly take advantage of these activities. Providing the public with information about the GBR, its management, and threats to its future may allow for a more informed evaluation and, ultimately, greater community desire to preserve the environment (Harriott, 2002).

Long-recognised as important stewards of the GBR, tourism operators have a key role to play in educating the public about the GBR and ensuring that visitors minimise their impact. As part of this work, tourism operators rely heavily on communication and interpretation to engage their guests, including face-to-face presentations, signage, and the distribution of materials such as fact sheets (Great Barrier Marine Park Authority, 2016). The Great Barrier Reef Marine Park Authority (GBRMPA),

the Federal agency tasked with managing the long-term preservation of the GBR, also enforces minimum standards of environmental behaviour through regulation and collaboration with tourism operators. For example, the GBRMPA encourages an eco-certification program that ensures sustainable and high quality nature-based experiences (Day & Dobbs, 2013). A program operated by Ecotourism Australia serves as a certification scheme for the GBRMPA, and these 'high standard operators' carry a majority of the tourists out to the GBR, e.g., more than 60% of all tourists visiting the GBR in 2012 (Day & Dobbs, 2013). Additionally, Australia has an obligation under the World Heritage Convention to present the outstanding universal value of the GBR (Lucas *et al.*, 1997). Tourism operators are well placed to deliver this information as well as other messages that relate to conservation and management of the threats to the GBR. Unfortunately, despite being recognised as the most severe long-term threat to the GBR (Great Barrier Marine Park Authority, 2014), little is known about how GBR tourism operators perceive the threat posed by climate change nor about how or why they present information about climate change to their guests.

### **7.2.1 Literature review: The role of Interpretation as a behavioural influence**

Tourist use of the environment continues to increase, and one effective management response to reduce negative associated impacts due to inappropriate behaviour is through education (Orams, 1996b). Education can be expanded upon using a communication process known as interpretation, defined by Tilden (1957) as "an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand media, and by illustrative media, rather than simply to communicate factual information." Supporters of strategic interpretation believe it can mitigate negative impacts of tourism whilst developing a motivated and educated public that supports conservation (Powell & Ham, 2008). Indeed, interpretation has been shown to successfully reduce tourism impacts on the environment (Ham *et al.*, 2009; Tubb, 2003), including a reduction in litter in a national park (Brown *et al.*, 2010). However, other studies have shown that interpretation leads to little or no improvements in environmental attitude or pro-environmental behaviour (Lee & Moscardo, 2005), possibly due to the ways in which the information was presented (Beaumont, 2001).

Resource managers often rely upon interpretation to influence visitor attitudes and knowledge, hoping these changes help to fulfil management or business objectives (Hughes & Saunders, 2005). Visitors who explore natural areas may be receptive to interpretative communication, affecting their attitudes related to conservation (Ballantyne *et al.*, 1998). Although attitudes have been shown to be influential causal variables associated with environmentally significant behaviours (Stern, 2000b), a change in attitude does not necessarily guarantee a change in the corresponding behaviour (Whitmarsh & Lorenzoni, 2010). Furthermore, perceived self-efficacy has been shown to be a strong predictor of behaviour (Moser & Dilling, 2004), including the facilitation of intentions into action (Armitage & Conner, 2001). Along the GBR, a greater emphasis on the ease and accessibility of pro-environmental actions, e.g., recycling and reducing energy consumption, may lead to an increase in conservation-related behaviour (van Riper *et al.*, 2012b). People who visit the GBR for snorkelling and diving activities may thus be a receptive audience to target with conservation messages that seek to influence key attitudes and behaviours.

Case studies have long been used as a comprehensive research strategy (Dufour & Fortin, 1992), evolving from the traditional methodologies of both qualitative and quantitative inquiry such as grounded theory (Platt, 1992). While occasionally criticised as being of limited scientific value (Oppermann, 2000), a comprehensive review by Xiao & Smith (2006) showed the widespread critiques of case studies as being conceptually and analytically weak are unjustified. Indeed, case studies provide effective examples with which to strengthen social science (Flyvbjerg, 2006), develop theoretical constructs (Eisenhardt & Graebner, 2007), and improve practical applications such as environmental valuations (Barde & Pearce, 2013) or the conservation of biodiversity in a changing climate (Anderson *et al.*, 2015). However, there are few case studies related to tourism and actions

related to climate change in World Heritage Areas (Jamal *et al.*, 2015), and research along the GBR is especially deficient.

### **7.2.2 Research questions**

Climate change may permanently affect the benefits that tourism operators derive from nature-based tourism experiences, but vulnerability can be reduced if action is taken (Marshall *et al.*, 2011). Along the GBR, many tourism operators are taking extensive actions to address climate change, e.g., the installation of a hybrid solar diesel power station at Lady Elliott Island Eco Resort (Zeppel, 2012a). Unfortunately, other tourism operators avoid personal or corporate responsibility for climate change action, preferring instead to focus on promoting the tourism experience whilst remaining unaware or ill-informed about climate change (McKercher *et al.*, 2014).

Here, I revisit the Theory of Planned Behaviour (TPB) described in detail in Chapter 2, using it as a conceptual framework to develop specific survey questions that explore tourism operator attitudes, social norms, and perceived behavioural control beliefs related to climate change interpretation and stakeholder engagement. This approach followed the recommendations made by Ham *et al.* (2009), with attention given to the phrasing of certain survey questions. In addition to focusing on three key areas most likely to influence individual decision-making, the TPB framework also provides a structure in which to target and track the effectiveness of behavioural interventions such as interpretation. Strategic interpretation can be used by resource managers to influence behaviour (Ham, 2007). More detail about the TPB can be found in Chapter 2.

Understanding why some marine tourism operators are taking action while others are not is one purpose of this study. Barriers to pro-environmental action, including constraints related to innovation or learning, can make tourism enterprises more vulnerable to crises, both external and self-induced (Biggs, 2011). Biggs *et al.* (2012) identified four main barriers to conservation action among tourism operators of the GBR: regulatory and bureaucratic obstacles, infrastructure constraints, lack of knowledge, and cost. Here, I build upon these findings, with particular focus on pro-environmental behaviours related to climate change. Clarification of the attitudes, barriers, and ongoing efforts of tourism operators to engage their guests about climate change, and to directly address impacts via their own business practices, will assist resource managers to encourage tourism operators to take more positive and direct action. To address the knowledge gap identified by McKercher *et al.* (2014), I explored four main research questions:

- I. What do tourism operators perceive the threat of climate change to be across multiple scales?
- II. How do tourism operators believe they can most effectively take action to address climate change impacts on the GBR?
- III. How responsible do tourism operators feel about offering interpretation about climate change to their guests and what do they believe is the best way for them to communicate this with their guests?
- IV. What are the salient beliefs that prevent or encourage marine tourism operators in engaging their guests about climate change?

Below, I present the results of 19 in-depth interviews conducted with marine tourism operators along the GBR. I used a semi-structured approach that enabled the collection of nuanced and contextual qualitative information to complement the quantitative data collected, based on a similar approach used by Biggs (2011). Consequently, my results focus upon both quantitative and qualitative analyses that address the research questions highlighted above. I discuss the key findings in a resource management context, including potential applications for ongoing communication programs along the GBR and next steps in future research.

### **7.3 Methods**

Sixteen tourism operators from the Cairns/Port Douglas and Whitsundays regions, two of the most popular and iconic tourism destinations along the GBR, were surveyed twice. Over the past two decades, nearly 90% of tourists who visit the GBR have done so via the Cairns/Port Douglas and Whitsundays regions (Biggs, 2011). Although the sample size appears small, the respondents included in this study represent businesses that cumulatively carry a disproportionately large number of tourists along the GBR, i.e. the majority of total visitors to the GBR. Thus, the businesses included in this study have the potential to influence millions of people each year. In order to maximise the utility of my results for resource managers, I sought to obtain an in depth understanding of the operators that carry the majority of visitors to the GBR. Specifically, I used a segmentation strategy to focus on a particular subset of operators that have the capacity to influence the most visitors. A detailed analysis of these individuals can guide managers on the best strategies to get the operators that carry the majority of visitors to the Reef to effectively communicate and influence about climate change. Feedback from the strategies that might be developed from this work the study can easily be repeated with additional operators to further tailor messaging to their needs. Further, if I did not focus this study on those that carry the most visitors, the resulting recommendations may not be focused on their needs and requirements (which due to high passenger numbers may be quite different from small operators), potentially undermining the value of this information in guiding management decisions.

Respondents were first interviewed over the telephone as part of baseline surveys conducted by the Social and Economic Long-Term Monitoring Program (SELTMP) of the Great Barrier Reef from June through August, 2013 (Curnock *et al.*, 2014a). Excerpts from the results of the large-scale quantitative interviews from SELTMP are presented as context to the results of these fine-scale qualitative surveys. Both surveys are described in depth in Chapter 3. The focused sample size ( $n = 19$ ) of these fine-scale follow up surveys allowed for a thorough investigation of tourism operator perceptions around multiple aspects of climate change, including their actions taken in response but also how they engage their guests about the issue. Focused evaluations have been shown to enhance the validity of certain inquiries, particularly studies like this one which aim to scrutinise the dynamic qualities of a situation, i.e., how and why marine tourism operators on the GBR are or are not addressing climate change (Crouch & McKenzie, 2006). Additionally, small sample sizes allow for a purposeful and deep understanding of each respondent within a case study (Sandelowski, 1995), preventing researchers from being overwhelmed by data and precluding respondents from being incorporated into an anonymous part of a larger whole (Robinson, 2014).

#### **7.3.1 Study Area**

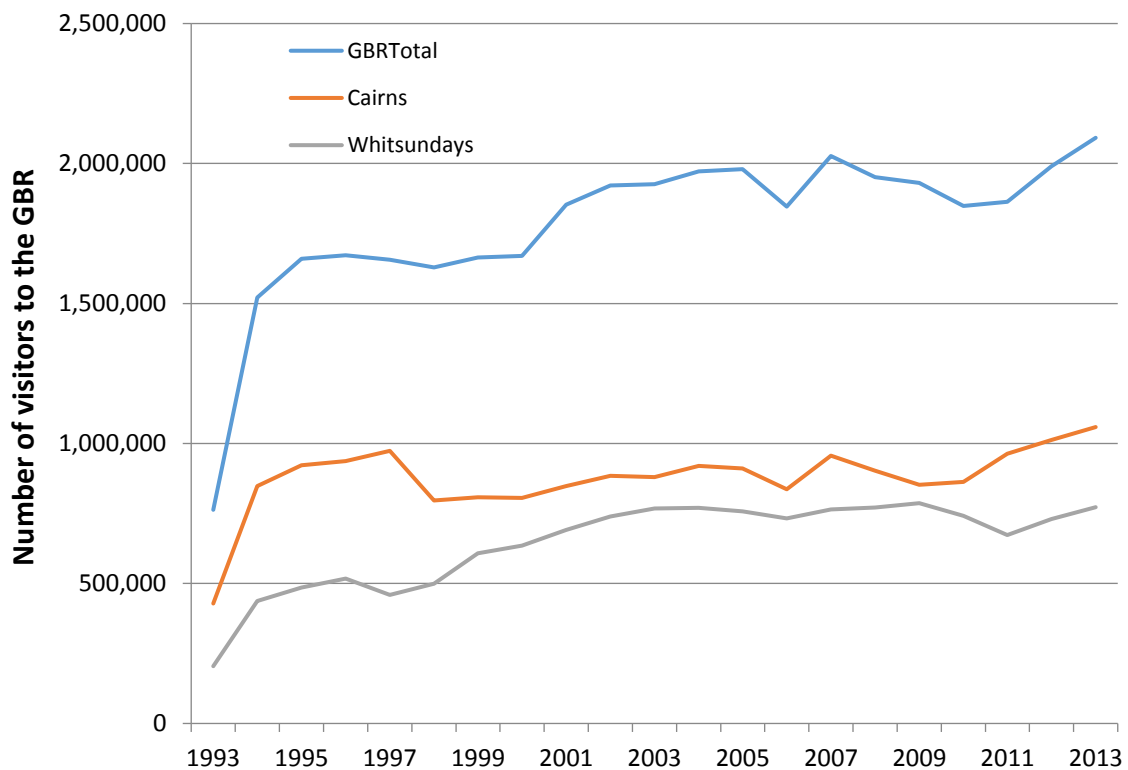
The Great Barrier Reef offers a wide variety of recreational activities including fishing, island visits, nature walks, and snorkelling and SCUBA dive trips (Curnock *et al.*, 2014a). Since 1993, approximately 85% of tourism visits along the GBR have occurred in the Cairns and Whitsundays regions (Figure 7.1). Cairns is the main gateway city to the GBR, receiving approximately 2.5 million visitors annually (Prideaux *et al.*, 2012), while the Whitsundays region is home to 74 islands, the popular backpacking area of Airlie Beach, and several upmarket resorts such as Hamilton Island. In response to the diverse suite of threats facing the GBR, the GBRMPA has initiated a comprehensive, ecosystem-based approach to management (Ruckelshaus *et al.*, 2008). Thus, its iconic status, vulnerability to environmental impacts, ongoing best-practice management and well-developed marine tourism industry make the GBR an excellent location to explore tourism operator perceptions about climate change.

#### **7.3.2 Survey design**

The survey was developed following a review of the scientific literature, an analysis of research gaps, and subsequent discussions with resource managers at the GBRMPA. When survey questions were



based upon previous studies, I have included the appropriate citations. Please see section 3.3.3 for greater detail. All other statements and questions without citations were developed by me. Additionally, I sought to further explore, and explain in greater depth, certain findings from earlier phases of this thesis. All questions sought to fill key knowledge gaps and address research questions identified by resource managers. The survey questions were designed to examine industry perceptions of climate change as a whole rather than individual impacts such as the mass coral bleaching event of early 2016. More information on the survey design can be found in Chapter 3, Section 3.3.3.



**Figure 7.1.** Long-term trend in full-day visitations to the Great Barrier Reef via the Cairns region and the Whitsundays region from 1993 to 2013 (adapted from Biggs (2011) and using data from [http://www.gbrmpa.gov.au/visit-the-reef/visitor-contributions/gbr\\_visitation](http://www.gbrmpa.gov.au/visit-the-reef/visitor-contributions/gbr_visitation)).

### 7.3.3 Survey administration

Semi-structured interviews were conducted with owners and managers of charter fishing operations as well as businesses that provide snorkel and SCUBA dive trips, either single or multi-day excursions, in the GBR Marine Park. These businesses have different priorities yet all of them provide tourists with a firsthand experience of the GBR. Most interviews were conducted in person – although two were conducted over the phone – and interviews were recorded to ensure accuracy in data capture and analysis. The average length of the interview was 33 minutes, ranging from 24 to 60 minutes in length. The tourism operators interviewed in this survey had spent considerable time in the tourism industry and the GBR region (Table 7.1). Most respondents were male (16 out of 19), with an average age of 47, who were heavily reliant on GBR tourism for their livelihoods. Respondents worked in businesses that were highly variable in size: Three businesses had more than 150 employees and six had less than 10 employees. More information on the survey administration can be found in Chapter 3, Section 3.4.3.

**Table 7.1: Summary demographic characteristics of the tourism operator respondents**

	Mean	Median	Std Dev	Minimum	Maximum
Age	47	48	8.95	31	64
Time spent in the tourism industry	20 years	21	8.8	7	36
Time spent in the GBR region	22 years	25	9.4	7	35
Days operating on the GBR in the last year*	323	360	90	50	365
Estimated proportion of household income that came from GBR tourism in the last financial year*	90	100	16	50	100
Number of full-time equivalent employees*	67	35	104	2	400

\*Based on data collected from the respondents during the SELTMP surveys in 2013 (Curnock *et al.* 2014).

### 7.3.4 Data analyses

Qualitative responses to the semi-structured questions were evaluated using a thematic analysis (Bryman, 2012). Thematic analyses are independent and reliable qualitative approaches that use codes to identify, analyse, and reports patters within data (Braun & Clarke, 2006; Vaismoradi *et al.*, 2013). Codes are defined here as, “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based data” (Saldaña, 2015). Codes were pre-tested by having two independent coders review the same section of interview using the defined codes. Following this, codes were examined, discussed, and revised based on the recommendations in (Gorden, 1992) for coding categories to be both “all-inclusive and mutually exclusive.” Once the codes were finalised, all individual responses were segregated into each category of code and then counted.

Words and numbers are occasionally viewed as opposing entities that “cannot easily or ‘shamelessly’ coexist without considerable effort” (Ford-Gilboe *et al.*, 1995, p. 230). Qualitative data cannot be directly reduced to quantitative information, yet there is no reason to view these two analogues as incompatible (Howe, 1988). Although qualitative research is often characterised by a lack of numbers, sums and counts are actually essential, helping to establish the significance of research findings, documenting specific problems, describing a sample, testing conclusions, and generating meaning (Sandelowski, 2001). The interpretation of qualitative findings is thus often reliant upon quantitative input and discussion. In this way, counts can be essential to ensuring descriptive, interpretive, and theoretical validity in qualitative research (Maxwell, 1992).

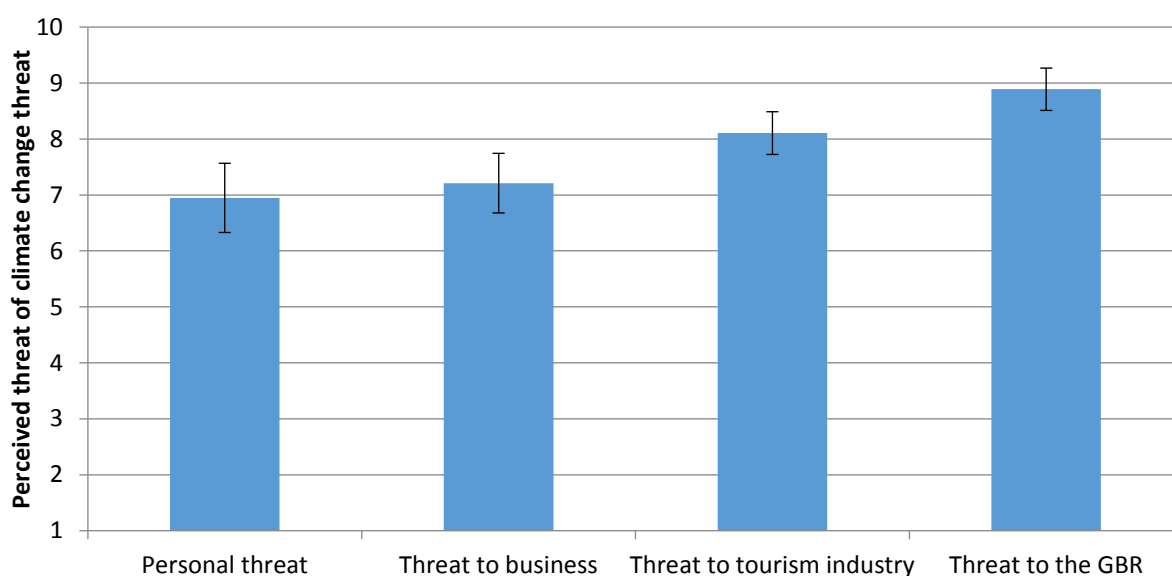
Summaries of the counts obtained in this study are presented in Tables 7.2 – 7.6. Inferential statistical analyses were not conducted due to the small sample size. However, to compare variability in responses, the means and standard errors were calculated using the quantitative responses to the statements that used 10-point Scales.

## 7.4 Results

The results below are presented in two parts. First, I describe what tourism operators believe about climate change and what actions they take in response to it. Secondly, I explain how tourism operators engage the public about climate change, including a description of how they use interpretation and strategic communication in their interactions with tourists. Following this presentation of the results, I discuss the implications for resource managers seeking to influence tourism operators as well as the tourists they take to the GBR.

#### 7.4.1 Tourist operator perceptions about the threat of climate change

Most tourism operators (13 out of 19) interviewed in this survey believed that climate change was “an immediate threat requiring action.” Two respondents believed that climate change was a “serious threat, but the impacts were too distant for immediate concern” while three needed “more evidence to be convinced of the problem.” Only one respondent did “not have a view on climate change” and nobody felt that “climate change is not a threat at all.” Respondents thought the threat of climate change varied depending upon the spatial scale considered (Figure 7.2). Most respondents (15 out of 19) agreed that climate change was a threat to themselves, their business (14 out of 19), the GBR tourism industry (16 out of 19), and the GBR (16 out of 19). However, respondents believed that climate change was a more extreme threat to the GBR (mean = 8.89, SE = 0.38, n = 19) than it was to the tourism industry (mean = 8.11, SE = 0.38, n = 19), their own business (mean = 7.21, SE = 0.53, n = 19), or them personally (mean = 6.95, SE = 0.62, n = 19).



**Figure 7.1.** Comparison of mean rating scores showing tourism operator perceptions of the threat of climate change to the GBR, the tourism industry, their business, and to themselves. Responses were ranked on a 10-point scale where 1 = not a threat at all and 10 = an extreme threat.

#### 7.4.2 Tourism operator perceptions about responsibilities, interpretation, and engagement

Respondents believed they had two overriding responsibilities as tourism operators on the GBR: Operating their business and protecting the environment (Table 7.2). In terms of business responsibilities, the main concerns of the operators were to ensure a good visitor experience, provide a safe environment for guests and staff, manage the profitability and administrative matters related to business operations, and hire and train good staff. The following quote typifies one such motive:

*(The) main responsibility is just that people have a good time and enjoy themselves and want to come back. – Tourism Operator 4*

Most operators (13 out of 19) highlighted that the sustainable use and conservation of the marine environment was paramount to their work. These operators focused their responses in three main areas: Environmental protection, sustainable use, and social concerns. Nearly half of the respondents

(9 out of 19) mentioned environmental protection and preservation as one of their top three business responsibilities. Consider, for example, this interview extract in which a tourism operator identifies his/her priorities as:

*Protecting our environment, and that being the precious island that we live on and also our beautiful reef, protecting what's in the reef. – Tourism Operator 3*

Finally, seven operators noted that engaging the community and advocating for protection of the GBR was a core responsibility. Specifically, these operators highlighted the important role of providing interpretation in this process, that is, in the words of one operator:

*Getting an environmental message out to domestic and international travellers.  
– Tourism Operator 1*

**Table 7.1: The responsibilities that respondents feel are key components of their job as tourism operators on the Great Barrier Reef**

“As a tourism operator in the GBR, what do you feel are your top three responsibilities around your job?”	Total Mentions	Tourism operators who mentioned it (n = 19)	Overall proportion of respondents who mentioned it (n/19)
<b>Business operations</b>	<b>28</b>	<b>19</b>	<b>100%</b>
Ensuring a good visitor experience	9	9	47%
Safety	8	8	42%
Management, profitability, and various administration matters	7	7	37%
Staff training, hiring, and development	4	4	21%
<b>Conservation of the GBR socio-ecological system</b>	<b>15</b>	<b>13</b>	<b>68%</b>
Protecting and preserving the environment	9	9	47%
Sustainable use of the GBR	4	4	21%
Social concerns	2	2	11%
<b>Community engagement and advocacy</b>	<b>7</b>	<b>7</b>	<b>37%</b>
Educate people and get messages across	5	5	26%
Raise awareness and be an advocate for the GBR	2	2	11%

Sixteen respondents agreed that providing more and/or better education and interpretation was a useful approach to help tourists to understand the threats to the GBR (Table 7.3). Respondents expressed various ideas about how best to communicate with tourists, including more effective representation in the media, improved government leadership, and better scientific research. Most operators (16 out of 19) felt that engaging with tourists and educating them about threats to the GBR was an effective option to increase their understanding about threats and the potential behaviours they could adopt to mitigate them. As one operator commented:

*Education is the short answer. The reef operators, yeah, and everyone in Cairns has a role to play. Everyone should provide information about the health of the reef.  
– Tourism Operator 7*

Respondents believed that an additional way to inform tourists about the threats to the GBR was to use media stories and endorsements from high profile figures. About a quarter of respondents felt that media and marketing interventions would help educate tourists about the GBR. Consider, for example, the following observation:

*Media is one way. I think a lot of people come with a preconceived idea of what they'll see or what they'll not, particularly international tourists. You know, this is happening, that is happening. They come out here and quite a bit of feedback we get is "ah, it's a lot better than what we thought it would be. We heard it was all dead." – Tourism Operator 12*

Finally, some respondents (4/19) believed that improving how the GBR is managed would help tourists to understand the threats to the GBR. These tourism operators believed that more effective governance and leadership would indirectly influence the perceptions of visitors about the GBR. For example:

*By doing, not saying, you know, move towards a much stronger environmental presentation of tourism. – Tourism Operator 10*

**Table 7.2: Respondent perceptions about how to help tourists understand the threats to the GBR**

“How do you think we could help tourists to understand what the real threats to the GBR are?”	Total mentions	Tourism operators who mentioned it (n = 19)	Overall proportion of respondents who mentioned it (/19)
<b>Provide more/better education and interpretation</b>	<b>20</b>	<b>16</b>	<b>84%</b>
Educate tourists	10	10	53%
Provide interpretation for tourists	6	6	32%
Improve the science/facts about the issue	4	4	21%
<b>Awareness and promotion</b>	<b>5</b>	<b>5</b>	<b>26%</b>
Utilise marketing resources such as endorsements and spokespeople	3	3	16%
Improve the stories portrayed in the media	2	2	11%
<b>Improved governance and management</b>	<b>4</b>	<b>4</b>	<b>21%</b>
Lead by example, “walk the talk”	2	2	11%
Have better government decisions and leadership	2	2	11%

### **7.4.3 Tourism operator actions to address climate change**

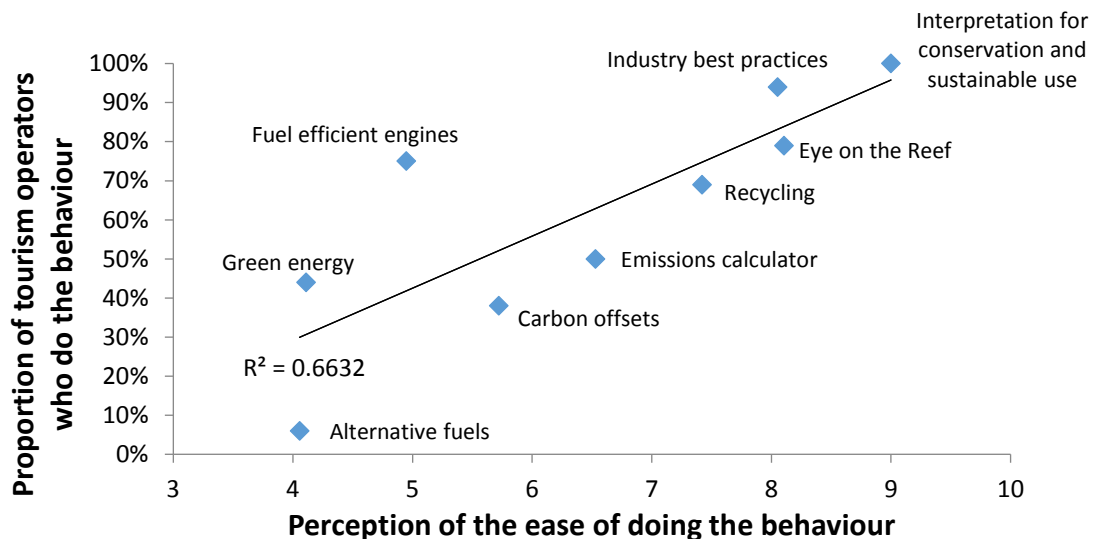
Respondents were questioned about 10 environmental behaviours related to climate change and the conservation of the GBR (Table 7.4). The three most commonly undertaken behaviours, i.e., those behaviours with the highest proportion of tourism operators who report doing them, received the three highest scores related to the ease of doing these behaviours. That is, the behaviours perceived to be the easiest were the ones that were most often done. Additionally, two of the three least common behaviours (use of green energy and use of alternative fuels) were perceived to be the most difficult behaviours.

**Table 7.3: Tourism operator perceptions of the ease and efficacy of ten environmental behaviours**

Behaviour	Proportion of operators who do it*	Mean of perception of ease (n = 19)	Mean of perception of effectiveness (n = 19)
Providing interpretation for tourists that promotes conservation and sustainable use of the GBR	100%	9.00	6.47
Participation in industry best practices, via a code of practice or MOU	94%	8.05	7.84
Participation in GBRMPA's Eye on Reef program	79%	8.11	5.74
Use of fuel efficient engines	75%	4.95	7.37
Separation of waste by tourists for recycling	69%	7.42	7.68
Use of an emissions calculator	50%	6.53	6.53
Use of green energy (e.g. solar)	44%	4.11	7.11
Use of carbon offsets	38%	5.72	6.12
Use alternative fuels such as biodiesel and ethanol	6%	4.06	6.50
Providing interpretation such as best practice guidelines - to help your guests/passengers minimise their impacts on the Reef.	<i>N/A (wasn't included in the 2013 SELTMP surveys)</i>	8.79	7.21

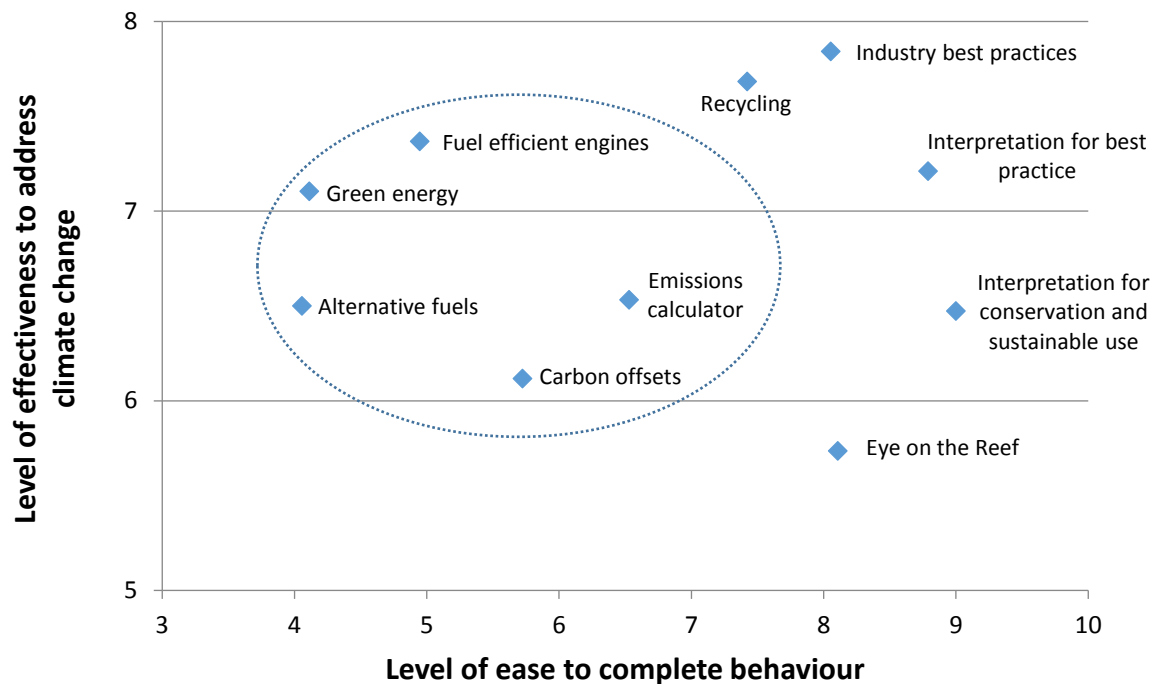
\*(adapted from Curnock *et al.* 2013)

The four behaviours that were done least all relate to climate change mitigation: use of an emissions calculator, use of green energy, use of carbon offsets, and the use of alternative fuels such as biodiesel and ethanol. Interpretation that encourages best practices and the conservation and sustainable use of the GBR was the most commonly undertaken behaviour and was also seen to be the easiest behaviour to implement (Table 7.4; Figure 7.3).



**Figure 7.2.** The proportion of tourism operators that undertake nine environmental behaviours plotted against the perceptions of how easy it is to do those behaviours. Responses were ranked on a 10-point scale where 1 = very difficult to do and 10 = very easy to do. The proportion of operators undertaking the behaviour was taken from the 2013 SELTMP surveys (Curnock *et al.*, 2013).

Of the ten behaviours included in the survey, tourism operators believed that maintaining industry best practices and recycling were the two most effective ways to address climate change on the GBR (Figure 7.4). Participation in GBRMPA’s Eye on the Reef program was perceived to be the least effective way to address climate change on the GBR. Respondents believed that high staff turnover in their businesses made it difficult to effectively participate in the Eye on the Reef program. They also did not recognise the link between monitoring and management, believing that the program did not focus on initiating change. Carbon offsets were also largely seen to be ineffective to address climate change on the GBR as many operators were sceptical about their efficacy, validity or reliability.



**Figure 7.3.** The perceived levels of ease and effectiveness of ten different conservation behaviours related to climate change. Responses were ranked on two separate 10-point scales. Ease to complete the behaviour was ranked on a scale where 1 = very difficult to do and 10 = very easy to do. Level of the effectiveness of each behaviour to address climate change was ranked on a scale where 1 = not at all effective to address climate change on the GBR and 10 = very effective to address climate change on the GBR. The behaviours in the circle are those that directly relate to climate change mitigation.

#### 7.4.4 Opportunities and obstacles for operators to address climate change on the GBR

Using the TPB as a framework for developing survey questions, I explored the attitudes and perceptions of self-efficacy related to climate change action held by marine tourism operators. The opportunity to influence tourist opinions was affected by a variety of attitudes held by respondents, including their internal perceptions (e.g., personal motivation) as well as external factors (e.g., the chance to converse directly with large numbers of people; Table 7.5). In particular, respondents thought they could use their location to their advantage. Many operators (11 out of 19) recognised that being out on the GBR provided a valuable opportunity to use visual examples to complement the information and messages they provided their guests. Here are two comments that illustrate this attitude on the part of operators:

*We have a living example that we can actually show to people and portray it.*  
 – Tourism Operator 1

*We are taking people out there and showing them, and doing the interpretation. Our attitude and how we treat it, how we present it to them, is the message they take away.*  
– Tourism Operator 19

Many operators also agreed they could affect proactive change in people, both in terms of their knowledge but also their behaviours. They felt this was a valid reason for them to influence public opinion, but some operators felt they could influence change beyond just the guests they took out to the GBR. Consider the following interview responses, for instance:

*I would think somehow our role would be more important in making government aware of how things will impact and therefore what potentially government can do with reef conservation in general.* – Tourism Operator 8

*Because through education we can inform the community and people will leave the area with a better appreciation of the GBR.* – Tourism Operator 17

Respondents also felt an obligation to influence the wider public opinion, recognising they had an emotional connection, obligation, and/or concern for the GBR that merited their efforts to affect change. Here are two operators giving voice to their sense of obligation:

*We are the people that work in this industry that would like to protect it so that the industry can keep on going and future generations can enjoy what we are currently enjoying at the moment.* – Tourism Operator 3

*People working in the industry have enormous love and affection for the reef and a care factor and, um, I think information presented through that quarter is extremely influential on the customer.* – Tourism Operator 10

Finally, respondents believed that they have a large and captive audience to engage, as illustrated by the following interview extracts:

*We have a captive audience who want to learn about the system.* – Tourism Operator 5

*We can potentially deal with 100,000 passengers in a year so if we can impact on them, then that certainly assists by taking somebody out there and actually showing them the reef and showing them why people are concerned about losing it.* – Tourism Operator 12

The TPB suggests that perceived ability to undertake a behaviour is a key factor in whether or not that behaviour is initiated. Here, the data indicate that several perceived obstacles made it challenging for respondents to provide interpretation for tourists about climate change and the GBR. First, the plethora of cultures and languages among international tourists visiting the GBR was seen as a hindrance to operators wishing to communicate with tourists. For example, due to the high volume of international tourists, information and fact sheets needed to be translated into many languages, including French, Spanish, Chinese, and Italian. The following excerpt illustrates the challenge faced by operators:

*Lots of big tour groups coming out with very little control or very little knowledge of where they're coming due to language barriers and as best as we try to advise them, it just doesn't always get through.* – Tourism Operator 3



**Table 7.4: The role of tourism operators in influencing public opinions about the GBR**

“Do you think tourism operators have a role to play in influencing public opinions about the conservation of the GBR? Why or why not?”	Total mentions	Tourism operators who mentioned it (n = 19)	Overall proportion of respondents (/19)
<b>Location: They are out on the GBR</b>	<b>14</b>	<b>11</b>	<b>58%</b>
They are “out on the front line”	8	8	42%
They can use physical examples on the GBR to support their ideas	6	6	32%
<b>Self-efficacy: They can affect change</b>	<b>8</b>	<b>8</b>	<b>42%</b>
Can influence knowledge and behaviour	8	8	42%
<b>Responsibility: They feel an obligation to do something</b>	<b>8</b>	<b>8</b>	<b>42%</b>
They feel responsible to protect the GBR and the tourism industry	6	6	32%
They have an emotional connection and/or concern	2	2	11%
<b>Opportunity: They have an engaged audience</b>	<b>6</b>	<b>6</b>	<b>32%</b>
They have a captive audience to connect with	4	4	21%
They can reach many people	2	2	11%

Additionally, the day trips to the GBR often have very strictly scheduled timelines such that there is not much time available for elaborate discussions or presentations. Many reef trips are tightly coordinated to ensure passengers are given safety briefings, morning tea, lunch, and that guests are provided with ample opportunity to sign up to purchase photos, dive packages, and other reef experiences. Interpretation must thus compete with these activities for the attention and time of the guests. This challenge is summarised in the words of one operator as follows:

*I guess what would make it hard is at times the trips are run quite tight, there’s certain things they have to do. Depending on weather and conditions, some trips don’t run as smooth as others and so the opportunities might not be there to give the full interpretation program.*  
– Tourism Operator 18

Third, respondents were cautious about discussing negative topics with guests as they were concerned how these discussions would affect the tourism experience on the day. Respondents also feared that guests would misinterpret information and spread bad publicity about the GBR back home, negatively influencing the tourism industry by reducing visitor numbers and business revenue. This reticence is typified by the following respondent comment:

*We don’t want to sour anyone’s experience on the day by putting out negative messages.*  
– Tourism Operator 7

Fourth, many respondents believed the government and/or industries or organisations with a vested interest would object or disapprove of them providing interpretation to tourists about climate change and the GBR. Tourism Operator 17 believed “*the resources industry, particularly the coal mining industry*” would disapprove while Tourism Operator 18 felt that “*industries in conflict, such as the mining developments going on at the moment*” would also object to such communication with tourists. Finally, many tourism operators believed that tourists were out for a good time, and, as Tourism Operator 5 stated, “*people don’t want to be lectured*” about environmental issues.

#### 7.4.5 Interpretation and messages provided by tourism operators

All of the tourism operators included in this survey provided interpretation about the GBR to their guests. This interpretation focused on three main themes: Education and awareness (15 out of 19), conservation activities such as resource management (14 out of 19), and information they believe enhanced the tourist experience (4 out of 19; Table 7.6). Most of the education and awareness-raising topics focused upon facts about the GBR and general knowledge, e.g., the size and history of the GBR. A few respondents (3 out of 19) discussed unique environmental attributes and more complex topics such as ecosystem dynamics. Other topics included the key threats to the GBR such as coral bleaching as well as the diversity of fish and corals, as illustrated by the following comment:

*The key message is the incredible diversity that we have. – Tourism Operator 1*

Conservation activities such as environmental protection and management approaches were also a main theme in the interpretation that many tourism operators provided to their guests. This included information about how tourists could minimise their impacts on the environment, e.g., recommendations about what behaviours to avoid. Respondents also focused upon how tourists could help protect the GBR and support the existing management arrangements in place, e.g., no-take areas. Here is an operator stressing this point:

*Key messages would have to be to look after our Great Barrier Reef, like not standing on it and all that sort of thing and don't touch anything and don't remove anything from the reef. – Tourism Operator 16*

Finally, four respondents focused interpretation on ensuring that tourists had a good experience. These respondents sought to guarantee an enjoyable time for their guests by complementing the visit with stories and anecdotes about the GBR. The following comment expresses this priority:

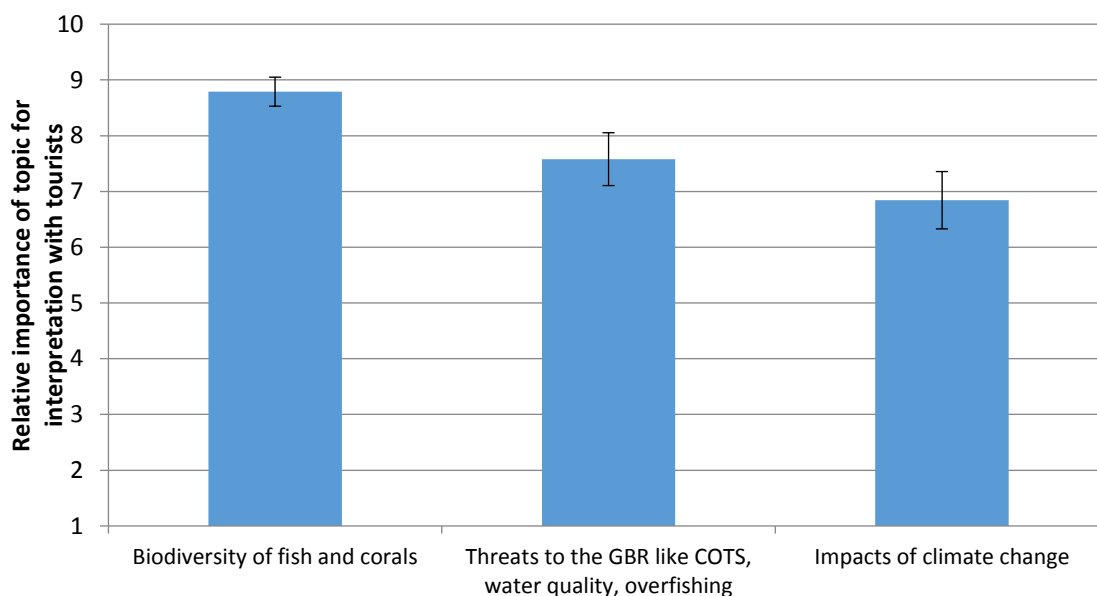
*We provide the most adventurous or almost extreme experiences for people... you also are giving them very often the best natural experience they've ever had in their life, so that's the building block and then interpretation complements all of that. – Tourism Operator 13*

**Table 7.5: The interpretation themes provided by tourism operators to their guests**

“What are the main themes of the interpretation about the GBR that you provide for your guests?”	Total mentions	Tourism operators who mentioned it (n = 19)	Overall proportion of respondents who mentioned it (/19)
<b>Education and awareness about the GBR</b>	<b>23</b>	<b>15</b>	<b>79%</b>
General knowledge about the GBR	8	8	42%
Biodiversity of the GBR	7	7	37%
Threats to the GBR, e.g., climate change	5	5	26%
Unique environmental attributes	2	2	11%
Ecosystem dynamics	1	1	5%
<b>Conservation activities</b>	<b>18</b>	<b>14</b>	<b>74%</b>
Environmental protection	14	14	74%
Environmental management	4	4	21%
<b>Tourist experience</b>	<b>6</b>	<b>4</b>	<b>21%</b>
Ensuring a good trip for guests	4	4	21%
Expectations for the day	2	2	11%

Compared with topic areas such as biodiversity and threats to the GBR, interpretation related to climate change was seen to be less of a priority for tourism operators to discuss (Figure 7.5). Respondents agreed strongly that informing tourists about the fish and corals they may encounter on the day was very important. Although threats to the GBR and the impacts of climate change were also seen as important, the majority of respondents did not discuss climate change with their guests. Just 5 out of 19 respondents include it in the interpretation they regularly provide to guests. A feeling of powerlessness to address the problem may influence this lack of engagement about climate change, as shown in the following quote:

*“Don’t get me started on climate change. And everyone is missing the point as to what is really happening, you know, with the coral dying out there and things like that. And so it should be politically taken at – at a global level, and do something about it, because it’s a global problem. It can’t be addressed by us.” – Tourism Operator 19*



**Figure 7.4.** Comparison of mean rating scores showing tourism operator rankings of the importance of informing tourists about biodiversity, threats to the GBR, and the impacts of climate change using a 10-point scale where 1 = not at all important and 10 = the highest importance.

### 7.5 Discussion and conclusions

Most respondents recognised the threat of climate change to themselves, the tourism industry, and the GBR. Additionally, they believed they had a role to play in influencing public opinion about the conservation of the GBR. However, some respondents were reluctant to discuss climate change with tourists and they had mixed views on the actions they could take to address climate change on the GBR, believing certain behaviours to be difficult, ineffective, or expensive. Here, I discuss these findings in depth, including a focus on addressing the research questions identified in Chapter 2. Specifically, I explore the perceptions of threats held by tourism operators, the actions they believe can effectively address climate change, and the role of interpretation in communicating with their guests. I conclude with a consideration of implications for resource managers seeking to influence the behaviour of marine tourism operators, particularly with respect to the climate change mitigation and stakeholder engagement activities they undertake. I also briefly discuss how the results from previous chapters may be used by tourism operators and resource managers to influence the actions of tourists as well.

### **7.5.1 Perceptions about the threat of climate change**

A majority of respondents recognised the severity, potential impact, and urgent need to address climate change. Their perceptions of climate change were influenced by their sense of the spatial scale of the threat. That is, respondents believed that climate change was a more extreme threat to the GBR than it was to them personally. This is consistent with other studies showing that individuals often do not believe that climate change is an immediate, personally relevant threat (Scannell & Gifford, 2013) and that distant locations are more threatened than local areas (Spence & Pidgeon, 2010). However, as a consequence of running a business that depends upon a healthy ecosystem, tourism operators are intimately intertwined with their surrounding environment. In that regard, there is no true separation of a threat to their business from a threat to the GBR. This is important because individuals who perceive climate change to be personally threatening are more likely to take action to address those threats (O'Connor *et al.*, 1999). Further clarification of why tourism operators feel personally threatened by climate change may assist in the development of messages and programs that help them to recognise the threat and take action to address it. Below, I describe how this study contributes to this process.

### **7.5.2 Climate change behaviours: attitudes, norms, and control beliefs held by tourism operators**

The Theory of Planned Behaviour (TPB), described in depth in Chapter 2, is one of the most widely accepted psychological theories related to human behaviour, providing a framework for identifying and understanding key drivers of individual actions such as attitudes, social norms, and control beliefs. Understanding these attributes, and the context in which individual drivers interact to influence decision-making processes, is an important step in changing behaviour, including those most relevant to climate change and natural resource management. These changes in behaviour may lead to an increase in political willingness to address climate change, a focused and more engaged general public, and a populace that is more effectively able to mitigate and adapt to climate change. Here, I discuss how the key findings from these in-depth interviews align with the constructs of the TPB. I then discuss how these findings can be used in a communication and interpretation context.

#### *Attitudes*

Most respondents had positive attitudes about the responsibilities that come with being a marine tourism operator on the GBR, and respondents felt good about their role as stewards of the marine environment. This is important because people with a greater sense of responsibility are also more likely to engage in pro-environmental behaviours (Kollmuss & Agyeman, 2002). Individual barriers to action lie within an individual, and Blake (1999) identified three key barriers to environmental conservation and action: individuality, responsibility, and practicality. Respondents felt that protecting and preserving the environment was seen to be a top priority, and tourism operators believed that educating people and advocating for conservation were core business activities. Thus, attitudes held by marine tourism operators appear to not be a limiting factor in the ways in which tourism operators perceive conservation or environmental protection. Their attitudes are well aligned with proactive intentions to serve as environmental stewards, supporting previous research in the region (Biggs, 2011; Curnock *et al.*, 2014a; Great Barrier Marine Park Authority, 2016).

#### *Social norms*

A key challenge for resource managers is to create solutions in tourism where social norms can influence operators with undesirable behaviours to model the sustainable examples set by those with pro-environmental behaviours (Miller *et al.*, 2010). Along the GBR, many tourism operators included in this survey felt a social obligation to take action to protect the GBR. This obligation related to the responsibility they felt to ensure the environmental focus of their business, but also to the tourism industry as a whole. In addition to normative influences regarding environmental conservation, respondents also recognised various social norms related to their business and community obligations. For instance, nearly half of the respondents wanted to ensure a good visitor experience

and others social concerns were a key aspect of the conservation of the GBR. In this way, tourism operators recognised their business had a considerable role to play in protecting the natural world around them and they also recognised their individual role in this process. Thus, the pressure of social norms is acknowledged by tourism operators and does not seem to hinder the pro-environmental behaviours they undertake to protect the GBR. Rather, the converse seems to be true, social norms may drive organisations to adapt their operations (Jamal & Getz, 1995). A management strategy promoting social norms may be highly effective at influencing certain environmental attitudes and behaviours that ultimately impact the management and conservation of the GBR (Coghlan et al., 2016).

### *Control beliefs*

Knowledge, skills, and abilities are three aspects of perceived behavioural control that may prevent an individual from taking action. Among marine tourism operators included in this survey, many felt that money was a limiting factor in undertaking climate change mitigation activities, i.e. they believed that certain behaviours are too expensive. This finding is consistent with the work of Zeppel and Beaumont (2013), who showed that tourism operators preferred easy, low-cost actions leading to financial savings. Unfortunately, market forces are often insufficient to produce tourism activities that foster sustainability and, as a consequence, government interventions are required (Bramwell, 2012). Federal subsidies, rebates, loans or government assistance packages may be effective mechanisms to assist tourism operators to reduce their greenhouse emissions (Odeku, 2013). Resource managers and policy makers seeking to mitigate greenhouse gases must find ways to assist tourism operators in performing climate change mitigation behaviours thought to be difficult, perhaps by overcoming perceived barriers and obstacles to action. For example, many operators expressed an interest in using alternative fuels, but they also noted that these fuels are largely unavailable in the rural and remote areas where they work. Additionally, several operators noted that there are no recycling facilities available in the ports they use. Thus, it seems that tourism operators may be motivated to undertake difficult behaviours with appropriate assistance and support. Future research and pilot programs which explore the barriers and benefits to action would be a valuable contribution towards encouraging climate change mitigation among tourism operators on the GBR.

With respect to taking action to address climate change impacts on the GBR, tourism operators believed they had a role to play in affecting public opinion, expressed a desire to make a difference, and were taking a variety of actions to mitigate greenhouse gas emissions. Although some behaviours such as industry best practices and recycling were seen to be the most effective at addressing climate change, the mean scores did not have strong variability, ranging from 5.74 to 7.84. There are two probable explanations for this: either the operators believed that many things needed to be done to protect the GBR, or they were unsure about what approach is the most effective and thus they simply agreed that most things do make a difference. Activities that reduce greenhouse gas emissions such as the use of green energy and fuel efficient engines were rated as the most difficult behaviours to undertake. This perception was mostly due to the associated costs or because of the harsh conditions, i.e., salt water corrosion, daily use of engines, long distances to travel, the large amount of energy required to operate, etc. Again, pilot programs established in collaboration with resource managers would be beneficial. Tourism operators want to do more to protect the GBR, but they face various barriers that must be overcome.

### **7.5.3 Communicating climate change: Accepting a messenger role, but what's the message?**

Tourism operators accept responsibility to provide trusted interpretation to their guests and they prefer to provide messages that are positive, informative, and contribute to a good visitor experience on the day. Many operators were proud that guests looked to them for information, ideas, and to answer questions about the GBR. Moreover, respondents hoped to use these exchanges to inspire people, increase their knowledge and, ultimately, change their behaviours. These intentions are well

supported by previous research. Interpretation has been shown to enhance visitor knowledge and encourage environmentally responsible behaviours (Xu *et al.*, 2013). Further, interpretation can improve the tourist experience in protected areas while concurrently addressing negative impacts in those places (Kuo, 2002; Orams, 1996a).

Most respondents focused their interpretation on local issues such as the flora, fauna, and weather conditions that tourists were expected to experience on the day. Threats to the GBR were seen as less of a priority for these interactions and few respondents openly discussed climate change with their guests. Several tourism operators believed that guests were on holiday and, consequently, they were very cautious about providing negative information that could adversely affect the enjoyment of the tourism experience. They were also fearful that negative word-of-mouth publicity would influence the decisions of tourists to come and visit the GBR, thus damaging their business/livelihood. These fears are not unfounded, as interpersonal influence can be an important information source for consumers making a purchasing decision (Litvin *et al.*, 2008) and negative publicity can have severe repercussions on popular tourism destinations (Brayshaw, 1995). However, alternative message frames are available. Interpretation can foster positive attitudes towards conservation (Van Dijk & Weiler, 2009) and several respondents seemed to relish this role, hoping their guests would return home, speak to friends and family and encourage them to change their behaviours as well. Tourism operators thus appear well-prepared and positioned to tell positive stories that contribute to a rewarding Reef experience for their guests. It is also in their long-term interest to encourage their guests to tackle climate change, particularly because the main impact on the GBR of most visitors is remotely, mostly through burning fossil fuels. Operators are taking action, e.g., using industry best practice, yet more can be done to encourage visitors to take action to support the GBR by reducing their carbon footprint, e.g. by offsetting flights or using renewable energies. However, message framing is key and action on climate change could be communicated as being part of everyone's responsibility, particularly as negative message frames will largely be avoided due to fears of damaging repercussions on their business and the industry.

#### **7.5.4 Delivering the message: How and what is the best approach?**

Tourism operators believed that positive messages are the most effective way to communicate with their guests about climate change and most operators were open to receiving help with this process. Many said they would use materials about climate change that were provided to them. They also expressed an openness to collaborate with the GBRMPA on the development of interpretive materials, particularly materials that are professionally produced with the support of respected scientists and backed up by good data. As such, considerable potential exists to work with operators to develop, refine, and assist them with the distribution of interpretation materials related to climate change (Commonwealth of Australia, 2009; Great Barrier Marine Park Authority, 2012; Young & Temperton, 2008). Resource managers are encouraged to prioritise pilot programs to pursue such a partnership, particularly as previous efforts in the GBR region have demonstrated the potential for successful collaborations between environmental managers and community groups to enhance environmental outcomes (Nurse-Bray & Rist, 2009). Further, visitors to coral reefs may support improvements to education materials designed to raise tourist awareness about the environment (Needham & Szuster, 2011), and improved interpretation materials have been shown to enhance the satisfaction of tourists visiting the GBR (Coghlan, 2012) whilst making substantial contributions towards the sustainability of the tourism industry (Moscardo, 1998). However, various engagement barriers were also identified. Some operators were hesitant to provide pamphlets or brochures as they believe people would not read them, language and cultural issues prevent effective communication and awareness raising, and communicating with large groups of individuals in an effective manner is difficult. While there is a captive audience on the boats, there are numerous issues at play that mitigate against effective communication. Factors identified by respondents included, *inter alia*: people get seasick if the weather is bad, they are tired after a long day on the GBR, they are tired in the morning as they had

to get up early, and they have other things to do (e.g., if they signed up to do a SCUBA dive, they have forms to fill out, etc.). Further research, or perhaps a pilot program, that clarifies ways to overcome these obstacles would be helpful for tourism operators seeking to better engage their guests.

### **7.5.5 Implications for resource management**

Tourism operators are open to the idea of providing climate change interpretation to their guests, yet they remain cautious about how the materials should be produced, what topics should be covered, and how the messages should be delivered. Tourist numbers are a primary concern for tourism operators and many believe that climate change stories in the media will “scare away guests.” Unfortunately, rather than confronting this perception, many operators prefer to avoid the discussion. Most operators do not discuss climate change with their guests. However, all tourism operators were open to using and presenting information and interpretation materials provided by external sources such as the GBRMPA. Here, I present a few options for resource managers and policymakers seeking to encourage tourism operators to take a more proactive approach to climate change engagement with their guests. Future research plans and projects should focus on the following:

- Resource managers are encouraged to closely collaborate with tourism operators regarding the development and implementation of climate change messaging. A unified message delivered across the GBR tourism industry would help build solidarity among operators while concurrently prioritising and perpetuating key points to tourists, potentially influencing their attitudes and behaviours. Disseminating pertinent information related to climate change and the GBR may also be a useful strategy for policy-makers and resource managers who seek to build understanding and support for conservation initiatives (Jamal *et al.*, 2015). Identifying the key messages and delivery mechanisms is a key first step.
- Policymakers may benefit from a closer engagement with tourism operators regarding the ongoing political debates about climate change and their impact on the GBR tourism industry. Many tourism operators in Queensland believe emissions-reduction measures to be integral to sustainable tourism (Zeppel & Beaumont, 2013). However, the respondents surveyed here expressed concern with the existing government policies and believed that increased government support would greatly enhance their ability to take action to protect the GBR. Specifically, respondents felt that increased funding is required to appropriately address the impacts of climate change and they are willing to act with government support.
- Pilot programs are required to identify and demonstrate how sustainable sources of subsidies, grants, and rebate programs can be used to assist on-the-ground actions among GBR tourism operators. Most operators understand the threat of climate change and want to do more to address it. They simply require assistance and support. Pilot programs should provide resources and opportunities for tourism operators to test what options work best. These trials can provide valuable lessons learned to inform the implementation of wider initiatives across the entire tourism industry, if required.

### **7.5.6 Conclusions**

Tourism operators recognised that climate change is an extreme threat at multiple spatial scales and they are taking a variety of actions to address this threat. Consistent with previous research, some climate change mitigation behaviours were perceived to be difficult and many were not being undertaken despite being seen as an effective way to address climate change (Whitmarsh, 2009). Cost and a lack of financial support were seen to be the main constraints to action mentioned by respondents. Consequently, one management response might be to offer financial incentives, as these have been shown to stimulate pro-environmental behaviours, especially if they are aggressively promoted and effectively communicated to end users (Maibach *et al.*, 2008). However, there were exceptions. The adoption of fuel efficient engines was seen to be difficult and effective at addressing climate change, and most operators used them. This is likely due to the additional benefit they provide operators in terms of cost savings, thus coinciding with their core responsibility as a business owner. Several other obstacles were identified including a lack of equipment. For instance, several operators

were open to using alternative fuels but noted there are none available in their area. Overall, respondents recognised the opportunity they have to inform and affect change in the lives of the guests they take to visit the GBR, and they are interested in taking action. Thus, pilot programs that provide government support for climate change action are likely to succeed because tourism operators are interested in doing more to help protect the GBR and they are already taking action to do so.

Finally, respondents expressed concern about the impact of negative climate change messages on their customer experience and industry as a whole. Discussions about climate change should thus be framed in a positive light. Options include highlighting the world-class management already underway in the GBR, that climate change requires everyone to take action, and that an incredible opportunity exists for guests to support this process and inspire others to do the same when they return home, perhaps via the use of renewable energies or flight offsets. Showcasing the vast range of proactive actions that tourism operators and resource managers are taking to help protect the GBR may reinforce the need for collective action and positively frame the discussion about climate change threats to the GBR. While the socio-ecological impacts of climate change on the GBR are almost inconceivably large, so too is the opportunity to galvanise millions of people to take action that will ensure its long-term future.

The next, and final, thesis chapter builds upon this idea, discussing the various theoretical, methodological, and empirical contributions I have made towards addressing the overall objective of the thesis: To advance an understanding of the influences of pro-environmental behaviours among key stakeholder groups of the GBR. In the Discussion chapter that follows, I explore how individual perceptions influence action, and how these can be influenced using strategic messaging approaches. In addition, I describe how my findings may support ongoing resource management initiatives along the GBR, including strategic planning and regional conservation programs trying to minimise threats to the GBR and spur community action. I also propose a communication roadmap that highlights how various findings within this thesis may assist in community engagement and awareness raising efforts already underway. Specifically, I propose certain message frames, messengers, and mediums of information that may be the most effective for creating behaviour change. Finally, I recommend future research topics that build upon the key findings of this thesis, recommending next steps that I believe are most relevant for resource managers working to protect the GBR.





## CHAPTER 8: DISCUSSION AND CONCLUSIONS

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Tropical marine conservation requires urgent attention as coral reefs around the world are severely threatened by a multitude of threats such as climate change. How the associated facts, impacts, and solutions are presented plays an important role in the way that people respond (or fail to respond) to the threats and their relative proclivity to take action to address them. This thesis makes several contributions towards understanding why people connect to natural areas, how these connections affect pro-environmental behaviours, and what resource managers can do to improve stakeholder engagement and encourage conservation activities, specifically within the context of the GBR. Although the proposed methods and outputs discussed here are tailored to coral reef socio-ecological systems, I believe there is considerable potential for them to be adapted and integrated into a variety of environmental settings and contexts throughout the world.

As an environmental social scientist, I have attempted to expand our knowledge of people and resources, limiting the boundary testing to the GBR context and including how individual behaviours can be influenced. Below, I discuss how my findings contribute to the larger objective of this thesis: To provide tools and data to assist the integration of social science information into resource management decision-making and strategic stakeholder engagement along the GBR, particularly with respect to climate change. My research has made various theoretical, methodological, and empirical contributions to improve our understanding of how individual perceptions influence conservation behaviours related to the GBR:

- From a theoretical perspective, I described how a multi-disciplinary approach using psychology, marketing, and communication science may contribute to stakeholder engagement in the GBR region. I also reviewed psychological theories, e.g., the Theory of Planned Behaviour, and summarised current understanding of behaviour change, describing how individual beliefs affect decision-making processes and influence how and why we do the things we do (Chapter 2).
- Methodologically, I demonstrated the practical utility of large-scale surveys in collecting information about an important ecosystem. Working as part of a team of researchers, in partnership with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and James Cook University (JCU), I demonstrated the usefulness of collecting nuanced and directly comparable information across regions and between stakeholder groups. The data included in Chapters 4 – 6, for example, were collected via the largest social survey ever conducted about the GBR. In addition, I developed a novel approach that used online market research tools to collect data from throughout Australia. The survey described in Chapter 4 was the first of its kind, collecting nationally-representative data about the GBR with the help of a collaborative partnership I led that included a team of marketing professionals and social science researchers. The Great Barrier Reef Marine Park Authority (GBRMPA) has also been a key partner throughout my thesis, ensuring the data collected provided valuable insights useful for resource management so the analyses and recommendations were applicable to ongoing conservation efforts.
- Empirically, I showed how various observed findings related to individual connection, concern, responsibility, pride, and identity may be integrated into the strategic engagement used by conservation practitioners. I also demonstrated the need for audience segmentation by comparing different user groups, e.g., residents, tourists, and marine tourism operators, and showing how attitudes about the GBR varied between these groups. Using these findings, I explained the implications for resource managers working to protect the GBR. I also documented behavioural differences between these stakeholder groups, clarifying how and why the connections people have to the environment influences the actions they take to protect it. Further, in Chapter 4, I described how individual connections with nature may be integrated within existing resource management frameworks.

This concluding chapter synthesises the main findings of the thesis (with *key points highlighted in italics*) and suggests answers to the various research questions posed within each of the previous chapters, including the Introduction. These research questions addressed several specific yet interrelated topics related to social science, community engagement, and GBR management, including:

- Documentation of the contemporary broad cultural context related to the GBR, including how and why Australians feel connection and concern for the GBR;
- An evaluation of how attitudes about the GBR relate to perceptions of responsibility to protect it;
- Analyses of the relationship between individual connection to the GBR and the actions people take to conserve the environment;
- Using a case study approach, clarification of the perceptions, barriers, and ongoing efforts of tourism operators to engage their guests about climate change and to address climate change impacts via their business practices;
- The identification of knowledge gaps that ensure the data and recommendations contained within this thesis are able to assist with the integration of the human dimension into ongoing resource management approaches.

This chapter begins with a brief synthesis of the main findings and key messages highlighted in the previous chapters. There follows a discussion of how social science may contribute to the ongoing natural resource management initiatives of the GBR at multiple scales (i.e., at an Australian, regional, and local community level), and with respect to individual stakeholder groups such as tourism operators. I then review how attitudes, social norms, and perceptions of self-efficacy, the three key constructs of the Theory of Planned Behaviour described in Chapter 2, were documented and analysed in this thesis across various stakeholder groups. A succinct communication roadmap is then proposed and discussed, based upon scientific literature and insights explored in this thesis. This roadmap is designed for conservation practitioners and resource managers, paying particular attention to key user groups within the GBR Marine Park. Finally, I propose future research topics that build upon the main findings of this thesis.

Overall, this discussion is divided into two parts:

1. **Understanding GBR stakeholders** – This thesis sought to explore and explain how stakeholders along the GBR think, feel, behave, and also to understand why and how these aspects interact. Three studies clarified the similarities and differences between key user groups, describing stakeholder concerns for the GBR as well as how they connect to it. Sections 8.2 – 8.4 discuss these areas of inquiry.
2. **Operationalising social science data** – Integrating social science data into ongoing natural resource management programs along the GBR is challenging. Crucial to this process is understanding the existing management arrangements in place and proposing ideas to evolve and/or expand current efforts. Sections 8.4 – 8.7 discuss these issues, evaluating some of the larger conservation projects already underway and proposing new ways to integrate social science. As part of this process, I describe how stakeholder groups along the GBR differ with respect to their individual attitudes, social norms, and perceptions of self-efficacy. I then review how these findings may be used to inform existing communication strategies and novel approaches to communicating with these various stakeholder groups. These sections also include a proposal of novel research questions for future studies and a discussion about how best to engage GBR stakeholders in conservation activities.

### **8.1 Behavioural Influences and strategic communication: Synthesis of chapters 2 and 3**

Chapter 2 explored the theoretical framework and scientific literature used to develop the thesis. Two research questions were addressed:

- What are the main influences of behaviour, particularly those that affect the environment?
- Which of the available approaches to change individual behaviours are the most robust?

In Chapter 2, I reviewed psychological literature that documented three important determinants of individual behaviour: attitudes, social norms, and perceptions of self-efficacy. These three factors form the basis of the Theory of Planned Behaviour (TPB), a widely accepted theory for understanding and influencing human behaviour across a variety of research fields including public health, agriculture, and transportation (Beedell & Rehman, 1999; de Bruijn *et al.*, 2009; Godin & Kok, 1996; Price & Leviston, 2014; Protogerou *et al.*, 2012). The TPB posits that individual behaviour is determined by an intention to undertake a behaviour, and these intentions are affected by various pertinent beliefs related to how we evaluate and assess specific choices. In other words, *attitudes influence action, and the way that individuals feel can have huge implications on their behaviours*. I also showed how approaches used in marketing and communication science may have considerable impacts on how and why people choose to do things. In particular, I explored audience segmentation approaches and proposed ways to utilise these methods in a GBR conservation context, i.e., segregating populations into similar groups based on arbitrary characteristics like demographics or beliefs, can assist in the development of strategic interventions. These interventions can assist in delivering targeted messages to specific audiences. These messages can also be framed in different ways, depending upon the beliefs of the intended audience and the desired outcomes. The main conclusion of the literature review was that an integration of psychology, marketing, and communication science is a viable approach for engaging GBR stakeholders about conservation issues like climate change.

In Chapter 3, I describe the social surveys and in-depth interviews I conducted to explore the connection between behaviour and beliefs. These methods are widely accepted approaches to investigating and enhancing our knowledge about the link between the two. Further, a comprehensive understanding of this connection is vital for developing campaigns and interventions that seek to initiate changes in individual behaviour, e.g., resource managers working to protect the GBR. The TPB constructs informed the development of the questions used in the various data collection efforts. For example, the national survey described in Chapter 4 explored widespread social norms in Australia related to GBR conservation. Further, the in-depth interviews with tourism operators detailed in Chapter 7 explored the attitudes and perceptions of self-efficacy associated with various climate change mitigation behaviours.

To develop insights into how to effectively engage local stakeholders along the GBR, I first sought to understand the broader cultural context within which their attitudes and behavioural decisions are embedded. In the next section, Section 8.2, I describe key findings from a nationally representative survey of Australians (Chapter 4), focusing specifically on the relationship that Australians have with the GBR and the social norms they associate with it. I also discuss two additional studies (Chapters 5 and 6) that help to clarify the connection that stakeholders have with the GBR, specifically attitudes related to pride, identity, optimism, and responsibility. Section 8.3 then provides a synthesis of Chapter 7, summarising in-depth interviews I conducted with tourism operators along the GBR. Finally, I present a brief review of how social science can be used in natural resource management (Section 8.4) and how my data form a preliminary part of that approach (Section 8.5). I conclude this discussion chapter with an analysis of what the potential implications of the data presented in this thesis are for resource managers (Section 8.6), how these data could be applied in a communication context (Section 8.7), and what types of future research may be of benefit to resource practitioners of the GBR, but also to conservation in general (Section 8.8).

## 8.2 Connection and concern for the Great Barrier Reef: Synthesis of Chapters 4, 5, and 6

Attitudes and social norms were the key behavioural influences explored in Chapters 4 and 5. Chapter 4 reviewed the main findings of a nationally representative online survey, focusing on two overarching research questions:

- Why do Australians feel connected to the GBR?
- What issues are Australians most concerned about with regard to the GBR?

In Chapter 4, I showed *the Australian public is connected to the GBR* in a variety of ways, including the sense of personal identity and pride that people derive from the GBR. Australians expressed concern about the future of the GBR and the ongoing management in place, and they acknowledged various threats to the GBR such as climate change. Building upon the important work of Nilsson *et al.*, 2010, Wynveen *et al.*, 2010, and Wynveen *et al.*, 2015b, I also presented a previously undocumented yet widespread social norm related to environmental protection: a strong majority of *the Australian public believes it is the responsibility of everyone to protect the GBR*. These data contribute to the wide gap in the literature around documenting and analysing public perceptions of the GBR, threats to its future, and desires to take action to protect it. Whilst the broader cultural and societal dimensions described in Chapter 4 are undoubtedly useful for contributing to the development of strategic messages about the GBR (van Riper *et al.*, 2012a), greater clarity among local stakeholders is required to create targeted campaigns that influence pro-environmental behaviours. For example, although personal responsibility has long been recognised as a crucial antecedent for initiating sustainable behaviours (Eden, 1993), little research has explored the specific factors that influence stakeholder sense of responsibility for protecting natural areas such as the GBR.

People must first accept responsibility for their choices before they can make the decision to act on them (McKinley & Fletcher, 2010). Thus, understanding why people feel responsibility to protect the GBR is an important step towards encouraging them to take action to protect it. Chapter 5 addressed this connection and focused upon two research questions:

- How does perceived responsibility to protect the GBR relate to attitudes about the GBR?
- Do attitudes about the GBR differ with respect to demographic differences such as gender and age?

In Chapter 5, I revealed that *individual and collective responsibility to protect the GBR correlated with the connection that an individual had with the GBR*. In other words, people with stronger connections to the GBR were more likely to feel a responsibility to protect it. My conclusions in Chapter 5 support previous research findings that highlight the important role that attitudes have on the individual decision-making process, affecting how and why people decide to take action or shirk responsibilities related to environmental protection (Bamberg & Moser, 2007; Rickard *et al.*, 2014). However, resource managers are not just interested in the attitudes and responsibility that people have about nature. They are ultimately concerned with how these attributes influence actions, e.g., pro-environmental behaviours that help to protect important and valuable ecosystems such as the GBR (Zeppel, 2012b). Specifically, resource managers need to know what steps they can take to change individuals' behaviours to be more sustainable and pro-environmental. Understanding the attitudes that people have about the environment is the first step in this process. The next step involves understanding how these attitudes relate to the behaviours themselves. For instance, do people who connect more with the GBR take more action to protect the environment than those who do not?

Chapter 6 described how individual attitudes about the GBR relate to the actions that people take to protect the environment. This chapter addressed these research questions:

- Do people with greater connection to the GBR take more action to protect the environment than those who do not? Why or why not?

- How do attitudes about the GBR relate to the pro-environmental behaviours undertaken by GBR stakeholders?

In Chapter 6, I showed that individuals who were more connected to the GBR, e.g., those who derived a greater sense of pride and self-identity from it, were more likely to undertake certain pro-environmental behaviours than those people who did not strongly relate to the GBR. Several pro-environmental behaviours, e.g., recycling or participating in conservation programs, were significantly correlated with specific beliefs that stakeholders held about the GBR such as attitudes related to identity, pride, and optimism about the future, as well as perceived barriers to reducing impacts and as personal perceptions about the severity of the threat of climate change. These data provide new insights into the ways that environmental attitudes influence the actions that people take in response to environmental protection. Demographic characteristics such as age and gender were also significantly correlated with pro-environmental behaviours. That is, *older people and women were more likely to engage in behaviours that protect the environment than younger age groups and males*. These findings are not novel; other researchers have found similar things (Xiao & McCright, 2013). Overall, I found that *attitudes about the GBR were correlated with the actions that residents, tourists, and tourism operators took to protect the environment*, also supporting previous research that showed strong linkages between conservation activities and individual beliefs (Bamberg & Moser, 2007; Evans *et al.*, 2012). Thus, enhancing the connection and concern that individuals have for the GBR may have indirect conservation impacts not just regarding the protection of the GBR, but also to the wider environment as well (Halpenny, 2010; Howard, 1997).

There is a complex and multifaceted connection between individual beliefs about the GBR and the actions taken to conserve it. Throughout this thesis, I have documented the various links between the two. In Chapter 2, I described the important role of beliefs in influencing behaviour, and in Chapter 4, I demonstrated that *most Australians are concerned about the GBR and feel an individual and collective responsibility for protecting it*. Chapter 5 revealed the significant linkages between responsibility and environmental attitudes while Chapter 6 documented how perceptions of responsibility affect the actions people take to protect the environment. There are thus clear connections between individual attitudes and actions. The literature also suggests that a linkage is evident between actions and intentions, but this linkage has not yet been observed with respect to conservation actions along the GBR. However, different groups of people face different constraints to action, regardless of their intentions to act in a sustainable, proactive manner. For example, commercial fishermen along the GBR believe and behave very differently than other GBR stakeholders. For example, commercial fishers along the GBR have very low trust in government representatives, but they trust other commercial fishers (Tobin *et al.*, 2014a).

In the next section, I build upon the findings from Chapters 4 – 6 to explore the broader relationship between connection to the GBR, perceptions of responsibility to protect the GBR, and the actions taken to protect and conserve the environment. However, without deeper insights, it is difficult to understand the intentions and motivations of stakeholders with respect to conservation activities, particularly industry groups who rely upon natural resources for their livelihoods. I address this knowledge gap in Chapter 7. Specifically, I focus on the way that an important local stakeholder group, marine tourism operators, addresses climate change, both in the direct ways members mitigate and adapt to climate change impacts with respect to their business, but also the ways in which they engage their guests and encourage them to take action.

### **8.3 In-depth interviews with tourism operators along the GBR: Synthesis of chapter 7**

Very little is known about how marine tourism operators along the GBR perceive climate change impacts, or what actions they believe are the most effective to address threats to the GBR. I used a

case study approach in Chapter 7 to document attitudes about climate change and the GBR held by marine tourism operators. Specifically, this chapter focused on three research questions:

- What do tourism operators perceive the threat of climate change to be across multiple scales?
- How responsible do tourism operators feel about offering interpretation to their guests and what do they believe is the best way for them to communicate with their guests?
- How do tourism operators believe they can most effectively take action to address climate change impacts on the GBR?

Following extensive face-to-face interviews, I found that most tourism operators were aware of the personal nature of the climate change threat, as well as the threat to the GBR and the tourism industry. Most also believed that they were able to influence public perceptions about the GBR and that this was an important part of their work. However, as shown in Chapter 7, despite acknowledging a responsibility to protect the GBR, most of the tourism operators that I interviewed *did not discuss climate change with their guests and many had not taken direct action on climate change* via their business practices, e.g., using renewable energy. Their primary reasons for this inaction related to self-efficacy, believing many of these activities to be difficult, expensive, or simply ineffective. However, most tourism operators expressed an interest in receiving assistance from the GBRMPA in developing professional messages to distribute to their guests. They also provided various recommendations for doing so, including ideas about how resource managers could facilitate a change in the behaviour of tourism operators. For example, tourism operators expressed strong and widespread agreement that a discussion about climate change would be beneficial for the GBR and the long-term security of the tourism industry. However, they also believed that spreading a message about climate change threatening the GBR could potentially be bad for business. Specifically, they felt tourists might misunderstand the message (possibly due to cultural or linguistic barriers) and that they might return home with exaggerated or misinformed views about the current and future status of the GBR, potentially reducing future tourist visitation numbers. However, whilst these concerns are valid, they are also surmountable. There are viable and scientifically robust solutions available to address these worries, as well as many others raised by local stakeholders. I discuss these options in the following sections.

#### **8.4 Managing the GBR: Integration of ecology, human dimensions, and resource management**

The ability of the GBR to respond to change is partially determined by the social systems in place to use, manage, and protect it. Although social and ecological principles may seem to operate independently of each other, the concepts are linked along the GBR in both theory and practice (Folke *et al.*, 2010). Consequently, as resource managers work to engage stakeholders in conservation measures that protect and maintain the ecological systems within the GBR, *there is no meaningful way to separate the environmental aspects of resource protection from the social impacts that affect them* (Adger, 2000). This combination of social and ecological perspectives provides a holistic and systematic framework to help resource managers understand the interconnectivity of the entire system, assisting in the development of proactive and responsive decision-making (Marshall, 2010). Most subsequent management interventions involve stakeholder engagement, e.g., working with farmers to reduce their use of pesticides and fertilisers. However, “the hardest part about changing behaviour is that everyone assumes it is easy” (D. McKenzie-Mohr, February 23, 2014, personal communication). Indeed, decades of scientific literature across a variety of disciplines has shown that humans are complex beings, and our behaviours are considerably more complicated than most people assume. Consequently, and as described in depth in Chapter 2, robust scientific approaches are required to adequately influence behaviour.

#### **8.5 The contribution of social science to ongoing management initiatives of the GBR**

The State of Queensland works in partnership with the Australian Government across numerous conservation initiatives protect and sustain the GBR. These initiatives vary in scale and scope, ranging from short-term to long-term and including a diverse array of activities such as strategic planning,

threat mitigation, and the establishment of expert panels. Below, I discuss four of the most significant resource management initiatives related to the GBR, in terms of scale and potential conservation impact. Following review and reflection, I highlight how the findings in my thesis may contribute to the programs already underway. In particular, I propose how targeted social science research – such as the studies that make up this thesis – may be used to address key knowledge gaps related to resource management.

1. *Reef 2050 Long-Term Sustainability Plan (The Plan)* – A 35-year blueprint for securing the long-term preservation of the GBR, The Plan is a \$2 billion government investment that aims to maintain and enhance the resilience of the GBR ecosystem while concurrently allowing sustainable development of the region (Great Barrier Marine Park Authority, 2015). The Plan was developed in close partnership with various government entities, industry groups, traditional owners, researchers, and community representatives, and seeks to streamline conservation activities across these groups. Some objectives of The Plan are to increase promotion of Reef-friendly behaviours, enhance stakeholder compliance with existing regulations, integrate public input into management arrangements such as decision-making, and develop an enhanced understanding of the values and threats that people associate with the GBR (Great Barrier Marine Park Authority, 2015). Consequently, and appropriately, strategic engagement with key stakeholders is highlighted in various sections of The Plan, including in the 2015-2020 Actions, 2020 Targets, 2035 Objectives, and 2050 Outcome. However, The Plan does not specify how these processes will be undertaken, nor does it clarify who will lead these various programs, nor when they will occur. There is also little explicit discussion about climate change, widely acknowledged as the most severe long-term threat to the GBR.

The Australian Academy of Science submitted a comment to the Federal and Queensland Governments stating that The Plan was inadequate to maintain the long-term health of the GBR, noting insufficient targets and resources provided. Thus, there appears genuine concerns with the ability of the plan to create tangible conservation outcomes. The strategic direction of The Plan to influence stakeholder behaviour appears robust, although it is concerning that the theoretical and operational basis for doing so is not specified. Scientists have studied behaviour for decades and there are now various theories and frameworks that can help to avoid the mistakes of the past (Hines *et al.*, 1987). For example, as discussed in Chapter 2, providing information and expecting widespread support for conservation initiatives is outdated and incorrect. Numerous behaviour change initiatives have failed because of the *false assumption that the provision of scientific facts is sufficient to stimulate new behaviours* (Ham *et al.*, 2009). However, the enhancement of environmental knowledge and even the creation of supportive attitudes has been shown to have limited impacts on behaviour (McKenzie-Mohr, 2000).

Fortunately, alternative approaches to change behaviour are available, including many that have been widely documented in the scientific literature. I have touched upon a few of them in this thesis, particularly approaches that utilise the Theory of Planned Behaviour in crafting intervention strategies with respect to individual actions (Chapter 2), the role of beliefs related to social norms and place attachment to help guide the development of strategic messaging that more effectively engages the public in resource management issues (Chapter 4), and the use of semi-structured interviews to identify barriers to action and identify solutions for resource managers to focus intervention an engagement efforts (Chapter 7). Each of these chapters touches on a common theme found throughout this thesis: if resource managers have a better understanding of the people they seek to engage, they will be in a better position to influence them. Studies that improve this understanding would assist in the



community engagement components identified in The Plan, particularly aspects that seek to clarify the perceptions and behaviours of various user groups along the GBR.

2. *GBR Climate Change Adaptation Strategy and Action Plan (2012-2017) (CCASAP)* – Climate change has been identified as the most severe long-term threat to the GBR (Great Barrier Marine Park Authority, 2014) and the CCASAP is central to ongoing activities seeking to improve the long-term outlook of the GBR (Great Barrier Marine Park Authority, 2012). Effective communication is a cornerstone of not only responding to climate change along the GBR, but is also core component of the human dimensions involved with natural resource management (Marshall *et al.*, 2007, 2012). The CCASAP and the GBRMPA have set specific objectives related to stakeholder engagement, including monitoring and increased understanding about the “awareness, attitudes and relevant behaviours among Reef stakeholders” (Great Barrier Marine Park Authority, 2012, p. 22) as well as the development of targeted communication tools related to climate change. For example, the CCASAP recommends several conservation actions that tourism operators can take such as engaging constituents in dialogue about climate change, advancing their own understanding of climate risks, and building adaptation plans. These are pragmatic and proactive objectives and the plan is still considered ‘active’, yet, unfortunately, there is a lack of specific funding to implement the CCASAP, (R. Beeden, personal communications, September 7, 2016), preventing the implementation of activities documented within the plan. Essentially, a change in Australian government policy lead to the sidelining of the initiation of the CCASAP. Further to this issue, the GBRMPA employs just one social scientist, and thus has no psychologists, communication scientists, sociologists, or marketing professionals on staff to assist with the pursuit of these objectives, particularly with respect to day to day decision-making and strategic planning. More experts in these fields are necessary because social change requires an understanding of social issues, including the way that people behave, believe, and change. In addition, the GBRMPA does not employ anyone who works full-time on climate change despite having a team of approximately seven full-time employees in years past. However, in response to these issues, the GBRMPA has established, and is reliant upon, a close and integrated network of social scientists from several research organisations, including the CSIRO, JCU, Central Queensland University, and the University of Queensland. Continuation of these innovative science/management partnerships will be important for GBRMPA to utilise social science data in decision-making as well as directing future research direction.

The previous version of the CCASAP, the Great Barrier Reef Climate Change Action Plan 2007 – 2011, involved a team of full-time employees implementing dozens of projects related to climate change mitigation and adaptation. Whilst the CCASAP aims to follow up on this progress, and is well written, concise, and aspirational, funding and resources have not been allocated to enact its recommendations. Thus, whilst the CCASAP remains a useful document to guide regional activities related to climate change mitigation and adaptation, progress on its recommendations has been slow in recent years. However, it provides strategic direction to guide decision-making and is ready to be operationalised once resources are allocated. In the final section of this discussion chapter, I propose various research directions that complement the ideas presented in the CCASAP.

3. *Great Barrier Reef Water Science Taskforce (Taskforce)* – The Queensland government has committed \$90 million to reduce nitrogen runoff by 80% and sediment runoff by 50% by 2025 in key catchments along the GBR. In addition to creating various water quality initiatives and scientific studies (Brodie *et al.*, 2014; Devlin *et al.*, 2015), a core component of the Taskforce involves helping the public transition to better environmental practices, particularly businesses involved in primary production industries such as farmers. The Taskforce aims to

develop the best approaches to achieve those outcomes (Queensland Government, 2016). However, out of the 21 experts that make up the Taskforce Panel, there is only one social scientist. Further, there are no professional communicators, sociologists, or marketing professionals involved. Indeed, the majority of the panel consists of natural scientists and representatives from industries such as cane, grazing, and tourism. This lack of social science expertise exists despite recognition by the Taskforce in a previous evaluation that “Some ideas have worked, but others have been too complex, fragmented, and have been poorly communicated... We need to provide better education and extension support to farmers. Everyone needs to be part of the solution, and we need to more clearly communicate that” (Queensland Government, 2016).

Improved engagement between the government and the public is essential for closing gaps in understanding as well as incorporating local perceptions and values into the resource management process (Larson & Stone-Jovicich, 2011). Social scientists are a crucial part of that process, and a lack of professional communicators or marketing professionals may hinder meaningful actions to improve water quality. The expert panel noted above may benefit strategically and operationally from enhanced participation from social scientists. For instance, in Chapter 4, I observed that Australians feel a collective responsibility to protect the GBR, yet in Chapter 6 I found that residents are not doing as much as they can to help protect it. Results like this from this thesis suggest there is likely to be broad public support for enhanced management action to protect the GBR yet this support is complex and variable, i.e., attitudes and behaviours differ by user group. Understanding the dynamics that hinder action, and creating and preparing expert panels to design campaigns that overcome them, will be crucial, e.g., including researchers and professionals who understand these obstacles and have experience creating solutions to overcome them.

4. *The Reef Water Quality Protection Plan 2013 (Reef Plan)* – Deteriorating water quality has been a major threat to the GBR for many years (Brodie *et al.*, 2005; Devlin & Brodie, 2005) and resource managers are working hard to respond via several targeted, large-scale regional initiatives (Great Barrier Marine Park Authority, 2014). Reef Plan is one example, involving a government investment of \$375 million over five years, including \$175 million from the Queensland Government, to deliver a series of programs that implement widespread best management practices among thousands of landowners across more than 1,000,000 hectares along the GBR catchment. Reef Plan recognises the important role that social science will play in understanding stakeholder values, motivations, and constraints to action. Communication with stakeholders is a vital component of the engagement process, and Reef Plan will focus upon coordinating capacity building services and collaborating in close partnership with both industry and landholders (Australian Government and Queensland Government, 2013). Specifically, Reef Plan seeks to develop, implement, and monitor “programs that proactively engage landowners to engender change” (Australian Government and Queensland Government, 2013, p. 25).

Similar to The Plan discussed above, Reef Plan identifies community engagement as a key component yet does not discuss how it will be done, by whom, or for what specific purpose. Although strategic interpretation has the potential to make substantial contributions towards sustainability of natural resources (Moscardo, 1998), it is important that it is done well. Previous research has shown that engagement is not easy, and that different types of people may require different approaches (Maibach *et al.*, 2011). A \$375 million investment such as the Reef Plan may be well placed to fund a considerable amount of social science work to complement the targeted improvement in water quality. As detailed in Chapter 6, research that identifies links between individual attitudes and behaviours would be a key first step

towards developing strategic messaging that influences stakeholder behaviours. For example, if Reef Plan seeks to minimise the use of fertiliser usage in farmers, it would be strategic to study the individuals they seek to engage, perhaps by employing the Theory of Planned Behaviour to explore stakeholder attitudes, social norms, and perceptions of self-efficacy, e.g., identifying what people feel about fertiliser usage, what pressures they feel from important others, and why they feel capable or incapable of reducing their usage.

The incorporation of the human dimension into local and regional management is a crucial aspect of managing an international icon like the GBR (Lal *et al.*, 2002). This integration is important because it may contribute to the development of new partnerships, divergent thinking, and meaningful contributions to research (Viseu, 2015). The integration of stakeholder attitudes and perceptions into the decision-making process also increases the likelihood of successful and sustainable conservation activities (McCook *et al.*, 2010). Social science and the human dimension of resource management, particularly research related to the relationship between stakeholder attitudes and behaviour, is thus fundamental to fostering community awareness and to instigating widespread behaviour change campaigns throughout the GBR region. In the next sections, I discuss how my research findings may be used to inform strategic stakeholder engagement within the GBR region, first with understanding stakeholder beliefs about the GBR and then with developing communication to influence them.

### **8.6 Attitudes, social norms, and perceptions of self-efficacy among GBR stakeholders**

In this section, I describe how stakeholder groups along the GBR differ with respect to their beliefs about it. Following a description of the three main constructs of the Theory of Planned Behaviour (attitudes, social norms, and perceptions of self-efficacy), I discuss how these findings may be used to inform strategic engagement of GBR stakeholders.

Attitudes, social norms, and control beliefs play a vital role in influencing individual intentions to take action and the behaviours that result (please see chapter 2 for a comprehensive review). Understanding these attributes, as well as the context to influence decision-making processes, is an important step in changing behaviour, including those related to climate change and natural resource management. The 7,942 surveys utilised in my thesis provide a huge amount of new information about how and why people connect to the GBR. These findings help to address a considerable gap in the literature about stakeholder perceptions of the GBR, including beliefs related to GBR conservation and management. Additionally, much more in depth information is available in a variety of technical reports produced by my colleagues and me, covering various topics relevant to conservation such as drivers of change, the influence of media, adaptive capacity, and cultural influences (Bohensky *et al.*, 2014; Curnock *et al.*, 2014b; Goldberg *et al.*, 2014; Goldberg *et al.*, 2015; Marshall, 2012; Tobin *et al.*, 2014a; Tobin *et al.*, 2014b). The data included and analysed in this thesis provides a substantial description of how GBR stakeholders feel about the GBR, why and how these factors influence their behaviours, and what actions resource managers might take to influence changes in both. As mentioned in Section 8.1, and described in depth in Chapter 2, researchers across multiple disciplines have identified three important factors that can influence individual behaviour: attitudes, social norms, and perceptions of self-efficacy. I have explored each of these factors in this thesis and I summarise key findings below.

#### *Attitudes*

With respect to attitudes, in Chapter 4 and Chapter 5 I documented widespread affection for the GBR, showing that national residents, local residents, tourists, and tourism operators all strongly identify with the GBR, take pride in its status as a World Heritage Area, and that people would be personally affected by the deterioration of the health of the GBR. Further, I showed that stakeholders recognise the multitude of threats facing the GBR, and that they are particularly concerned about the impacts of climate change on the GBR. Finally, I demonstrated in Chapter 6 that *attitudes about the GBR affect*

*behaviours taken to protect the environment*, suggesting important linkages for managers to consider when developing interventions and interpretation approaches. For example, I found that stakeholders who derive a sense of identity from the GBR are more inclined to take action to protect it. Message frames and interpretation outputs that foster this identity may lead to the initiation of pro-environmental behaviours in stakeholders (Devine-Wright & Clayton, 2010).

There are significant differences in the attitudes about the GBR held by national residents, local residents in the GBR region, and tourists visiting the GBR region. Specifically, in Chapter 5 I described how local residents feel greater connection and concern than tourists and national residents, including greater pride in the World Heritage Area status of the GBR, that they take more responsibility to protect the GBR, and would be more affected if the health of the GBR declined. Whilst the underlying mechanisms for this fondness were not clarified, it is likely that the geographic proximity to the GBR may be partially responsible, particularly as people feel close association to their local resources and favourite places (Devine-Wright, 2013; Kaltenborn & Williams, 2010). Overall, local residents appear more closely connected to the GBR than the other user groups, and in Chapter 6, I showed the impact of this connection. Respondents with the greatest connection to the GBR were more likely to take action to protect the environment.

#### *Social norms*

In Chapters 4 and 5, I showed that responsibility to protect the GBR is a collective phenomenon among Australians and that *a strong desire to protect the GBR is widespread throughout the country*, including rural areas and capital cities as well as across demographic parameters such as age and gender. Thus, there exists a widely recognised yet previously undescribed social norm around the protection of the GBR. Using this norm to promote natural resource management may be an effective engagement approach, i.e. spreading the message that the continued degradation of the GBR is 'un-Australian'. Iconic places like the GBR are more than just landscapes or a means to earn revenue or a place to take tourists. They are ecosystems that attract widespread affection and connection, feelings that can be drawn upon to help foster the long-term preservation of the ecosystem. As described in Chapter 5, these sentiments are also shared by tourists and, consequently, may also form the foundation of a communication campaign designed to instil lasting connection and a conservation ethos in visiting the GBR region. Among tourism operators, in Chapter 7 I also demonstrated an industry-wide acceptance of resource protection and conservation, showing how tourism operators acknowledge their own abilities and opportunities to affect change, and recognise the expectations from society for them to do so. The considerable influence of social norms on individual action is widely recognised and well documented in the scientific literature (Armitage & Conner, 2001; Ockwell *et al.*, 2009). Consequently, marketing professionals have used the influence of peer pressure and social expectations to affect behaviour across a multitude of areas, including environmental issues (Downing & Ballantyne, 2007; Maibach *et al.*, 2008; McKenzie-Mohr, 2000). There is strong potential to use my findings to contribute towards similar behaviour change campaigns. For example, messages that recognise and promote the expectations from society, including the influence on tourism operators of colleagues in the tourism industry, may help influence people to take more action with respect to environmental conservation. I discuss several ideas in the following section.

#### *Perceptions of self-efficacy*

A lack of knowledge, skills, time, and financial resources can impede pro-environmental actions. In Chapter 6 I showed that a lack of behaviour initiation may be influenced by perceived barriers to action. For instance, GBR residents and tourists who perceived barriers to reducing their impact on the GBR were less likely to undertake pro-environmental behaviours such as recycling or the purchase of carbon offsets. These findings support previous studies showing that those who perceived barriers to action were less likely to act (Gist & Mitchell, 1992; O'Neill & Nicholson-Cole, 2009) and that perceptions of self-efficacy can impede certain behaviours depending upon individual

perceptions (Gist & Mitchell, 1992). In addition to residents and tourists, perceptions of self-efficacy also influenced the behaviours of marine tourism operators. In Chapter 7, I showed how a lack of financial resources was seen as a major hindrance for marine tourism operators to address climate change, and operators felt that government should provide rebates, subsidies and other monetary incentives to stimulate action. This is an important finding, as I have identified that *tourism operators have the knowledge, desire, and ability to take action on climate change*, yet they have identified a lack of funding as a key obstacle preventing them from doing so. Moving forward, resource managers can begin to investigate various funding or grant programs to initiate change in the industry based upon further consultation and additional consideration of priority actions. More research is required to tease out the explicit reasons for these barriers and how to overcome them.

Information about attitudes, social norms, and self-efficacy, if used strategically and appropriately, can influence large numbers of people in significant ways. Yet, communication campaigns that do not strategically develop messages using sound research risk wasting time and resources on programs that do not deliver expected outcomes. However, there is considerable potential to integrate social science data, e.g., psychological and market research, into the ongoing efforts of resource managers to engage local stakeholders in sustainability and conservation activities. I expand on this idea in the sections that follow.

### **8.7 Ideas for improved regional stakeholder communication and engagement**

A major complexity associated with community engagement, and trying to change behaviour in general, is that influential processes are dynamic, evolving through time as new events and contexts emerge. For example, attitudes change, social norms progress, and beliefs related to self-efficacy vary with the addition of new skills and circumstances. A vital consideration for communication is thus how to design messages that take these factors into account, e.g., by encouraging appropriate and proactive behaviours (Leitch, 2011) whilst minimising barriers and promoting the benefits of taking action (McKenzie-Mohr & Smith, 1999). As described in Chapter 2, *a better understanding of the human dimension is necessary* for resource managers seeking to develop targeted messages aimed at influencing stakeholders.

Investigating distinct stakeholder groups provides an opportunity to compare and contrast how the ways that people feel about the GBR can differ by proximity as well as dependency on natural resources. For example, an Australian living in Perth who has never seen the GBR may have a very different relationship with the GBR compared to a tourism operator who visits the Reef every day and depends upon it for livelihood and recreation. This next section provides an analysis of the concern and connection to the GBR felt by four key stakeholder groups along the GBR: Australian Residents, GBR Residents, Tourists, and Tourism Operators. Teasing out the explicit connections that people associate with the GBR may improve understanding of why people value, use, and care about the GBR. This enhanced understanding of key stakeholders may then be used to inform discussions about the ongoing and long-term management of the GBR, including the development of community engagement approaches.

In this next section, I describe how this process may work by offering a succinct communication roadmap for operationalising the social science data collected in this thesis. Specifically, I discuss three key aspects of the engagement process most relevant to resource managers: the messenger (who says it?), the message (what do they say?), and the medium (how do they say it?), as identified and recommended by Moser (2010). Following this, I propose and discuss new areas of research and a future strategic direction that I hope may benefit resource managers in the region.

**8.7.1 Australians residents:** In Chapter 4, I showed that *the GBR is one of the most inspiring and personally significant icons for Australians*. An overwhelming majority of Australians are also

connected to the GBR, and they recognise its vulnerabilities, acknowledging various threats to its future and showing concern for its health and long-term management (Goldberg *et al.*, 2016). Consequently, I suggest that protecting the GBR may be part of what it means to be Australian, or that allowing for continued degradation may be un-Australian (Phillips & Smith, 2000). Leveraging this widespread social norm may be a useful way to frame communication with the Australian public in order to inspire pragmatic conservation outcomes and pro-environmental behaviours. As *the GBR is part of how respondents identify themselves as Australians*, messages that focus on promoting cultural identity and connection to the GBR may also resonate with the public. That is, linking a personal construct like identity with a call to action may be an effective way to inspire change and increase public support for environmental policies, particularly those that are aligned with their own beliefs (Ward & van Vuuren, 2013).

Trust in messengers will be a crucial aspect of the communication process (Wynveen & Sutton, 2015). Australians tend to distrust the media and government as sources of environmental information (Goldberg *et al.*, 2014). However, environmental groups such as the World Wildlife Fund, the Australian Conservation Foundation, and the United Nations are seen to be trustworthy sources and would thus be worth considering as messengers. If government agencies partner with trusted organisations like these to deliver messages to the Australian public, they may be better received and acted upon. Australians also trust information and recommendations received from friends and family (Goldberg *et al.*, 2015). Consequently, direct interactions from loved ones, or, alternatively, via social media platforms such as Facebook, may be a useful medium for spreading key messages and engaging the public. Thus, for Australian residents, the best approach may be to utilise trusted environmental groups as messengers, and to focus messages on enhancing and promoting identity derived from the GBR, particularly as identity is tied to pro-environmental behaviours (as shown and discussed in depth in Chapter 6).

**8.7.2 GBR residents:** As discussed in Chapters 5 and 6, *residents of the GBR region are closely connected to the GBR*. They feel personally responsible for the GBR, derive a sense of identity from it, and believe that society has a collective commitment to protect it (Tobin *et al.*, 2014b). Thus, a strong majority of GBR residents supports environmental protection for the GBR. This widely accepted social obligation may be a potentially impactful way to communicate with local residents, particularly via targeted messages (Bator & Cialdini, 2000; Cialdini, 2003). Spreading this message, i.e., helping people to recognise the vast support that exists for the conservation of the GBR and their role in that, may help maintain and reinforce this social norm. Social norms have been shown to be powerful influences on individual behaviour (Cialdini, 2003), including pro-environmental behaviours related to resource management (Bamberg & Moser, 2007; Price & Leviston, 2014). For example, injunctive social norms that highlight social approval for desired behaviours have been widely used in pro-environmental public service announcements to encourage behaviour change across diverse populations and situations (Cialdini *et al.*, 1991). Resource managers along the GBR may be able to capitalise on the vast support for GBR protection by designing engagement campaigns that frame messages to reinforce or spread social norms. Such messages may boost the recall potential among recipients, allowing people to remember the message more readily, thus increasing the persuasiveness of communication campaigns (Bator & Cialdini, 2000). Finally, norms may serve as the basis for general predispositions to pro-environmental behaviours (Stern, 2000a), suggesting that the way people perceive the influence of others can have a substantial influence on their own individual actions. My findings document the widespread social norms about the GBR that already exist. The next step is to utilise these findings in message dissemination and interpretation programs aimed at key stakeholders.

GBR residents who are made aware of the culture of conservation that exists across coastal communities may be more inclined to act in ways that perpetuate it. Choosing the best messenger

and medium of engagement will be important. Approximately 85% of residents trust research institutions such as universities and CSIRO, and 63% trust NGOs or community groups, but just 23% trust media sources such as television or newspapers (Tobin *et al.*, 2014b). Consequently, *traditional media outlets may not be the best approach* for widespread dissemination of messages. However, trusted environmental groups may be a helpful resource to spread messages related to the environmental protection and conservation measures they hope to perpetuate. At the same time, resource managers such as the GBRMPA may benefit from programs that build community trust, particularly as a greater trust may lead to the development of pro-environmental behaviours in key stakeholders (Wynveen & Sutton, 2015). If engagement programs head in this direction, they are likely to gain enhanced support for conservation activities and initiatives, securing sustainable management outcomes for the GBR. Overall, the most effective way to communicate with GBR residents may be to focus upon the perpetuation and promotion of existing social norms via respected messengers such as research institutions.

**8.7.3 Tourists:** In Chapter 6, I showed that tourists felt close connections to the GBR despite living outside the GBR region. Most individuals felt a sense of responsibility to protect the GBR and they felt proud of its status as a World Heritage Area. These perceptions were closely aligned with those held by local residents and tourism operators, and thus similar message frames may also resonate with tourists. However, I also showed that tourists believed they had *significantly less ability than other stakeholder groups to reduce their impact on the GBR*. While future research is required to confirm how and in what detail, it may be that this lack of self-efficacy is hindering tourist decision-making related to environmental protection. Tourists also *perceived a lack of opportunities to make a difference*, believing they are only in the region for a limited time and thus have minimal chances to do something to help, as noted in Chapter 6. Additionally, many tourists believed that it might be too expensive for them to reduce their impacts on the GBR. Thus, communication programs that emphasise how cheap, easy, and possible it is for tourists to help protect the GBR may be impactful. For example, successful outcomes may arise from messages that reinforce the ability of tourists to participate in resource management along the GBR, e.g., via the Eye on The Reef or Sightings Network programs, and to take action to address climate change, e.g., supporting the transition to renewable energy sources (Beeden *et al.*, 2014b; Zeppel, 2012a).

Resource managers must be cautious when selecting delivery mechanisms because the choice of messenger will influence how readily the information will be accepted. Importantly, personal values contribute to the perceptual filtering entailed in interpreting information (Nisbet & Mooney, 2007) and informing individual decisions and actions (Moser & Ekstrom, 2010). The use of stories or anecdotes may make information more accessible (Pelletier & Sharp, 2008) as would the use of strategic messengers that are widely regarded and recognised. For example, the use of famous tourists as spokespeople for conservation or GBR protection may be worth pursuing, particular with respect to Asian tourists. Recent years have seen a large growth in Asian tourists, e.g., a 21% increase in Chinese visitors (Tourism Australia, 2016), and the use of famous cultural icons from these countries to promote the protection of the GBR may result in positive responses (Packer *et al.*, 2014). Again, further research such as focus groups of Asian tourists is needed to identify what messengers may be best. Finally, tourism operators noted that time is limited on boat rides to and from the GBR, resulting in tourists not having much opportunity to read pamphlets or brochures. Other options may be pursued, such as the distribution of information in airports upon arrival, at hotels and tourism outlets following the booking of package tours, and via online videos and articles produced for social media.

**8.7.4 Tourism Operators:** Along with environmental protection and sustainability, *tourism operators saw business management to be a core responsibility* of their position as a tourism operator on the GBR (Chapter 7). Thus, message frames which focus upon economic issues may be an effective way to engage these individuals, particularly as negative ramifications on profit and tourism numbers

were common concerns about addressing climate change impacts. Promoting environmental programs or policies in a way that highlights and frames a conservation message with a focus on the long-term profitability of the industry, rather than purely as an ecological necessity, may resonate well with tourism operators. An additional message frame worth exploring involves the social norm that exists within the industry that focuses upon a strong conservation ethos. The GBR tourism industry is very pragmatic with respect to conservation and sustainability; most tourism operators believe that they, and others within the industry, should take steps to reduce impacts on the GBR (Curnock *et al.*, 2014a). Tourism operators also believe that tourists expect this behaviour from them. Consequently, a message frame that highlights and gives social approval to the ongoing work that these operators undertake, may serve to further strengthen the pro-environmental ethos found within the tourism industry. Peer pressure can also be a powerful influence on behaviour. As many operators are already doing the right thing with respect to conservation and sustainability of the GBR, resource managers may wish to capitalise on the widespread environmentalism that already exists among these individuals in order to promote greater conservation activities. Identifying specific constraints to action will be paramount to this process and more information will be needed to tailor strategic engagement to specific behaviours. The use of in depth interviews with key informants may be a useful way to obtain relevant information, as shown in Chapter 7.

In this thesis I have shown that *tourism operators are interested in leading the discussion about climate change* but are fearful of the ramifications. A question for resource managers is thus, how can tourism operators be encouraged to take more action on climate change? Without any context of the situation, resource managers may mistakenly assume that tourism operators are not interested in conservation, or that they are unconvinced about the severity of the climate change threat. While this belief may have been accurate in the past, and indeed was a key component of previous plans such as the Great Barrier Reef Tourism Climate Change Action Strategy 2009-2012 (Commonwealth of Australia, 2009), it is now most likely unnecessary and may represent an inefficient investment of resources. As described in detail in Chapter 7, the main obstacle stopping tourism operators from discussing climate change with their guests is not a lack of belief in the threat, but rather fear of the potential harmful ramifications on the tourism industry and uncertainty about the best communication approach, e.g., what to say and how to say it so that the messages are honest yet do not frighten people and impede action. Thus, the most prudent way to encourage tourism operators to discuss climate change with their guests may be to develop, in partnership and with professional assistance, materials that tourism operators feel confident and comfortable using, with positive messages that resonate with tourists, described succinctly and easily enough to minimise the chances for them to be misunderstood by guests. For example, resource managers may seek to contract a marketing firm to work with the tourism industry to provide training and messages that have been tested and shown to be effective at instigating behaviour change among tourists. Such a project has yet to be instigated.

This thesis describes why national residents, regional stakeholders like tourists and residents, and industry groups such as tourism operators connect to the GBR, how concerned they feel about it, and what influences them to take action to protect the environment. However, considerably more research is required to adequately understand the dynamic and complex relationship that people have with the GBR. Studies that elucidate the most impactful messages and means of delivering content to stakeholders may be helpful in improving community engagement approaches. An improved recognition of how stakeholders process information can help resource managers to define problems and solutions in a way that is more personally, socially, and culturally relevant to the recipients (Langford, 2002). Further, research that clarifies specific impediments to action among various stakeholder groups may aid the development of communication approaches that overcome these obstacles, resulting in greater numbers of compliant stakeholders and enhanced conservation



outcomes. Below, I discuss these ideas, including the research areas I believe may be most beneficial for long-term management of the GBR.

### **8.8 Next steps and future research**

Social science has been used for decades to assist with behaviour change programs, marketing campaigns, and the development of strategic communication for the private sector and government agencies. Despite the supporting evidence, however, the use of such practices to assist natural resource management along the GBR remains underutilised. One reason for this may be that social scientists have done a poor job communicating the utility of their work to individuals working to promote conservation and sustainable use of threatened ecosystems. Another reason may be because resource managers lack familiarity with the potential applications of social science or they may be uninformed about the ways that attitudes influence behaviour. For example, there is vast potential to integrate social science into the design, implementation, and improvement of stewardship campaigns, community engagement projects, and general communication outputs such as press releases, fact sheets, brochures, and online platforms including social media pages like Facebook. Below, I propose future research directions for both a national and regional context, affording particular attention to how managers may better engage the public about conservation of the GBR.

The research presented in this thesis provides the first nationally representative overview of how Australians connect with the GBR, including the broad concerns they have for its future, its management, and the multitude of recognisable threats to its health. Although this is a considerable step forward, additional research is required to better understand the Australian cultural context as it relates to the management of the GBR. In order to build upon the key findings of this thesis that describe the broader Australian attitudes and social norms, future research projects may benefit from a focus on the following four key areas:

- ***The link between Australian attitudes and actions*** – Despite considerable previous research about the human dimension of the GBR (Wynveen *et al.*, 2010, 2012; Marshall *et al.*, 2012), the relationship between how Australian attitudes about the GBR relate to conservation activities remains largely unknown. Research that explores the link between individual perceptions about the GBR and the management actions and policies they support, including the pro-environmental behaviours they undertake, may be beneficial for those developing conservation projects and seeking widespread community support, e.g., political backing for sound policy development for long-term sustainability.
- ***The role and use of social norms in affecting widespread behaviour change*** – Australians have a close relationship with the GBR, with a strong majority of residents feeling a deep responsibility to protect it (Goldberg *et al.*, 2016). Using the widespread affection Australians feel for the GBR in a way that fosters conservation outcomes may make a valuable contribution to the long-term management of the GBR. In particular, the identification of key messages that can leverage collective affections whilst influencing stakeholders to make more sustainable decisions would be especially useful.
- ***How strategic communication can help influence individuals*** – Explicit messages delivered to specific audiences can influence individual attitudes, norms, and behaviours (Fielding *et al.*, 2008a, 2008b). As highlighted above, these messages may highlight the widespread social acceptance of GBR protection, the ways in which the GBR contributes to identity, and various opportunities that exist to easily and effectively collaborate on GBR conservation. A number of projects have demonstrated the power of strategic communication to influence stakeholder groups, e.g., community-based social marketing programs (McKenzie-Mohr, 2000), yet these projects are rarely utilised either at national or regional GBR levels. Testing and refining key messages, and the mechanisms used to deliver information, may assist in

developing programs that effectively distribute impactful information to appropriate stakeholders.

- **How threat perceptions affect decision-making among GBR stakeholders** – Further research is required to clarify the links between threat perceptions and the responsive actions taken by key stakeholders such as tourism operators. Studies that elucidate the link between pro-environmental behaviours and climate change beliefs would be especially beneficial for resource managers seeking to inspire action among local stakeholders to address this threat. For instance, I have described a significant correlation between climate change perceptions and pro-environmental behaviours, but I do not know if a causality exists between the two. I also do not fully understand how threat perceptions influence the actions people take to directly protect the GBR.
- **How perceptions of the GBRMPA influence stakeholder responses** – Little is known about how residents, tourists, and tourism operators feel about the GBRMPA specifically. For example, the CSIRO is a government research organisation, yet they are seen as the most trusted source of environmental information (Goldberg *et al.*, 2015). This appears to be a contradiction. However, like the GBRMPA, the primary management agency in charge of the GBR, the CSIRO is its own brand. Consequently, the CSIRO is viewed independently of government and is perceived to be an entity unto itself, a well trusted and valuable source of scientific data. A similar study to the one conducted in Chapter 4, i.e., a nationwide survey, could clarify public perceptions of the GBRMPA. A better understanding of how the public perceives the GBRMPA may help resources managers to develop approaches that can overcome public doubts, concerns, and barriers to action. Identifying ways to gain public trust in GBRMPA should be a key aspect of this process (Wynveen & Sutton, 2015).

In addition to the national survey of Australians, my thesis also focused on regional perceptions of the GBR, including those held by Coastal Residents, Tourists, and Tourism Operators. Here, I describe six additional areas of inquiry that may benefit resource managers along the GBR:

- **How specific messages influence individual actions related to the GBR** – Greater emphasis on deliberate messaging approaches may help resource managers reach target audiences in a more meaningful way (Ham, 2007). Research which documents the messages that resonate most with different segments of the population will aid this process, e.g., research that explores how and why some message frames affect some individuals and not others, particularly messages related to climate change. Focus groups may be needed to explore and document ideas whilst in-depth interviews may help to solicit attitudes and responses to specific words or phrases, e.g., using the template questions and statistical approaches recommended by Ham *et al.* (2009) and which detail a proven and effective manner of influencing behaviour via strategic messaging.
- **The use of pride and responsibility into support for GBR conservation** – Little is known about the best ways to transform personal affections for the GBR into support for management, stewardship, or conservation. Identifying the particular pathways and interventions that can encourage individuals to become more active in community programs, advocacy, and management initiatives may be of great practical benefit. One possible approach may be to build upon the work of Wynveen and Kyle (2015) to explore the way that place meanings are constructed and understood, and the way these meanings can influence individual conservation actions.
- **The role of identity in affecting decision-making** – All GBR user groups studied in this thesis derived a sense of identity from the GBR, and I showed in Chapter 6 that identity is correlated with behaviours people undertake to protect the environment. Greater clarity of the linkage between identity and action may assist in the development of campaigns that strengthen individual connections to the GBR (Goldberg *et al.*, 2016). For instance, what aspects of the GBR do user groups specifically identify with, and why? How does identity develop and

change through time, and why do some individuals identify closely with the GBR yet others do not? Understanding the impact of messages delivered with an identity frame, i.e., in comparison to others that may focus upon pride, responsibility, etc., is also a worthwhile endeavour. Research like this would help to clarify which messages are most resonant or impactful to influence stakeholder perceptions, behaviours, and connection to the GBR, would be beneficial for program managers and policy makers (Clayton & Opatow, 2003).

- **How interpretation influences the tourist experience of the GBR** – There has been little research into how the interpretation that tourism operators provide about threats to the GBR influences tourist attitudes or perceptions, particularly their levels of satisfaction with the GBR on the day. Clarifying these impacts, if any, may give confidence to tourism operators who wish to engage tourists in discussions but are currently fearful of negative repercussions on the visitor experience and, ultimately, the profitability of their business.
- **Identification of key barriers to specific pro-environmental behaviours** – Research that details the obstacles preventing stakeholders from taking action to protect the environment would be especially useful. I showed that general obstacles like a lack of time, knowledge, and money are correlated with whether or not an individual takes action to protect the environment. However, if researchers can identify individual barriers that prevent specific pro-environmental behaviours from being undertaken by stakeholders, resource managers will be better placed to develop programs that can overcome these barriers. For example, follow-up surveys with tourism operators may help to clarify how and why they undertake certain pro-environmental behaviours such as the use of alternative fuels like biodiesel. In-depth analyses may identify barriers to action that are specific to that user group as well as that action. In addition to identifying obstacles, this research may also develop solutions, including the ways that resource managers may help tourism operators to do more to help protect the environment, with specific attention given to the solutions that tourism operators need and request. For example, if future research identifies a lack of funding as a crucial barrier to action, then resource managers can focus capacity on overcoming this barrier. Similar work can also be done for additional user groups such as commercial fishers and farmers.
- **The link between visitor experience and lasting pro-environmental behaviours** – Little is known about the long-term impacts of a GBR visitor experience on individual lifestyles, purchasing decisions, and pro-environmental behaviours. Documenting what changes arise in people who have positive experiences on the GBR, including what attributes or messages create the strongest and most lasting connections, will be an important way to identify opportunities to create change. Specifically, quantifying how, where, and why proactive changes occur may help to increase the potential for partnerships that design interpretation and experiences which result in the greatest conservation benefit. A longitudinal study of GBR visitors would be especially useful to measure the long-term influence of a visit to the GBR on individual decision-making related to environmental protection and sustainability (Marshall *et al.*, 20102).

## 8.9 Summary and conclusions

Human behaviours are influenced, inter alia, by attitudes, family, peers, colleagues and perceptions of self-efficacy. For those seeking to influence human behaviour in ways that promote sustainability and conservation outcomes for natural areas like the GBR, a greater understanding of the human dimension is critical. Clarifying the individual drivers of human behaviour is a key first step towards developing intervention approaches that promote pro-environmental behaviours and help people to overcome obstacles to action.

The overall aim of the thesis was to advance an empirically-based understanding of the pro-environmental attitudes and behaviours among key stakeholder groups of the GBR that may

contribute towards natural resource management. In this thesis, I have made theoretical, methodological, and empirical contributions to assist resource managers with the integration of the human dimension into GBR management. From a theoretical standpoint, I used psychological concepts to inform the data collection and analysis, and then used marketing and communication literature to frame the interpretation in a resource management context. Methodologically, I showed the value of large-scale surveys, including the development of a novel approach using online market research tools to collect nationally-representative data across Australia. Finally, I discussed empirical findings related to individual connection, concern, responsibility, and identity that have the potential to be incorporated into strategic messaging frames used by resource managers. Considerable opportunities exists to streamline the incorporation of existing social science data into the day to day management of the GBR, particularly with respect to climate change. However significant work remains to be done in clarifying key aspects of the human dimension of the GBR and operationalising these findings in a resource management context. Documenting and analysing how strategic messages and engagement influences the relationship that people have with the GBR is an important next step towards widespread conservation action. This thesis has sought to contribute key arguments and original empirical evidence that can help to inform this crucially important process.

## REFERENCES

- Abroms, L. C., & Maibach, E. W. (2008). The effectiveness of mass communication to change public behavior. *Annual Review of Public Health, 29*, 219-+.
- Adger, W. N. (2000). Social and ecological resilience: are they related? *Progress in Human Geography, 24*(3), 347-364.
- Adger, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography, 79*(4), 387-404.
- Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'Brien, K. (2013). Cultural dimensions of climate change impacts and adaptation. [10.1038/nclimate1666]. *Nature Clim. Change, 3*(2), 112-117.
- Adger, W. N., Barnett, J., Chapin, F. S., & Ellemor, H. (2011). This Must Be the Place: Underrepresentation of Identity and Meaning in Climate Change Decision-Making. *Global Environmental Politics, 11*(2), 1-25.
- Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl (Ed.), *Action Control: From Cognition to Behaviour* (pp. 11-39). Berlin: Springer-Verlag Berlin Heidelberg.
- Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.
- Ajzen, I. (2011). Reflections on Morgan and Bachrach's critique. *Vienna Yearbook of Population Research, 9*, 63-69.
- Ajzen, I., & Fishbein, M. (2005). The influence of attitudes on behavior. In D. Albarracín, B. T. Johnson & M. P. Zanna (Eds.), *The handbook of attitudes* (pp. 173-221). Mahwah, NJ: Erlbaum.
- Anderson, M. G., Comer, P. J., Beier, P., Lawler, J. J., Schloss, C. A., Buttrick, S., . . . Faith, D. P. (2015). Case studies of conservation plans that incorporate geodiversity. *Conservation Biology, 29*(3), 680-691.
- Anthony, K. R. N., Marshall, P. A., Abdulla, A., Beeden, R., Bergh, C., Black, R., . . . Wear, S. (2015). Operationalizing resilience for adaptive coral reef management under global environmental change. *Global Change Biology, 21*(1), 48-61.
- Anthony, K. R. N., Maynard, J. A., Diaz-Pulido, G., Mumby, P. J., Marshall, P. A., Cao, L., & Hoegh-Guldberg, O. (2011). Ocean acidification and warming will lower coral reef resilience. *Global Change Biology, 17*(5), 1798-1808.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*, 471-499.
- Arnocky, S., & Stroink, M. (2010). Gender differences in environmentalism: The mediating role of emotional empathy. *Current Research in Social Psychology, 16*(9), 1-14.
- Aswani, S., Mumby, P. J., Baker, A. C., Christie, P., McCook, L. J., Steneck, R. S., & Richmond, R. H. (2015). Scientific frontiers in the management of coral reefs. *Frontiers in Marine Science, 2*, 50.
- Australian Government and Queensland Government. (2013). *Reef Water Quality Protection Plan 2013*. Reef Water Quality Protection Plan Secretariat.
- Axelrod, L. J., & Lehman, D. R. (1993). Responding to Environmental Concerns - What Factors Guide Individual Action. *Journal of Environmental Psychology, 13*(2), 149-159.
- Badman, T., Bomhard, B., Fincke, A., Langley, J., Rosabal, P., & Sheppard, D. (2009). World Heritage in Danger. *IUCN World Heritage Studies*(7).
- Bagozzi, R. P. (1996). The role of arousal in the creation and control of the halo effect in attitude models. *Psychology & Marketing, 13*(3), 235-264.
- Ballantine, B. (1995). Networks of "no-take" marine reserves are practical and necessary. In L. Shackell & J. H. Martin Willison (Eds.), *Marine protected areas and sustainable fisheries* (pp. 13-20). Nova Scotia, Canada: Science and Management of Protected Areas Association.
- Ballantyne, R., Packer, J., & Beckman, E. (1998). Targeted interpretation: exploring relationships among visitors' motivations, activities, attitudes, information needs and preferences. *Journal of Tourism Studies 9*(2), 14-25.

- Bamberg, S. (2002). Effects of implementation intentions on the actual performance of new environmentally friendly behaviours - Results of two field experiments. *Journal of Environmental Psychology*, 22(4), 399-411.
- Bamberg, S., & Moser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27(1), 14-25.
- Barde, J.-P., & Pearce, D. W. (2013). *Valuing the environment: six case studies* (Vol. 9): Routledge.
- Bator, R. J., & Cialdini, R. B. (2000). The application of persuasion theory to the development of effective pro-environmental public service announcements. *Journal of Social Issues*, 56(3), 527-541.
- Beaumont, N. (2001). Ecotourism and the conservation ethic: recruiting the uninitiated or preaching to the converted? *Journal of Sustainable Tourism*, 9(4), 317-341.
- Beedell, J. D. C., & Rehman, T. (1999). Explaining farmers' conservation behaviour: Why do farmers behave the way they do? *Journal of Environmental Management*, 57(3), 165-176.
- Beeden, R., Maynard, J., Johnson, J., Dryden, J., Kininmonth, S., & Marshall, P. (2014a). No-anchoring areas reduce coral damage in an effort to build resilience in Keppel Bay, southern Great Barrier Reef. *Australasian Journal of Environmental Management*, 21(3), 311-319.
- Beeden, R., Maynard, J. A., Marshall, P. A., Heron, S. F., & Willis, B. L. (2012). A Framework for Responding to Coral Disease Outbreaks that Facilitates Adaptive Management. *Environmental Management*, 49(1), 1-13.
- Beeden, R. J., Turner, M. A., Dryden, J., Merida, F., Goudkamp, K., Malone, C., . . . Maynard, J. A. (2014b). Rapid survey protocol that provides dynamic information on reef condition to managers of the Great Barrier Reef. *Environmental Monitoring and Assessment*, 186(12), 8527-8540.
- Bergkvist, L., & Rossiter, J. R. (2009). Tailor-made single-item measures of doubly concrete constructs. *International Journal of Advertising*, 28(4), 607-621.
- Bergsma, E., Gupta, J., & Jong, P. (2012). Does individual responsibility increase the adaptive capacity of society? The case of local water management in the Netherlands. *Resources Conservation and Recycling*, 64, 13-22.
- Berkelmans, R., De'ath, G., Kininmonth, S., & Skirving, W. J. (2004). A comparison of the 1998 and 2002 coral bleaching events on the Great Barrier Reef: spatial correlation, patterns, and predictions. [journal article]. *Coral Reefs*, 23(1), 74-83.
- Berkes, F. (2002). Cross-scale institutional linkages: perspectives from the bottom up. *The drama of the commons*, 293-321.
- Biggs, D. (2011). Understanding Resilience in a Vulnerable Industry: the Case of Reef Tourism in Australia. *Ecology and Society*, 16(1), 30.
- Biggs, D., Ban, N. C., & Hall, C. M. (2012). Lifestyle values, resilience, and nature-based tourism's contribution to conservation on Australia's Great Barrier Reef. *Environmental Conservation*, 39(4), 370-379.
- Birtles, A., Valentine, P., & Curnock, M. (2001). Tourism based on free-ranging marine wildlife. Opportunities and responsibilities. *Wildlife Tourism Research Report Series: No.11. Status Assessment of Wildlife Tourism in Australia Series*. (pp. 62). Townsville, Australia: CRC Sustainable Tourism.
- Blake, J. (1999). Overcoming the 'value-action gap' in environmental policy: Tensions between national policy and local experience. *Local environment*, 4(3), 257-278.
- Bohensky, E., Butler, J. R. A., Costanza, R., Bohnet, I., Delisle, A., Fabricius, K., . . . Wolanski, E. (2011). Future makers or future takers? A scenario analysis of climate change and the Great Barrier Reef. *Global Environmental Change-Human and Policy Dimensions*, 21(3), 876-893.
- Bohensky, E., Marshall, N., Curnock, M., Gillet, S., Goldberg, J., Gooch, M., . . . Tobin, R. (2014). The Social and Economic Long Term Monitoring Program (SELTMP) 2013: Coastal Communities in

- the Great Barrier Reef *Report to the National Environmental Research Program* (pp. 35). Cairns, Australia: Reef and Rainforest Research Centre Limited.
- Bohensky, E. L. (2008). Discovering Resilient Pathways for South African Water Management: Two Frameworks for a Vision. *Ecology and Society*, 13(1), 19.
- Bohensky, E. L., Smajgl, A., & Brewer, T. (2012). Patterns in household-level engagement with climate change in Indonesia. *Nature Climate Change*, 3, 348–351.
- Bramwell, B. (2012). 21 Interventions and policy instruments for sustainable tourism. *Global tourism*, 406.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.
- Brayshaw, D. (1995). Negative publicity about tourism destinations - a Florida case study. *Travel & Tourism Analyst*, 5, 62-71.
- Brodie, J., Fabricius, K., De'ath, G., & Okaji, K. (2005). Are increased nutrient inputs responsible for more outbreaks of crown-of-thorns starfish? An appraisal of the evidence. *Marine Pollution Bulletin*, 51(1-4), 266-278.
- Brodie, J., Lewis, S., Wooldridge, S., Bainbridge, Z., & Waterhouse, J. (2014). Ecologically relevant targets for pollutant discharge from the drainage basins of the Wet Tropics Region, Great Barrier Reef. *TropWATER Report No. 14/33, Centre for Tropical Water and Aquatic Ecosystem Research (TropWATER)*. Townsville, Australia: James Cook University.
- Brown, T. J., Ham, S. H., & Hughes, M. (2010). Picking up litter: an application of theory-based communication to influence tourist behaviour in protected areas. *Journal of Sustainable Tourism*, 18(7), 879-900.
- Brulle, R., J Carmichael, J Craig Jenkins. (2012). Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the U.S., 2002–2010. *Climatic Change*, 114.2, 69-188.
- Bryman, A. (2012). *Social research methods*: Oxford University Press.
- Budruk, M., Stanis, S. A. W., Schneider, I. E., & Anderson, D. H. (2011). Differentiating Place Attachment Dimensions Among Proximate and Distant Visitors to Two Water-Based Recreation Areas. *Society & Natural Resources*, 24(9), 917-932.
- Buttel, F. H. (1979). Age and Environmental Concern - Multivariate-Analysis. *Youth & Society*, 10(3), 237-256.
- Cardinale, B. J., Duffy, J. E., Gonzalez, A., Hooper, D. U., Perrings, C., Venail, P., . . . Naeem, S. (2012). Biodiversity loss and its impact on humanity. *Nature*, 486(7401), 59-67.
- Cesar, H., Burke, L., & Pet-Soede, L. (2003). The Economics of Worldwide Coral Reef Degradation (pp. 23). Arnhem, The Netherlands: Cesar Environmental Economics Consulting (CEEC)
- Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, 12(4), 105-109.
- Cialdini, R. B. (2007). Descriptive social norms as underappreciated sources of social control. *Psychometrika*, 72(2), 263-268.
- Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, 55, 591-621.
- Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. *Advances in experimental social psychology*, 24(20), 1-243.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A Focus Theory of Normative Conduct - Recycling the Concept of Norms to Reduce Littering in Public Places. *Journal of Personality and Social Psychology*, 58(6), 1015-1026.
- Cinner, J. E., Marnane, M. J., & McClanahan, T. R. (2005). Conservation and community benefits from traditional coral reef management at Ahus Island, Papua New Guinea. *Conservation Biology*, 19(6), 1714-1723.

- Clayton, S., Devine-Wright, P., Stern, P. C., Whitmarsh, L., Carrico, A., Steg, L., . . . Bonnes, M. (2015). Psychological research and global climate change. [Review]. *Nature Clim. Change*, 5(7), 640-646.
- Clayton, S. D., & Opatow, S. (2003). *Identity and the natural environment: The psychological significance of nature*: MIT Press.
- Coghlan, A. (2012). Facilitating reef tourism management through an innovative importance-performance analysis method. *Tourism Management*, 33(4), 767-775.
- Coghlan, A., McLennan, C.-L., & Moyle, B. (2016). Contested images, place meaning and potential tourists' responses to an iconic nature-based attraction 'at risk': the case of the Great Barrier Reef. *Tourism Recreation Research*, 1-17.
- Commonwealth of Australia. (2009). Great Barrier Reef Tourism Climate Change Action Strategy 2009-2012 (pp. 56). Townsville, Australia: Great Barrier Reef Marine Park Authority.
- Connell, S., Fien, J., Lee, J., Sykes, H., & Yencken, D. (1999). "If it doesn't directly affect you, you don't think about it': a qualitative study of young people's environmental attitudes in two Australian cities'. *Environmental Education Research*, 5(1), 95-113.
- Conner, M., & Armitage, C. J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology*, 28(15), 1429-1464.
- Corner, A., & Randall, A. (2011). Selling climate change? The limitations of social marketing as a strategy for climate change public engagement. *Global Environmental Change-Human and Policy Dimensions*, 21(3), 1005-1014.
- Corvalan, C., Hales, S., & McMichael, A. (2005). Ecosystems and Human Well-Being: Health Synthesis (pp. 64). France: Millennium Ecosystem Assessment.
- Crouch, M., & McKenzie, H. (2006). The logic of small samples in interview-based qualitative research. *Social Science Information Sur Les Sciences Sociales*, 45(4), 483-499.
- Csutora, M. (2012). One More Awareness Gap? The Behaviour-Impact Gap Problem. *Journal of Consumer Policy*, 35, 145-163.
- Cummins, R. A., & Gullone, E. (2000). *Why we should not use 5-point Likert scales: The case for subjective quality of life assessment*. Paper presented at the Second International Conference on Quality of Life in Cities, Singapore, National University of Singapore.
- Curnock, M., Marshall, N., Tobin, R., Stone-Jovicich, S., Bohensky, E., Pert, P., . . . Scherl, L. (2014a). Social and Economic Long-Term Monitoring Program for the Great Barrier Reef 2013: Tourism Report to the National Environmental Research Program (pp. 53). Townsville, Australia: CSIRO.
- Curnock, M., Marshall, N., Tobin, R., Stone-Jovicich, S., Bohensky, E., Pert, P., . . . Scherl, L. (2014b). The Social and Economic Long Term Monitoring Program(SELTMP) 2014, Tourism in the Great Barrier Reef. Report to the National Environmental Research Program (pp. 69). Cairns, Australia: CSIRO.
- Curtis, D. J. (2009). Creating inspiration: the role of the arts in creating empathy for ecological restoration. *Ecological Management & Restoration*, 10(3), 174-184.
- Dawes, J. (2002). Five Point vs. Eleven Point Scales: Does It Make A Difference to Data Characteristics? *Australian Journal of Market Research*, 10(1), 39-47.
- Dawes, J. (2008). Do data characteristics change according to the number of scale points used? An experiment using 5-point, 7-point and 10-point scales. *International Journal of Market Research*, 50(1), 61-77.
- Day, J. C., & Dobbs, K. (2013). Effective governance of a large and complex cross-jurisdictional marine protected area: Australia's Great Barrier Reef. *Marine Policy*, 41, 14-24.
- De'ath, G., Fabricius, K., & Lough, J. (2013). Yes—Coral calcification rates have decreased in the last twenty-five years! *Marine Geology*, 346, 400-402.
- De'ath, G., Fabricius, K. E., Sweatman, H., & Puotinen, M. (2012). The 27-year decline of coral cover on the Great Barrier Reef and its causes. [Research Support, Non-U.S. Gov't]. *Proc Natl Acad Sci U S A*, 109(44), 17995-17999.



- De'ath, G., Lough, J. M., & Fabricius, K. E. (2009). Declining Coral Calcification on the Great Barrier Reef. *Science*, 323(5910), 116-119.
- de Bruijn, G. J., Kremers, S. P. J., Singh, A., van den Putte, B., & van Mechelen, W. (2009). Adult Active Transportation Adding Habit Strength to the Theory of Planned Behavior. *American Journal of Preventive Medicine*, 36(3), 189-194.
- de Velde, L. V., Verbeke, W., Popp, M., & Van Huylenbroeck, G. (2010). The importance of message framing for providing information about sustainability and environmental aspects of energy. *Energy Policy*, 38(10), 5541-5549.
- Dechezlepretre, A., Glachant, M., Hascic, I., Johnstone, N., & Meniere, Y. (2011). Invention and Transfer of Climate Change-Mitigation Technologies: A Global Analysis. *Review of Environmental Economics and Policy*, 5(1), 109-130.
- Deloitte Access Economics. (2013). Economic contribution of the Great Barrier Reef. Townsville, Australia: Great Barrier Reef Marine Park Authority.
- Department of Environment and Conservation (NSW). (2006). *Who cares about the environment in 2006? A survey of NSW people's environmental knowledge, attitudes and behaviours*. Sydney, Australia: DEC Social Research Series. .
- Dess, G. G., & Picken, J. C. (2000). Changing roles: Leadership in the 21st century. *Organizational Dynamics*, 28, 18–33.
- Devine-Wright, P. (2009). Rethinking NIMBYism: The Role of Place Attachment and Place Identity in Explaining Place-protective Action. *Journal of Community & Applied Social Psychology*, 19(6), 426-441.
- Devine-Wright, P. (2013). Think global, act local? The relevance of place attachments and place identities in a climate changed world. *Global Environmental Change-Human and Policy Dimensions*, 23(1), 61-69.
- Devine-Wright, P., & Clayton, S. (2010). Introduction to the special issue: Place, identity and environmental behaviour. *Journal of Environmental Psychology*, 30(3), 267-270.
- Devine-Wright, P., & Howes, Y. (2010). Disruption to place attachment and the protection of restorative environments: A wind energy case study. *Journal of Environmental Psychology*, 30(3), 271-280.
- Devlin, M. J., & Brodie, J. (2005). Terrestrial discharge into the Great Barrier Reef Lagoon: nutrient behavior in coastal waters. *Marine Pollution Bulletin*, 51(1-4), 9-22.
- Devlin, M. J., Petus, C., Da Silva, E., Tracey, D., Wolff, N. H., Waterhouse, J., & Brodie, J. (2015). Water quality and river plume monitoring in the Great Barrier Reef: an overview of methods based on ocean colour satellite data. *Remote Sensing*, 7(10), 12909-12941.
- Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P., & Kaiser, S. (2012). Guidelines for choosing between multi-item and single-item scales for construct measurement: a predictive validity perspective. [journal article]. *Journal of the Academy of Marketing Science*, 40(3), 434-449.
- Dobbs, K., Day, J., Skeat, H., Baldwin, J., Molloy, F., McCook, L., . . . Kenchington, R. (2011). Developing a long-term outlook for the Great Barrier Reef, Australia A framework for adaptive management reporting underpinning an ecosystem-based management approach. *Marine Policy*, 35(2), 233-240.
- Donner, S. D., & Potere, D. (2007). The inequity of the global threat to coral reefs. *Bioscience*, 57(3), 214-215.
- Downing, P., & Ballantyne, J. (2007). Tipping Point or Turning Point? Social Marketing and Climate Change (pp. 45): Ipsos MORI Social Research Institute.
- Dufour, S., & Fortin, D. (1992). Annotated bibliography on case study method. 1, 167-200.
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3), 425-442.
- Eagle, L., Case, P., & Low, D. R. (2013). Challenges facing behaviour change interventions: a social marketing perspective on communicating sustainability and climate change science. In K.

- Kubacki & S. Rundle-Thiele (Eds.), *Current Issues in Social Marketing*. England: Cambridge Scholars Publishing.
- Eden, S. E. (1993). Individual Environmental Responsibility and Its Role in Public Environmentalism. *Environment and Planning A*, 25(12), 1743-1758.
- Ehrlich, P. R., & Kennedy, D. (2005). Millennium assessment of human behavior. *Science*, 309(5734), 562-563.
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), 25-32.
- Elliot, A. J. (1997). Integrating the "classic" and "contemporary" approaches to achievement motivation: A hierarchical model of approach and avoidance achievement motivation. In M. L. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 10, pp. 143–179). Greenwich, CT: JAI Press.
- Evans, L., Maio, G. R., Corner, A., Hodgetts, C. J., Ahmed, S., & Hahn, U. (2012). Self-interest and pro-environmental behaviour. *Nature Climate Change, Advance online publication*.
- Evans, N. (2011). *More Than a Sign on the Fence? Teacher Learning and the Reef Guardian Schools Program in Far North Queensland* Saarbrücken, Germany: VDM Verlag Dr. Müller.
- Fernandes, L., Day, J., Lewis, A., Slegers, S., Kerrigan, B., Breen, D., . . . Stapleton, K. (2005). Establishing representative no-take areas in the Great Barrier Reef: Large-scale implementation of theory on marine protected areas. *Conservation Biology*, 19(6), 1733-1744.
- Festinger, L. (1957). A theory of cognitive dissonance. *Evanston, Il: Row, Peterson*.
- Festinger, L. (1962). Cognitive Dissonance. *Scientific American*, 207(4), 93-107.
- Field, C. B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White. (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (pp. 1,132). Cambridge, United Kingdom and New York, NY, USA.
- Fielding, K. S., McDonald, R., & Louis, W. R. (2008a). Theory of planned behaviour, identity and intentions to engage in environmental activism. *Journal of Environmental Psychology*, 28(4), 318-326.
- Fielding, K. S., Terry, D. J., Masser, B. M., & Hogg, M. A. (2008b). Integrating social identity theory and the theory of planned behaviour to explain decisions to engage in sustainable agricultural practices. *British Journal of Social Psychology*, 47, 23-48.
- Fischhoff, B. (2007). Nonpersuasive communication about matters of greatest urgency: Climate change. *Environmental Science & Technology*, 41(21), 7204-7208.
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, 12(2), 219-245.
- Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockstrom, J. (2010). Resilience Thinking: Integrating Resilience, Adaptability and Transformability. *Ecology and Society*, 15(4).
- Ford-Gilboe, M., Campbell, J., & Berman, H. (1995). Stories and numbers: Coexistence without compromise. *Advances in Nursing Science*, 18(1), 14-26.
- Fransson, N., & Garling, T. (1999). Environmental concern: Conceptual definitions, measurement methods, and research findings. *Journal of Environmental Psychology*, 19(4), 369-382.
- Frieler, K., Meinshausen, M., Golly, A., Mengel, M., Lebek, K., Donner, S. D., & Hoegh-Guldberg, O. (2012). Limiting global warming to 2C is unlikely to save most coral reefs. *Nature Climate Change*, 3.2, 165-170.
- Gifford, R. (2008). Psychology's Essential Role in Alleviating the Impacts of Climate Change. *Canadian Psychology-Psychologie Canadienne*, 49(4), 273-280.
- Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology*, 49(3), 141-157.

- Gifford, R., Scannell, L., Kormos, C., Smolova, L., Biel, A., Boncu, S., . . . Uzzell, D. (2009). Temporal pessimism and spatial optimism in environmental assessments: An 18-nation study. *Journal of Environmental Psychology, 29*(1), 1-12.
- Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management Review, 17*(2), 183-211.
- Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion, 11*(2), 87-98.
- Goldberg, J., Marshall, N., Birtles, A., Case, P., Bohensky, E., Curnock, M., . . . Visperas, B. (2016). Climate change, the Great Barrier Reef and the response of Australians. [Article]. *Palgrave Communications, 2*, 15046.
- Goldberg, J., Marshall, N., Curnock, M., Stone-Jovicich, S., Bohensky, E., Gooch, M., . . . Villani, C. (2014). Social and Economic Long Term Monitoring Program (SELTMP) 2013: A National Survey of the Great Barrier Reef (pp. 43). Townsville, Australia: CSIRO.
- Goldberg, J., Marshall, N., Curnock, M., Stone-Jovicich, S., Bohensky, E., Gooch, M., . . . Visperas, B. (2015). Social and Economic Long Term Monitoring Program (SELTMP) 2014: THE GREAT BARRIER REEF NATIONAL SURVEY (pp. 46). Townsville, Australia: CSIRO.
- Gollwitzer, P. M. (1999). Implementation intentions - Strong effects of simple plans. *American Psychologist, 54*(7), 493-503.
- Gollwitzer, P. M., & Brandstatter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology, 73*(1), 186-199.
- Gorden, R. (1992). *Basic Interviewing Skills*. Itasca, Illinois: F.E. Peacock.
- Gragson, T. L., & Grove, M. (2006). Social science in the context of the long term ecological research program. *Society & Natural Resources, 19*(2), 93-100.
- Grayson, M. (2013). Agriculture and drought. [Outlook]. *Nature, 501*(7468), S1-S1.
- Great Barrier Marine Park Authority. (2007). Great Barrier Reef Climate Change Action Plan 2007 – 2011 (pp. 14). Townsville, Australia: Great Barrier Reef Marine Park Authority.
- Great Barrier Marine Park Authority. (2009). Great Barrier Reef Outlook Report 2009. Townsville, Australia.: Great Barrier Reef Marine Park Authority.
- Great Barrier Marine Park Authority. (2012). Great Barrier Reef Climate Change Adaptation Strategy and Action Plan (2012-2017) (pp. 23). Townsville: Great Barrier Reef Marine Park Authority.
- Great Barrier Marine Park Authority. (2014). Great Barrier Reef Outlook Report 2014 (pp. 328). Townsville, Australia: Great Barrier Reef Marine Park Authority.
- Great Barrier Marine Park Authority. (2015). *Reef 2050 Long-term Sustainability Plan*. Townsville, Australia.
- Great Barrier Marine Park Authority. (2016). Onboard: The tourism operator's handbook for the Great Barrier Reef, from [http://onboard.gbrmpa.gov.au/home/high\\_standards/training\\_opportunities](http://onboard.gbrmpa.gov.au/home/high_standards/training_opportunities)
- Great Barrier Reef Marine Park Authority. (2016). Interim report: 2016 coral bleaching event on the Great Barrier Reef. Townsville, Australia: GBRMPA.
- Griskevicius, V., Cialdini, R. B., & Goldstein, N. J. (2008). Social norms: an underestimated and underemployed lever for managing climate change. *IJSC 3*, 5-13.
- Grothmann, T., & Patt, A. (2005). Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change-Human and Policy Dimensions, 15*(3), 199-213.
- Halpenny, E. A. (2010). Pro-environmental behaviours and park visitors The effect of place attachment. *Journal of Environmental Psychology, 30*(4), 409-421.
- Ham, S., Brown, T., Curtis, J., Weiler, B., Hughes, M., & Poll, M. (2009). *Promoting Persuasion in Protected Areas: A guide for managers who want to use strategic communication to influence visitor behaviour*.

- Ham, S. H. (2007). *Can interpretation really make a difference? Answers to four questions from cognitive and behavioural psychology*. Paper presented at the Interpreting World Heritage Conference, Vancouver, Canada.
- Harriott, V. (2002). Marine tourism impacts and their management on the Great Barrier Reef *Technical Report no. 46*. Townsville, Australia: CRC Reef Research Centre.
- Hay, R. (1998). Sense of place in developmental context. *Journal of Environmental Psychology, 18*(1), 5-29.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis. *The Journal of Environmental Education, 18*(2), 1-8.
- Hochschild, J., Crabill, A., & Sen, M. (2012). Technology Optimism or Pessimism: How Trust in Science Shapes Policy Attitudes toward Genomic Science. *Issue in Technology Innovation at Brookings*.
- Hoegh-Guldberg, O., Mumby, P. J., Hooten, A. J., Steneck, R. S., Greenfield, P., Gomez, E., . . . Hatziolos, M. E. (2007). Coral reefs under rapid climate change and ocean acidification. *Science, 318*(5857), 1737-1742.
- Hoepfner, B. B., Kelly, J. F., Urbanoski, K. A., & Slaymaker, V. (2011). Comparative Utility of a Single-Item vs. Multiple-Item Measure of Self-Efficacy in Predicting Relapse among Young Adults. *Journal of Substance Abuse Treatment, 41*(3), 305-312.
- Hoffman, A. J. (2011). SOCIOLOGY The growing climate divide. *Nature Climate Change, 1*(4), 195-196.
- Holland, R. W., Aarts, H., & Langendam, D. (2006). Breaking and creating habits on the working floor: A field-experiment on the power of implementation intentions. *Journal of Experimental Social Psychology, 42*(6), 776-783.
- Honnold, J. A. (1984). Age and Environmental Concern - Some Specification of Effects. *Journal of Environmental Education, 16*(1), 4-9.
- Howard, G. S. (1997). *Ecological psychology: Creating a more earth-friendly human nature*. Notre Dame, IN: University of Notre Dame Press.
- Howe, K. R. (1988). Against the quantitative-qualitative incompatibility thesis or dogmas die hard. *Educational researcher, 17*(8), 10-16.
- Howe, P. D., & Leiserowitz, A. (2013). Who remembers a hot summer or a cold winter? The asymmetric effect of beliefs about global warming on perceptions of local climate conditions in the U.S. *Global Environmental Change, 23*(6), 1488-1500.
- Howell, R. A. (2013). It's not (just) "the environment, stupid!" Values, motivations, and routes to engagement of people adopting lower-carbon lifestyles. *Global Environmental Change-Human and Policy Dimensions, 23*(1), 281-290.
- Hughes, M., & Saunders, A. M. (2005). Interpretation, activity participation, and environmental attitudes of visitors to Penguin Island, Western Australia. *Society & Natural Resources, 18*(7), 611-624.
- Hughes, T. P., Graham, N. A. J., Jackson, J. B. C., Mumby, P. J., & Steneck, R. S. (2010). Rising to the challenge of sustaining coral reef resilience. *Trends in Ecology & Evolution, 25*(11), 633-642.
- Hughes, T. P., Gunderson, L. H., Folke, C., Baird, A. H., Bellwood, D., Berkes, F., . . . Worm, B. (2007). Adaptive management of the Great Barrier Reef and the Grand Canyon world heritage areas. *Ambio, 36*(7), 586-592.
- Jamal, T., Prideaux, B., Sakata, H., & Thompson, M. (2015). A micro-macro assessment of climate change and visitors to the Great Barrier Reef, Australia. In M. Vijay Reddy & K. Wilkes (Eds.), *Tourism in the Green Economy* (pp. 271-287). New York: Routledge.
- Jamal, T. B., & Getz, D. (1995). Collaboration theory and community tourism planning. *Annals of Tourism Research, 22*(1), 186-204.
- Jamieson, S. (2004). Likert scales: how to (ab)use them. *Medical Education, 38*(12), 1217-1218.
- Jenks, B., Vaughan, P. W., & Butler, P. J. (2010). The evolution of Rare Pride: Using evaluation to drive adaptive management in a biodiversity conservation organization. *Evaluation and Program Planning, 33*(2), 186-190.

- Jensen, M. C. (1994). Self-interest, altruism, incentives and agency theory. *Journal of Applied Corporate Finance*, 7(2), 40-45.
- Johnson, J. E., & Marshall, P. A. (2007). *Climate Change and the Great Barrier Reef: A Vulnerability Assessment*. Australia: Great Barrier Marine Park Authority and Australian Greenhouse Office.
- Joshi, M., Hawkins, E., Sutton, R., Lowe, J., & Frame, D. (2011). Projections of when temperature change will exceed 2 degrees C above pre-industrial levels. *Nature Climate Change*, 1(8), 407-412.
- Juntti, M., Russel, D., & Turnpenny, J. (2009). Evidence, politics and power in public policy for the environment. *Environmental Science & Policy*, 12(3), 207-215.
- Kahan, D. (2010). Fixing the communications failure. *Nature*, 463(7279), 296-297.
- Kahan, D. M., Braman, D., Slovic, P., Gastil, J., & Cohen, G. (2009). Cultural cognition of the risks and benefits of nanotechnology. *Nature Nanotechnology*, 4(2), 87-90.
- Kahan, D. M., Jenkins-Smith, H., & Braman, D. (2011). Cultural cognition of scientific consensus. *Journal of Risk Research*, 14(2), 147-174.
- Kahan, D. M., Peters, E., Wittlin, M., Slovic, P., Ouellette, L. L., Braman, D., & Mandel, G. (2012). The polarizing impact of science literacy and numeracy on perceived climate change risks. *Nature Climate Change*, 2.10, 732-735.
- Kaiser, F. G., Wolfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behaviour. *Journal of Environmental Psychology*, 19(1), 1-19.
- Kaltenborn, B. P., & Williams, D. R. (2010). The meaning of place: Attachments to Femundsmarka National Park, Norway, among tourists and locals. *Norwegian Journal of Geography*, 56(3), 189-198.
- Knapp, T. R. (1990). Treating Ordinal Scales as Interval Scales - an Attempt to Resolve the Controversy. *Nursing Research*, 39(2), 121-123.
- Knutson, T. R., McBride, J. L., Chan, J., Emanuel, K., Holland, G., Landsea, C., . . . Sugi, M. (2010). Tropical cyclones and climate change. *Nature Geoscience*, 3(3), 157-163.
- Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3).
- Kuo, I. L. (2002). The effectiveness of environmental interpretation at resource-sensitive tourism destinations. *International Journal of Tourism Research*, 4(2), 87-101.
- Kwon, H., & Trail, G. (2005). The Feasibility of Single-Item Measures in Sport Loyalty Research. *Sport Management Review*, 8(1), 69-88.
- Lal, P., Lim-Applegate, H., & Scocciarro, M. (2002). The adaptive decision-making process as a tool for integrated natural resource management: Focus, attitudes, and approach. *Conservation Ecology*, 5(2).
- Langford, I. H. (2002). An existential approach to risk perception. *Risk Analysis*, 22(1), 101-120.
- Larson, S., De Freitas, D. M., & Hicks, C. C. (2013). Sense of place as a determinant of people's attitudes towards the environment: Implications for natural resources management and planning in the Great Barrier Reef, Australia. *Journal of Environmental Management*, 117, 226-234.
- Larson, S., & Stone-Jovicich, S. (2011). Community perceptions of water quality and current institutional arrangements in the Great Barrier Reef Region of Australia. *Water Policy*, 13(3), 411-424.
- Laurance, W. F., Clements, G. R., Sloan, S., O'Connell, C. S., Mueller, N. D., Goosem, M., . . . Arrea, I. B. (2014). A global strategy for road building. [Letter]. *Nature*, 513(7517), 229-232.
- Lee, W. H., & Moscardo, G. (2005). Understanding the impact of ecotourism resort experiences on tourists' environmental attitudes and behavioural intentions. *Journal of Sustainable Tourism*, 13(6), 546-565.
- Leiserowitz, A. A. (2005). American risk perceptions: Is climate change dangerous? *Risk Analysis*, 25(6), 1433-1442.
- Leitch, A. (2011, May 4). Understanding emotional responses to climate change. *Ecos*.

- Leviston, Z., Price, J., Malkin, S., & McCrea, R. (2014). Fourth annual survey of Australian attitudes to climate change: Interim report (pp. 31). Perth, Australia: Climate Adaptation Flagship, CSIRO.
- Leviston, Z., & Walker, I. (2011a). Baseline Survey of Australian attitudes to climate change: PRELIMINARY REPORT (pp. 22). CSIRO.
- Leviston, Z., & Walker, I. (2011b). Second Annual Survey of Australian Attitudes to Climate Change: Interim Report *National Research Flagships - Climate Adaptation*: CSIRO.
- Leviston, Z., Walker, I., & Morwinski, S. (2012). Your opinion on climate change might not be as common as you think. *Nature Climate Change*.
- Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology*, 31(3), 207-230.
- Lewis, S. E., Brodie, J. E., Bainbridge, Z. T., Rohde, K. W., Davis, A. M., Masters, B. L., . . . Schaffelke, B. (2009). Herbicides: A new threat to the Great Barrier Reef. *Environmental Pollution*, 157(8-9), 2470-2484.
- Lindell, M. K., & Perry, R. W. (2012). The Protective Action Decision Model: Theoretical Modifications and Additional Evidence. *Risk Analysis*, 32(4), 616-632.
- Litvin, S. W., Goldsmith, R. E., & Pan, B. (2008). Electronic word-of-mouth in hospitality and tourism management. *Tourism Management*, 29(3), 458-468.
- Lorenzoni, I., Nicholson-Cole, S., & Whitmarsh, L. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change-Human and Policy Dimensions*, 17(3-4), 445-459.
- Lough, J. M., & Cantin, N. E. (2014). Perspectives on massive coral growth rates in a changing ocean. *The Biological Bulletin*, 226(3), 187-202.
- Lubell, M. (2002). Environmental activism as collective action. *Environment and Behavior*, 34(4), 431-454.
- Lucas, P. H. C., Webb, T., Valentine, P., & Marsh, H. (1997). *The outstanding universal value of the Great Barrier Reef world heritage area*: Great Barrier Reef Marine Park Authority.
- MacDonald, E., Milfont, T., & Gavin, M. (2015). Thinking Globally But Not Acting Locally?: Expert and Public Perceptions of Environmental Threats and Conservation Actions. *Human Dimensions of Wildlife*, 20(2), 123-132.
- Maibach, E. W., Leiserowitz, A., Roser-Renouf, C., & Mertz, C. K. (2011). Identifying Like-Minded Audiences for Global Warming Public Engagement Campaigns: An Audience Segmentation Analysis and Tool Development. *Plos One*, 6(3).
- Maibach, E. W., Roser-Renouf, C., & Leiserowitz, A. (2008). Communication and Marketing As Climate Change-Intervention Assets A Public Health Perspective. *American Journal of Preventive Medicine*, 35(5), 488-500.
- Malka, A., Krosnick, J. A., & Langer, G. (2009). The association of knowledge with concern about global warming: Trusted information sources shape public thinking. *Risk Analysis*, 29(5), 633-647.
- Manning, R. E., Valliere, W., Bacon, J., Graefe, A., Kyle, G., & Hennessy, R. (2000). Use and users of the Appalachian Trail: A geographic study. *Proceedings of the 2000 Northeastern Recreation Research Symposium*, 276, 115-120.
- Manstead, A. S. R. (2011). The benefits of a critical stance: A reflection on past papers on the theories of reasoned action and planned behaviour. *British Journal of Social Psychology*, 50(3), 366-373.
- Marshall, N., Bohensky E, Goldberg J, Gooch M, Lankester A, Pert P, Stone-Jovicich S and R Tobin (2012). *Social and economic long-term monitoring program: social and economic conditions of the Great Barrier Reef*. Technical report published by the CSIRO. 415 pp.
- Marshall, N., Marshall, P., & Abdulla, A. (2009). Using social resilience and resource dependency to increase the effectiveness of marine conservation initiatives in Salum, Egypt. *Journal of Environmental Planning and Management*, 52(7), 901-918.
- Marshall, N., Tobin, R., Marshall, P., Gooch, M., & Hobday, A. (2013). Social Vulnerability of Marine Resource Users to Extreme Weather Events. *Ecosystems*, 16(5), 797-809.

- Marshall, N. A. (2007). Can policy perception influence social resilience to policy change? *Fisheries Research*, 86(2-3), 216-227.
- Marshall, N. A. (2010). Understanding social resilience to climate variability in primary enterprises and industries. *Global Environmental Change-Human and Policy Dimensions*, 20(1), 36-43.
- Marshall, N. A., Fenton, D. M., Marshall, P. A., & Suffon, S. G. (2007). How resource dependency can influence social resilience within a primary resource industry. *Rural Sociology*, 72(3), 359-390.
- Marshall, N. A., & Marshall, P. A. (2007). Conceptualizing and operationalizing social resilience within commercial fisheries in northern Australia. *Ecology and Society*, 12(1).
- Marshall, N. A., Marshall, P. A., Abdulla, A., Roupheal, T., & Ali, A. (2011). Preparing for climate change: recognising its early impacts through the perceptions of dive tourists and dive operators in the Egyptian Red Sea. *Current Issues in Tourism*, 14(6), 507-518.
- Marshall, N. A., Park, S. E., Adger, W. N., Brown, K., & Howden, S. M. (2012). Transformational capacity and the influence of place and identity. *Environmental Research Letters*, 7(3), 034022.
- Martin, G. (2011). The importance of marketing segmentation. *American Journal of Business Education*, 4(6), 15-18.
- Maxwell, J. (1992). Understanding and validity in qualitative research. *Harvard educational review*, 62(3), 279-301.
- McCook, L. J., Ayling, T., Cappo, M., Choat, J. H., Evans, R. D., De Freitas, D. M., . . . Williamson, D. H. (2010). Adaptive management of the Great Barrier Reef: A globally significant demonstration of the benefits of networks of marine reserves. *Proceedings of the National Academy of Sciences of the United States of America*, 107(43), 18278-18285.
- McKenzie-Mohr, D. (2000). Promoting sustainable behavior: An introduction to community-based social marketing. *Journal of Social Issues*, 56(3), 543-554.
- McKenzie-Mohr, D., & Smith, W. (1999). *Fostering sustainable behaviour: An introduction to community-based social marketing*. Gabriola Island, B.C.: New Society.
- McKercher, B., Mak, B., & Wong, S. (2014). Does climate change matter to the travel trade? *Journal of Sustainable Tourism*, 22(5), 685-704.
- McKinley, E., & Fletcher, S. (2010). Individual responsibility for the oceans? An evaluation of marine citizenship by UK marine practitioners. *Ocean & Coastal Management*, 53(7), 379-384.
- Miller, G., Rathouse, K., Scarles, C., Holmes, K., & Tribe, J. (2010). Public understanding of sustainable tourism. *Annals of Tourism Research*, 37(3), 627-645.
- Milliken, F. J. (1987). Three types of perceived uncertainty about the environment: State, effect, and response uncertainty. *Academy of Management review*, 12(1), 133-143.
- Moberg, F., & Folke, C. (1999). Ecological goods and services of coral reef ecosystems. *Ecological Economics*, 29(2), 215-233.
- Mobley, C., & Kilbourne, W. (2013). Gender Differences in Pro-Environmental Intentions: A Cross-National Perspective on the Influence of Self-Enhancement Values and Views on Technology\*. *Sociological Inquiry*, 83(2), 310-332.
- Mohamed, M. (2012). *Changing Reef Values: An Inquiry into the Use, Management and Governances of Reef Resources in Island Communities of the Maldives*. Doctor of Philosophy in Environmental Science, University of Canterbury, Christchurch, New Zealand.
- Moscardo, G. (1998). Interpretation and sustainable tourism. *The Journal of Tourism Studies*, 14(1), 112-123.
- Moscardo, G. (2008). Exploring public awareness of threats to the Great Barrier Reef environment. *Interdisciplinary Environmental Review*, X(1 & 2), 45-64.
- Moser, S. C. (2010). Communicating climate change: history, challenges, process and future directions. *Wiley Interdisciplinary Reviews-Climate Change*, 1(1), 31-53.
- Moser, S. C., & Dilling, L. (2004). Making climate hot - Communicating the urgency and challenge of global climate change. *Environment*, 46(10), 32-46.

- Moser, S. C., & Ekstrom, J. A. (2010). A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academy of Sciences of the United States of America*, 107(51), 22026-22031.
- Myers, S. A., Blackmore, M. J., Smith, T. F., & Carter, R. W. (2012a). Climate change and stewardship: strategies to build community resilience in the Capricorn Coast. *Australasian Journal of Environmental Management*, 19(3), 164-181.
- Myers, T. A., Nisbet, M. C., Maibach, E. W., & Leiserowitz, A. A. (2012b). A public health frame arouses hopeful emotions about climate change. *Climatic Change*, 113, 1105-1112.
- Needham, M. D., & Szuster, B. W. (2011). Situational influences on normative evaluations of coastal tourism and recreation management strategies in Hawai'i. *Tourism Management*, 32(4), 732-740.
- Nicholls, R. J., Marinova, N., Lowe, J. A., Brown, S., Vellinga, P., De Gusmao, D., . . . Tol, R. S. J. (2011). Sea-level rise and its possible impacts given a 'beyond 4 degrees C world' in the twenty-first century. *Philosophical Transactions of the Royal Society a-Mathematical Physical and Engineering Sciences*, 369(1934), 161-181.
- Nielsen, J. O., & Reenberg, A. (2010). Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso. *Global Environmental Change-Human and Policy Dimensions*, 20(1), 142-152.
- Nigbur, D., Lyons, E., & Uzzell, D. (2010). Attitudes, norms, identity and environmental behaviour: Using an expanded theory of planned behaviour to predict participation in a kerbside recycling programme. *British Journal of Social Psychology*, 49(2), 259-284.
- Nilsson, J. A., Sutton, S. G., & Tobin, R. C. (2010). A Community Survey of Climate Change and the Great Barrier Reef *Marine and Tropical Research Facility Research Report Series* (pp. 85). Cairns, Australia: Marine and Tropical Research Facility.
- Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The Nature Relatedness Scale Linking Individuals' Connection With Nature to Environmental Concern and Behavior. *Environment and Behavior*, 41(5), 715-740.
- Nisbet, M. C. (2009). Communicating Climate Change Why Frames Matter for Public Engagement. *Environment*, 51(2), 12-23.
- Nisbet, M. C., & Mooney, C. (2007). Science and society - Framing science. *Science*, 316(5821), 56-56.
- Novacek, M. J. (2008). Engaging the public in biodiversity issues. *Proceedings of the National Academy of Sciences of the United States of America*, 105, 11571-11578.
- Nurse-Bray, M., & Rist, P. (2009). Co-management and protected area management: Achieving effective management of a contested site, lessons from the Great Barrier Reef World Heritage Area (GBRWhA). *Marine Policy*, 33(1), 118-127.
- Nyaupane, G. P., & Graefe, A. R. (2008). Travel Distance: A Tool for Nature-Based Tourism Market Segmentation. *Journal of Travel & Tourism Marketing*, 25(3-4), 355-366.
- O'Connor, R. E., Bord, R. J., & Fisher, A. (1999). Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk Analysis*, 19(3), 461-471.
- O'Neill, S., & Nicholson-Cole, S. (2009). "Fear Won't Do It" Promoting Positive Engagement With Climate Change Through Visual and Iconic Representations. *Science Communication*, 30(3), 355-379.
- O'Neill, S. J., & Hulme, M. (2009). An iconic approach for representing climate change. *Global Environmental Change-Human and Policy Dimensions*, 19(4), 402-410.
- Ockwell, D., Whitmarsh, L., & O'Neill, S. (2009). Reorienting Climate Change Communication for Effective Mitigation Forcing People to be Green or Fostering Grass-Roots Engagement? *Science Communication*, 30(3), 305-327.
- Odeku, K. O. (2013). On Decarbonising Tourism: The Need to Switch to Renewable Energy. *The Journal of Human Ecology*, 44(3), 231-245.
- Oh, H., Fiore, A. M., & Jeoung, M. (2007). Measuring experience economy concepts: Tourism applications. *Journal of Travel Research*, 46, 119-132.



- Olsson, P., Folke, C., & Hahn, T. (2004). Social-ecological transformation for ecosystem management: the development of adaptive co-management of a wetland landscape in southern Sweden. *Ecology and Society*, 9(4).
- Oppermann, M. (2000). Triangulation--a methodological discussion. *The International Journal of Tourism Research*, 2(2), 141.
- Orams, M. B. (1996a). Using interpretation to manage nature-based tourism. *Journal of Sustainable Tourism*, 4(2), 81-94.
- Orams, M. B. (1996b). Using interpretation to manage nature-based tourism. . *Journal of Sustainable Tourism*, 4(2), 81-94.
- Owens, S., Petts, J., & Bulkeley, H. (2006). Boundary work: knowledge, policy, and the urban environment. *Environment and Planning C*, 24(5), 633.
- Packer, J., Ballantyne, R., & Hughes, K. (2014). Chinese and Australian tourists' attitudes to nature, animals and environmental issues: Implications for the design of nature-based tourism experiences. *Tourism Management*, 44, 101-107.
- Parisi, D., Taquino, M., Grice, S. M., & Gill, D. A. (2004). Civic Responsibility and the Environment: Linking Local Conditions to Community Environmental Activeness. *Society & Natural Resources*, 17(2), 97-112.
- Parker, D., Manstead, A. S. R., & Stradling, S. G. (1995). Extending the Theory of Planned Behavior - the Role of Personal Norm. *British Journal of Social Psychology*, 34, 127-137.
- Parmesan, C., Burrows, M. T., Duarte, C. M., Poloczanska, E. S., Richardson, A. J., Schoeman, D. S., & Singer, M. C. (2013). Beyond climate change attribution in conservation and ecological research. *Ecology Letters*, 16, 58-71.
- Partridge, E. (2008). From ambivalence to activism: young people's environmental views and actions. *Youth Studies Australia*, 27(2), 18.
- Pauly, D., & Zeller, D. (2016). Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining. [Article]. *Nat Commun*, 7.
- Pelletier, L. G., & Sharp, E. (2008). Persuasive Communication and Proenvironmental Behaviours: How Message Tailoring and Message Framing Can Improve the Integration of Behaviours Through Self-Determined Motivation. *Canadian Psychology-Psychologie Canadienne*, 49(3), 210-217.
- Perkins, H. E. (2010). Measuring love and care for nature. *Journal of Environmental Psychology*, 30(4), 455-463.
- Perry, R. I., Barange, M., & Ommer, R. E. (2010). Global changes in marine systems: A social-ecological approach. *Progress in Oceanography*, 87(1-4), 331-337.
- Phillips, T., & Smith, P. (2000). What is 'Australian'? Knowledge and attitudes among a gallery of contemporary Australians. *Australian Journal of Political Science*, 35(2), 203-224.
- Pidgeon, N., & Fischhoff, B. (2011). The role of social and decision sciences in communicating uncertain climate risks. *Nature Climate Change*, 1(1), 35-41.
- Platt, J. (1992). Case study in American methodological thought. *Current Sociology*, 40(1), 17-48.
- Powell, R. B., & Ham, S. H. (2008). Can ecotourism interpretation really lead to pro-conservation knowledge, attitudes and behaviour? Evidence from the Galapagos islands. *Journal of Sustainable Tourism*, 16(4), 467-489.
- Price, J. C., & Leviston, Z. (2014). Predicting pro-environmental agricultural practices: The social, psychological and contextual influences on land management. *Journal of Rural Studies*, 34, 65-78.
- Prideaux, B., McNamara, K. E., & Thompson, M. (2012). The irony of tourism: visitor reflections of their impacts on Australia's World Heritage rainforest. *Journal of Ecotourism*, 11(2), 102-117.
- Prideaux, B., Thompson, M., & Lee, L. (2015). The Great Barrier Reef: A profile of tourism use patterns and visitors' concerns In E. Wilson & M. Witsel (Eds.), *CAUTHE 2015: Rising Tides and Sea Changes: Adaptation and Innovation in Tourism and Hospitality*. (pp. 678-681). Gold Coast, QLD: School of Business and Tourism, Southern Cross University.

- Protogerou, C., Flisher, A. J., Aaro, L. E., & Mathews, C. (2012). The theory of planned behaviour as a framework for predicting sexual risk behaviour in sub-Saharan African youth: A critical review. *Journal of Child & Adolescent Mental Health, 24*(1), 15-35.
- Queensland Government. (2016). Great Barrier Reef Water Science Taskforce synopsis. Retrieved February 9, 2016, from <http://www.gbr.qld.gov.au/taskforce/>.
- Raymond, C. M., Brown, G., & Robinson, G. M. (2011). The influence of place attachment, and moral and normative concerns on the conservation of native vegetation: A test of two behavioural models. *Journal of Environmental Psychology, 31*(4), 323-335.
- Reddi, B. A. J., & Carpenter, R. H. S. (2000). The influence of urgency on decision time. [10.1038/77739]. *Nat Neurosci, 3*(8), 827-830.
- Reno, R. R., Cialdini, R. B., & Kallgren, C. A. (1993). The Transsituational Influence of Social Norms. *Journal of Personality and Social Psychology, 64*(1), 104-112.
- Reser, J. P., & Bentrupperbaumer, J. M. (2005). What and where are environmental values? Assessing the impacts of current diversity of use of 'environmental' and 'World Heritage' values. *Journal of Environmental Psychology, 25*(2), 125-146.
- Rickard, L. N., Yang, Z. J., Seo, M., & Harrison, T. M. (2014). The "I" in climate: The role of individual responsibility in systematic processing of climate change information. *Global Environmental Change-Human and Policy Dimensions, 26*, 39-52.
- Rimal, R. N., & Real, K. (2003). Understanding the influence of perceived norms on behaviors. *Communication Theory, 13*(2), 184-203.
- Roberts, C. M., McClean, C. J., Veron, J. E. N., Hawkins, J. P., Allen, G. R., McAllister, D. E., . . . Werner, T. B. (2002). Marine biodiversity hotspots and conservation priorities for tropical reefs. *Science, 295*(5558), 1280-1284.
- Roberts, J. T. F. (2014). Delivering the deadly blow: Understanding collective responsibility. *Rivista Italiana di Filosofia Analitica Junior, 5*(1), 49-58.
- Robinson, O. C. (2014). Sampling in Interview-Based Qualitative Research: A Theoretical and Practical Guide. *Qualitative Research in Psychology, 11*(1), 25-41.
- Rokeach, M., & Mclellan, D. D. (1972). Feedback of Information About Values and Attitudes of Self and Others as Determinants of Long-Term Cognitive and Behavioral Change. *Journal of Applied Social Psychology, 2*(3), 236-251.
- Rolfe, J., & Windle, J. (2012). Distance Decay Functions for Iconic Assets: Assessing National Values to Protect the Health of the Great Barrier Reef in Australia. *Environmental & Resource Economics, 53*(3), 347-365.
- Rose, N., Weinrich, M., & Finkle, M. (2003). Swim-with-whales tourism—a preliminary review of commercial operations. *Journal of Cetacean Research and Management, Working Document SC-55-WW4*, 1-14.
- Rose, N., Weinrich, M., Iníguez, M., & Finkle, M. (2005). Swim-with-Whales Tourism-an updated Review of Commercial Operations: Paper SC/57/WW6 submitted to the Scientific Committee of the International Whaling Commission (IWC).
- Ruckelshaus, M., Klinger, T., Knowlton, N., & Demaster, D. R. (2008). Marine ecosystem-based management in practice: Scientific, and governance challenges. *Bioscience, 58*(1), 53-63.
- Saldaña, J. (2015). *An introduction to codes and coding: The coding manual for qualitative researchers*: Sage.
- Sandelowski, M. (1995). Sample size in qualitative research. *Research in Nursing & Health, 18*, 179–183.
- Sandelowski, M. (2001). Real qualitative researchers do not count: the use of numbers in qualitative research. *Research in Nursing & Health, 24*(3), 230-240.
- Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology, 30*(1), 1-10.

- Scannell, L., & Gifford, R. (2013). Personally Relevant Climate Change: The Role of Place Attachment and Local Versus Global Message Framing in Engagement. *Environment and Behavior*, 45(1), 60-85.
- Scerri, A. (2009). Paradoxes of increased individuation and public awareness of environmental issues. *Environmental Politics*, 18(4), 467-485.
- Scheffer, M., Barrett, S., Carpenter, S., Folke, C., Green, A. J., Holmgren, M., . . . Nepstad, D. (2015). Creating a safe operating space for iconic ecosystems. *Science*, 347(6228), 1317-1319.
- Schultz, P. W. (2000). Empathizing with nature: The effects of perspective taking on concern for environmental issues. *Journal of Social Issues*, 56(3), 391-406.
- Schwartz, S. H. (1977). Normative influences on altruism. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 221-279). New York: Academic Press.
- Schwartz, S. P., White, P. E., & Hughes, R. G. (1985). Environmental threats, communities and hysteria. *Journal of Public Health Policy*, 6(1), 58-77.
- Seguin, C., Pelletier, L. G., & Hunsley, J. (1998). Toward a model of environmental activism. *Environment and Behavior*, 30(5), 628-652.
- Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The Theory of Reasoned Action - a Meta-Analysis of Past Research with Recommendations for Modifications and Future-Research. *Journal of Consumer Research*, 15(3), 325-343.
- Shove, E. (2010). Beyond the ABC: climate change policy and theories of social change. *Environment and Planning A*, 42(6), 1273-1285.
- Solomon, S., Plattner, G. K., Knutti, R., & Friedlingstein, P. (2009). Irreversible climate change due to carbon dioxide emissions. *Proceedings of the National Academy of Sciences of the United States of America*, 106(6), 1704-1709.
- Sommers, S. (2011). *Situations matter : understanding how context transforms your world*. New York: Riverhead Books.
- Souitaris, V., Zerbini, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing*, 22(4), 566-591.
- Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change-Human and Policy Dimensions*, 20(4), 656-667.
- Stedman, R. C. (2002). Toward a social psychology of place - Predicting behavior from place-based cognitions, attitude, and identity. *Environment and Behavior*, 34(5), 561-581.
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309-317.
- Steneck, R., Paris, C., Arnold, S., Ablan-Lagman, M., Alcala, A., Butler, M., . . . Sale, P. (2009). Thinking and managing outside the box: coalescing connectivity networks to build region-wide resilience in coral reef ecosystems. *Coral Reefs*, 28(2), 367-378.
- Sterman, J. D. (2008). Economics - Risk communication on climate: Mental models and mass balance. *Science*, 322(5901), 532-533.
- Stern, P. C. (1999). A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. *Human Ecology Review*, 6(2), 81-97.
- Stern, P. C. (2000a). New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues*, 56(3), 407-424.
- Stern, P. C. (2000b). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424.
- Stern, P. C. (2011). Contributions of Psychology to Limiting Climate Change. *American Psychologist*, 66(4), 303-314.
- Stern, P. C. (2012). Fear and hope in climate messages. *Nature Climate Change*, 2(8), 572-573.

- Sundström, A., & McCright, A. M. (2013). Examining Gender Differences in Environmental Concern across Four Levels of the Swedish Polity. *QoG Working Paper Series 2013:10* (pp. 33). Goteborg: The Quality of Government Institute.
- Sutton, S. G., & Tobin, R. C. (2011). Constraints on community engagement with Great Barrier Reef climate change reduction and mitigation. *Global Environmental Change-Human and Policy Dimensions, 21*(3), 894-905.
- Swim, J. K., Stern, P. C., Doherty, T. J., Clayton, S., Reser, J. P., Weber, E. U., . . . Howard, G. S. (2011). Psychology's Contributions to Understanding and Addressing Global Climate Change. *American Psychologist, 66*(4), 241-250.
- Teh, L. S. L., Teh, L. C. L., & Sumaila, U. R. (2013). A Global Estimate of the Number of Coral Reef Fishers. *Plos One, 8*(6), e65397.
- Thrash, T. M., & Elliot, A. J. (2003). Inspiration as a psychological construct. *Journal of Personality and Social Psychology, 84*(4), 871-889.
- Tilden, F. (1957). *Interpreting our heritage*. Chapel Hill, North Carolina: University of North Carolina Press.
- Tjas, K., Nelsen, E. A., & Taylor, M. (1997). Successful alumni as role models for high school youth. *High School Journal, 80*, 103-110.
- Tobin, R., Bohensky, E., Curnock, M., Goldberg, J., Gillet, S., Gooch, M., . . . Stone-Jovicich, S. (2014a). The Social and Economic Long Term Monitoring Program (SELTMP) 2013: Commercial Fishing in the Great Barrier Reef. Report to the National Environmental Research Program. (pp. 73). Cairns: Reef and Rainforest Research Centre Limited.
- Tobin, R., Bohensky, E., Curnock, M., Goldberg, J., Gillet, S., Gooch, M., . . . Stone-Jovicich, S. (2014b). The Social and Economic Long Term Monitoring Program (SELTMP) 2013: Recreation in the Great Barrier Reef. Report to the National Environmental Research Program. (pp. 77). Cairns: Reef and Rainforest Research Centre Limited.
- Tompkins, E. L., & Adger, W. (2004). Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society, 9*(2), 10.
- Tubb, K. N. (2003). An evaluation of the effectiveness of interpretation within Dartmoor National Park in reaching the goals of sustainable tourism development. *Journal of Sustainable Tourism, 11*(6), 476-498.
- United Nations Educational, S. C. O. U. (1972). Convention concerning the protection of the world cultural and natural heritage *Report No. WHC-2001/WS/2*. Paris, France.
- Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences, 15*(3), 398-405.
- Vallerand, R. J., Pelletier, L. G., Deshaies, P., Cuerrier, J. P., & Mongeau, C. (1992). Ajzen and Fishbein Theory of Reasoned Action as Applied to Moral Behavior - a Confirmatory Analysis. *Journal of Personality and Social Psychology, 62*(1), 98-109.
- Van Der Linden, S. (2015). Intrinsic motivation and pro-environmental behaviour. *Nature Climate Change, 5*(7), 612-613.
- Van Der Wal, J., Murphy, H. T., Kutt, A. S., Perkins, G. C., Bateman, B. L., Perry, J. J., & Reside, A. E. (2013). Focus on poleward shifts in species' distribution underestimates the fingerprint of climate change. *Nature Climate Change, 3*(3), 239-243.
- Van Dijk, P., & Weiler, B. (2009). An assessment of the outcomes of a Chinese-language interpretive tour experience at a heritage tourism attraction. *Tourism Analysis, 14*(1), 49-63.
- van Riper, C. J., Kyle, G. T., Sutton, S. G., Barnes, M., & Sherrouse, B. C. (2012a). Mapping outdoor recreationists' perceived social values for ecosystem services at Hinchinbrook Island National Park, Australia. *Applied Geography, 35*(1-2), 164-173.
- van Riper, C. J., Kyle, G. T., Sutton, S. G., Yoon, J. I., & Tobin, R. C. (2012b). Australian residents' attitudes toward pro-environmental behaviour and climate change impacts on the Great Barrier Reef. *Journal of Environmental Planning and Management, iFirst article*, 1-18.

- van Riper, C. J., Kyle, G. T., Sutton, S. G., Yoon, J. I., & Tobin, R. C. (2013). Australian residents' attitudes toward pro-environmental behaviour and climate change impacts on the Great Barrier Reef. *Journal of Environmental Planning and Management*, *56*(4), 494-511.
- Vaske, J. J., & Kobrin, K. C. (2001). Place Attachment and Environmentally Responsible Behavior. *The Journal of Environmental Education*, *32*(4), 16-21.
- Viseu, A. (2015). Integration of social science into research is crucial. *Nature*, *525*(7569), 291-291.
- Vorosmarty, C. J., McIntyre, P. B., Gessner, M. O., Dudgeon, D., Prusevich, A., Green, P., . . . Davies, P. M. (2010). Global threats to human water security and river biodiversity. *Nature*, *467*(7315), 555-561.
- Wandersman, A. H., & Hallman, W. K. (1993). Are people acting irrationally? Understanding public concerns about environmental threats. *American Psychologist*, *48*(6), 681-686.
- Ward, S., & van Vuuren, K. (2013). Belonging to the Rainbow Region: Place, Local Media, and the Construction of Civil and Moral Identities Strategic to Climate Change Adaptability. *Environmental Communication Journal of Nature and Culture*, *7*(1), 63-79.
- Weber, E. P. (2000). A new vanguard for the environment: Grass-roots ecosystem management as a new environmental movement. *Society & Natural Resources*, *13*(3), 237-259.
- Weber, E. U., & Stern, P. C. (2011). Public Understanding of Climate Change in the United States. *American Psychologist*, *66*(4), 315-328.
- Weijters, B., Cabooter, E., & Schillewaert, N. (2010). The effect of rating scale format on response styles: The number of response categories and response category labels. *International Journal of Research in Marketing*, *27*(3), 236-247.
- Weinstein, N. D. (1989). Effects of personal experience on self-protective behavior. *Psychological Bulletin*, *105*(1), 31-50.
- Welsh, M. (2014). Resilience and responsibility: governing uncertainty in a complex world. *Geographical Journal*, *180*(1), 15-26.
- Whitmarsh, L. (2008). Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. *Journal of Risk Research*, *11*(3), 351-374.
- Whitmarsh, L. (2011). Scepticism and uncertainty about climate change: Dimensions, determinants and change over time. *Global Environmental Change-Human and Policy Dimensions*, *21*(2), 690-700.
- Whitmarsh, L., & Lorenzoni, I. (2010). Perceptions, behavior and communication of climate change. *Wiley Interdisciplinary Reviews-Climate Change*, *1*(2), 158-161.
- Whitmarsh, L., O'Neill, S., & Lorenzoni, I. (2011). Climate change or social change? Debate within, amongst, and beyond disciplines. *Environment and Planning A*, *43*(2), 258-261.
- Wilkinson, C., & Salvat, B. (2012). Coastal resource degradation in the tropics: Does the tragedy of the commons apply for coral reefs, mangrove forests and seagrass beds. *Marine Pollution Bulletin*, *64*(6), 1096-1105.
- Wilkinson, C. R. (1999). Global and local threats to coral reef functioning and existence: review and predictions. *Marine and Freshwater Research*, *50*(8), 867-878.
- Wolf, J., Brown, K., & Conway, D. (2009). Ecological citizenship and climate change: perceptions and practice. *Environmental Politics*, *18*(4), 503-521.
- Wynveen, C. J., & Kyle, G. T. (2015). A Place Meaning Scale for Tropical Marine Settings. *Environmental Management*, *55*(1), 128-142.
- Wynveen, C. J., Kyle, G. T., & Sutton, S. G. (2010). Place Meanings Ascribed to Marine Settings: The Case of the Great Barrier Reef Marine Park. *Leisure Sciences*, *32*(3), 270-287.
- Wynveen, C. J., Kyle, G. T., & Sutton, S. G. (2012). Natural area visitors' place meaning and place attachment ascribed to a marine setting. *Journal of Environmental Psychology*, *32*(4), 287-296.
- Wynveen, C. J., Kyle, G. T., & Sutton, S. G. (2014). Environmental Worldview, Place Attachment, and Awareness of Environmental Impacts in a Marine Environment. *Environment and Behavior*, *46*(8), 993-1017.

- Wynveen, C. J., & Sutton, S. G. (2015). Engaging the public in climate change-related pro-environmental behaviors to protect coral reefs: The role of public trust in the management agency. *Marine Policy, 53*, 131-140.
- Wynveen, C. J., Wynveen, B. J., & Sutton, S. G. (2015). Applying the Value-Belief-Norm Theory to Marine Contexts: Implications for Encouraging Pro-Environmental Behavior. *Coastal Management, 43*(1), 84-103.
- Xiao, C., & McCright, A. M. (2013). Gender Differences in Environmental Concern: Revisiting the Institutional Trust Hypothesis in the USA. *Environment and Behavior, 47*(1), 17-37.
- Xiao, H., & Smith, S. L. J. (2006). Case studies in tourism research: A state-of-the-art analysis. *Tourism Management, 27*(5), 738-749.
- Xu, H., Cui, Q., Ballantyne, R., & Packer, J. (2013). Effective environmental interpretation at Chinese natural attractions: the need for an aesthetic approach. *Journal of Sustainable Tourism, 21*(1), 117-133.
- Young, J., & Mar, R. (2010). Community perceptions of climate change and the effects on the Great Barrier Reef (pp. 165): Colmar Brunton.
- Young, J., & Temperton, J. (2008). *Measuring community attitudes and awareness towards the Great Barrier Reef: 2007*. Townsville, Queensland: Great Barrier Reef Marine Park Authority.
- Zelezny, L. C., Chua, P.-P., & Aldrich, C. (2000). New Ways of Thinking about Environmentalism: Elaborating on Gender Differences in Environmentalism. *Journal of Social Issues, 56*(3), 443-457.
- Zeppel, H. (2012a). Climate change and tourism in the Great Barrier Reef Marine Park. *Current Issues in Tourism, 15*(3), 287-292.
- Zeppel, H. (2012b). Collaborative governance for low-carbon tourism: climate change initiatives by Australian tourism agencies. *Current Issues in Tourism, 15*(7), 603-626.
- Zeppel, H., & Beaumont, N. (2013). Climate Change and Sustainable Tourism: Carbon Mitigation by Environmentally Certified Tourism Enterprises. *Tourism Review International, 3*, 161-177.
- Zylstra, M. J., Knight, A. T., Esler, K. J., & Le Grange, L. L. (2014). Connectedness as a core conservation concern: An interdisciplinary review of theory and a call for practice. *Springer Science Reviews, 2*(1-2), 119-143.

## APPENDIX 1: NATIONAL SURVEY OF AUSTRALIANS

<b>Project Green Pulse</b>	<b>QUESTIONNAIRE</b>
<b>Design</b>	<b>15 minute questionnaire</b>
<b>Sample size</b>	<b>N=1000</b>
<b>Sample</b>	<b>National representative (Age 14-64), gender, location, metro regional.</b>

### INTRODUCTION

We are conducting a survey about people’s attitudes and behaviours related to several prominent social and environmental issues within Australia. Specifically, we are interested to learn more about individual and regional perceptions, and how these may correspond to behaviours and decision-making processes. The information obtained from this survey will improve our understanding of how people and communities may respond to future changes in economic, societal or environmental conditions. In addition, anonymous data collected from this survey may be shared with other research organisations (e.g. universities, government institutions, etc.) for the purposes of clarifying and better understanding the survey findings and may eventually be used to inform local and regional policy development processes.

This survey will take you 15 minutes to complete. We hope you find the subject matter interesting and the responses you provide are well considered and an honest representation of your current behaviour and attitudes.

Click the “Next” button below to begin.

<b>GBR1</b>	Below is a list of places in Australia that people have said are inspiring. Please rank the following in terms of how inspiring they are to you.						
	<b>RANDOMISE ORDER OF DESTINATIONS</b>						
<b>SR PER ROW</b>		<b>Most inspiring</b>	<b>Second most inspiring</b>	<b>Third most inspiring</b>	<b>Inspiring, but not in my top 3</b>	<b>Not inspiring</b>	<b>Don't know</b>
	Uluru	1	2	3	4	5	99
	Bondi Beach	1	2	3	4	5	99
	Sydney Opera House	1	2	3	4	5	99
	Melbourne Cricket Ground	1	2	3	4	5	99

The Kimberley Region	1	2	3	4	5	99
Great Barrier Reef	1	2	3	4	5	99
Outback Australia	1	2	3	4	5	99
Blue Mountains	1	2	3	4	5	99
Great Ocean Road	1	2	3	4	5	99
Margaret River	1	2	3	4	5	99
The Gold Coast	1	2	3	4	5	99
Kakadu	1	2	3	4	5	99

<b>GBR2</b>	Please list the first words that come to mind when you think of the Great Barrier Reef. You can add as many words as you like.
<b>OE</b>	

<b>GBR3</b>	Which of the following statements best applies to you?	
<b>SR</b>	I have visited the Great Barrier Reef in the last 12 months	1
	I have visited the Great Barrier Reef, but not recently – it was more than 12 months ago	2
	I have never visited the Great Barrier Reef, but I would like to at some stage	3
	I have never visited the Great Barrier Reef, and don't intend to	4

<b>GBR4</b>	What do you think are the three most serious threats to the Great Barrier Reef? If you don't know, please type "don't know".	
<b>OE</b>	<b>Most serious threat:</b>	
	<b>Next most serious threat:</b>	
	<b>Third most serious threat:</b>	



<b>GBRS</b>	Using the scale below, from 1-10, where 1 = “Not at all threatening” and 10 = “Extremely threatening”, please indicate how threatening you think each of the following is to the Great Barrier Reef. If you don’t know, please tick “Don’t know”. <b>RANDOMISE ORDER OF STATEMENTS</b>											
<b>SR PER ROW</b>		1 – Not at all threatening	2	3	4	5	6	7	8	9	10 – Extremely threatening	Don’t know
	Land-based mining	1	2	3	4	5	6	7	8	9	10	99
	Cyclones and tropical storms	1	2	3	4	5	6	7	8	9	10	99
	Floods	1	2	3	4	5	6	7	8	9	10	99
	Coastal development (i.e. increased buildings and people living along the coastline)	1	2	3	4	5	6	7	8	9	10	99
	Tourism activities (e.g. SCUBA diving, snorkelling, etc.)	1	2	3	4	5	6	7	8	9	10	99
	Crown of Thorns Starfish	1	2	3	4	5	6	7	8	9	10	99
	New shipping ports and port expansions	1	2	3	4	5	6	7	8	9	10	99
	Marine debris and beach littering (e.g. rubbish, discarded fishing gear, etc.)	1	2	3	4	5	6	7	8	9	10	99
	Commercial fishing	1	2	3	4	5	6	7	8	9	10	99
	Recreational fishing	1	2	3	4	5	6	7	8	9	10	99
	Climate change (i.e. leading to increased ocean temperatures, coral bleaching etc.)	1	2	3	4	5	6	7	8	9	10	99
	Shipping (i.e. very large cargo container type ships)	1	2	3	4	5	6	7	8	9	10	99
	Agricultural run-off (i.e. pesticides and fertilisers)	1	2	3	4	5	6	7	8	9	10	99

<b>GBR6</b>	Please indicate how strongly you agree or disagree with each of the following, on the 10-point scale below, where 1=very strongly disagree and 10=very strongly agree  <b>RANDOMISE ORDER OF STATEMENTS</b>											
<b>SR PER ROW</b>		1 – very strongly disagree	2 - strongly disagree	3 - disagree	4 - slightly disagree	5 - very slightly disagree	6 - very slightly agree	7 - slightly agree	8 - agree	9 - strongly agree	10 – very strongly agree	Don't know
	I feel optimistic about the future of the Great Barrier Reef	1	2	3	4	5	6	7	8	9	10	99
	I would not be personally affected if the health of the Great Barrier Reef declined	1	2	3	4	5	6	7	8	9	10	99
	The Great Barrier Reef is part of my Australian identity	1	2	3	4	5	6	7	8	9	10	99
	I am concerned about the impacts of climate change on the Great Barrier Reef	1	2	3	4	5	6	7	8	9	10	99
	It is not my responsibility to protect the Great Barrier Reef	1	2	3	4	5	6	7	8	9	10	99
	I feel proud that the Great Barrier Reef is a world Heritage Area	1	2	3	4	5	6	7	8	9	10	99
	It is the responsibly of all Australians to protect the Great Barrier Reef	1	2	3	4	5	6	7	8	9	10	99
	I feel confident that the Great Barrier Reef is well managed	1	2	3	4	5	6	7	8	9	10	99

**SELTMP Template Survey**

**Resident Survey**

<b>Researcher use:</b>	Date: _____
Location: _____	

**PREAMBLE / INTRODUCTION**

We are conducting research on the Great Barrier Reef, if and how people use it, and people’s relationship with it. We would like to ask you some questions that will help future management of the Great Barrier Reef.

The research is being conducted by CSIRO and James Cook University as part of a SOCIAL AND ECONOMIC LONG TERM MONITORING PROGRAM.

Would you mind if we were to talk with you for 15 minutes?

Of course, your answers are confidential, and you do not need to answer every question! I can also give you details of how to access the research results when they are out, if you like (*DISTRIBUTE HANDOUT*).

**1. What are the first words that come to mind when you think of the Great Barrier Reef?**

*Please list as many words as you like:*

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**Section A.** In this section, we would like to know how you use the Great Barrier Reef. *When we refer to “the Great Barrier Reef”, this includes all land and water from the beaches on the coast, the bays and creeks, the islands, the shoals and seafloor, the open waters, and of course the coral reefs.*

**2. Have you ever visited the Great Barrier Reef?** (including all land and water from the beaches on the coast, the bays and creeks, the islands, the shoals and seafloor, the open waters, and of course the coral reefs)

*Please tick one box:*  Yes  No – if no, please go to Q.4.

**3. In the previous 12 months, how many days did you visit the Great Barrier Reef for recreation?**

*(Please tick one box):*

- |  |   |
|--|---|
| <input type="checkbox"/> 0 days ( <i>if 0, please go to Q.4</i> )        | <input type="checkbox"/> 1-2 days ( <i>once or twice a year</i> )   |
| <input type="checkbox"/> 3-6 days ( <i>every few months</i> )            | <input type="checkbox"/> 7-12 days ( <i>approximately monthly</i> ) |
| <input type="checkbox"/> 13-24 days ( <i>approximately fortnightly</i> ) | <input type="checkbox"/> 25-52 days ( <i>approximately weekly</i> ) |
| <input type="checkbox"/> 53-100 days ( <i>several times a week</i> )     | <input type="checkbox"/> more than 100 days ( <i>almost daily</i> ) |

**4. a) Do you own a jet ski/personal jet water craft?  No  Yes**

*If yes, how often did you use it in the last 12 months? (Please tick ONE)*

- |                                       |   |   |                                      |
|---------------------------------------|---|---|--------------------------------------|
| <input type="checkbox"/> Almost daily | <input type="checkbox"/> Several times a week | <input type="checkbox"/> Weekly               | <input type="checkbox"/> Fortnightly |
| <input type="checkbox"/> Monthly      | <input type="checkbox"/> Every few months     | <input type="checkbox"/> Once or twice a year | <input type="checkbox"/> Not at all  |

b) Do you own a sailing boat?     No     Yes

*If yes*, how often did you use it in the last 12 months? (Please tick one box)

- Almost daily                       Several times a week                       Weekly                       Fortnightly  
 Monthly                       Every few months                       Once or twice a year                       Not at all

*If yes*, how long is this vessel? \_\_\_\_\_ (please circle one: **metres** or **feet**)

c) Do you own a registered motor boat?     No     Yes

*If yes*, how often did you use it in the last 12 months? (Please circle **ONE**)

- Almost daily                       Several times a week                       Weekly                       Fortnightly  
 Monthly                       Every few months                       Once or twice a year                       Not at all

*If yes*, how long is this vessel? \_\_\_\_\_ (please circle one: **metres** or **feet**)

**Thinking about your most recent trip to the Great Barrier Reef (remembering that it includes the beach, islands and inshore areas as well as the reef itself...)**

**5. ... on this trip:**

a) Where did you visit? (Please mark on the map below (label with "recent"), and tell us the name of this place): \_\_\_\_\_

b) What were your main activities that you did during this visit?

\_\_\_\_\_  
\_\_\_\_\_

c) Was this trip to a mainland beach?  Yes (please go to 7d)     No (please go to 7f)

d) Have you been on any trips BEYOND the beach in the past 12 months? (E.g. to an island and/or coral reef)                       Yes (please go to 6e)     No (please go to Q8)

e) Where was your most recent trip beyond the beach? (Please mark on the map above (label with "recent"), and tell us the name of this place):

\_\_\_\_\_

f) How did you get there (e.g. ferry, commercial tour, own boat)? \_\_\_\_\_

g) Where was your point of departure (i.e. which township/city on the mainland)?

\_\_\_\_\_

h) What were your main activities on this particular visit?

\_\_\_\_\_  
\_\_\_\_\_

**6. How long was this trip to the Great Barrier Reef?** (For your most recent trip beyond the beach, if applicable)

- ½ day or less     Full day     Overnight     2 to 3 nights     4 nights or more

**7. How many other people went with you in your group?** (For your most recent trip beyond the beach, if applicable)

- 0 (travelled alone)     1 other person     2 to 5 others     6 to 10     more than 10

**8. How satisfied were you overall with your experience?** (For your most recent trip beyond the beach, if applicable)

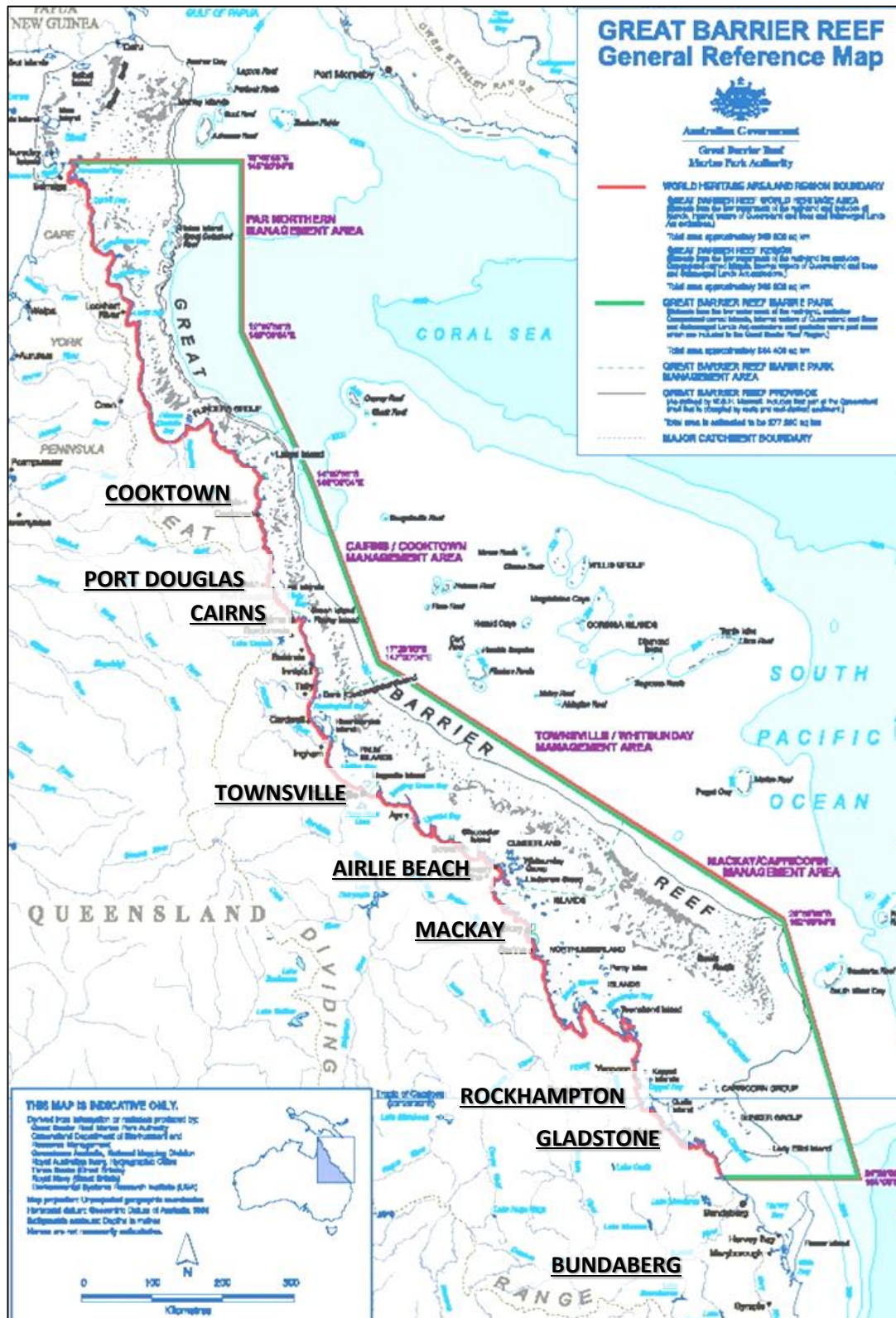
Please circle one number:

Extremely Dissatisfied    1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7 - - - - 8 - - - - 9 - - - - 10    Extremely Satisfied

9. What had the greatest influence on your satisfaction / dissatisfaction?

10. Thinking about the entire Great Barrier Reef area, please mark the location of your favourite place on the map below (Please mark with a dot and/or use an arrow to point to it. Label as "favourite"):

10a) What is the **name** of this favourite place? \_\_\_\_\_



**Section B.** In the following section we would like to know a bit more about your relationship with the Great Barrier Reef region.

**Please read through the following statements, and then rate your level of agreement or disagreement with each statement, by circling a number on the 10-point scale below.**

(where 1 = Very Strongly Disagree, and 10 = Very Strongly Agree)

Statement: (GBR = Great Barrier Reef)	Very Strongly DISAGREE	Very Strongly AGREE
	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
11. There are many other places that are better than the GBR for the recreation activities I enjoy	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
12. I feel proud that the GBR is a World Heritage Area	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
13. The GBR is part of my identity	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
14. I live here because of the GBR	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
15. I do <u>not</u> plan to be a resident of this region in the next five years	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
16. I am <u>not</u> likely to remain living in this region if events such as cyclones and floods occur more frequently	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
17. I value the GBR because it supports a variety of life, such as fish and corals	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
18. I value the GBR because it supports a desirable and active way of life	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
19. I value the GBR because we can learn about the environment through scientific discoveries	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
20. I value the GBR because it attracts people from all over the world	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
21. The GBR is a great asset for the economy of this region	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
22. I value the GBR for the fresh seafood it provides	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
23. The GBR contributes to my quality of life and well-being	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
24. The aesthetic beauty of the GBR is outstanding	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
25. The place that I most recently visited in the GBR is <u>not</u> in great condition	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10
26. I feel optimistic about the future of the GBR	1 --- 2 --- 3 --- 4 --- 5	6 --- 7 --- 8 --- 9 --- 10

27. What do you think are the three (3) most serious threats to the Great Barrier Reef?

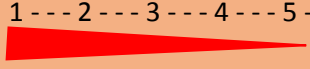

i. \_\_\_\_\_

ii. \_\_\_\_\_

iii. \_\_\_\_\_

Again, please read through the following statements, and then rate your level of agreement or disagreement with each statement, by circling a number on the 10-point scale below.

(where 1 = Very Strongly Disagree, and 10 = Very Strongly Agree)

Statement: (GBR = Great Barrier Reef)	Very Strongly <u>DISAGREE</u>	Very Strongly <u>AGREE</u>
	1 --- 2 --- 3 --- 4 --- 5 - 	- 6 --- 7 --- 8 --- 9 --- 10 
28. I feel confident that the GBR is well managed	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
29. I support the current rules and regulations that affect access and use of the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
30. I do <u>not</u> have fair access to the GBR compared to other user groups	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
31. I would like to do more to help protect the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
32. I would <u>not</u> be personally affected if the health of the GBR declined	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
33. I would like to learn more about the condition of the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
34. I <u>cannot</u> make a personal difference in improving the health of the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
35. I try to encourage other people to reduce their impacts on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
36. It is <u>not</u> my responsibility to protect the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
37. Coastal residents should take steps to reduce their impacts on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
38. It is the responsibility of all Australians to protect the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
39. I have the necessary knowledge and skills to reduce any impact that I might have on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
40. I do not have the time and opportunity required to reduce any impact that I might have on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
41. It is too expensive for me to reduce any impact I might have on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10

**Section C.** In this section we would like to know a little more about you.

42. a) In what year were you born? 19\_\_\_\_\_

b) In what country were you born? \_\_\_\_\_

c) What is your current home postcode? \_\_\_\_\_

d) For how many years have you lived in the Great Barrier Reef region?

(i.e. all coastal areas between Cape York and Bundaberg) \_\_\_\_\_ (years)

e) Do you identify as an Indigenous Australian?  No  Yes

or a Torres Strait islander?  No  Yes

Are you a “Fly-In-Fly-Out” worker?  No  Yes

**43. a) To what extent does the Great Barrier Reef contribute to your household income? (Please tick one)**

Not at all  Contributes a little  Contributes a lot  Contributes to all of my income

**b) From what industry do you obtain your main household income?**

**44. Could you please indicate (approximately) the total pre-tax income for your household?**

(Please tick one box)

- \$1 to \$20,000  \$60,001 to \$100,000  \$200,001 to \$300,000  
 \$20,001 to \$60,000  \$100,001 to \$200,000  more than \$300,000

**45. What is your gender? (please tick one):**  Female  Male

**46. How often do you do the following? (Please tick one box for each item)**

Recycle: .....  Never  Sometimes  Often  Always

Bring your own bags to the supermarket .  Never  Sometimes  Often  Always

Engage in environmental community programs  Never  Sometimes  Often  Always

**47. a) Do you have solar power in your home?**  No  Yes  N/A (e.g. don't own home)

**b) Do you own a hybrid / electric vehicle?**  No  Yes  N/A (e.g. don't own car)

**48. Which of the following statements best describes your beliefs about climate change?**

- a.  Climate change is an **immediate** threat requiring action.
- b.  Climate change is a **serious threat**, but the impacts are too distant for immediate concern.
- c.  I **need more evidence** to be convinced of the problem
- d.  I believe that climate change is **not a threat** at all
- e.  I **do not have a view** on climate change

49. On a scale of 1-10, how much do you trust the information you receive about the GBR from the following groups?	Do not trust at all	Trust Very strongly
Friends, and family, and/or work colleagues.....	1-- 2 --- 3 --- 4 --- 5 --- 6 --- 7 -- 8 -- 9 --- 10	
Government managers (e.g. GBRMPA, Fisheries Qld) .....	1-- 2 --- 3 --- 4 --- 5 --- 6 --- 7 -- 8 -- 9 --- 10	
Research institutions (e.g. CSIRO, Universities) .....	1-- 2 --- 3 --- 4 --- 5 --- 6 --- 7 -- 8 -- 9 --- 10	
Industry Groups/representatives (e.g. from tourism, fisheries) ....	1-- 2 --- 3 --- 4 --- 5 --- 6 --- 7 -- 8 -- 9 --- 10	
Non-Government Organisations/other community groups (e.g. NRM regional bodies) .....	1-- 2 --- 3 --- 4 --- 5 --- 6 --- 7 -- 8 -- 9 --- 10	
Media (i.e. radio, newspapers, TV) .....	1-- 2 --- 3 --- 4 --- 5 --- 6 --- 7 -- 8 -- 9 --- 10	
Social media (e.g. Facebook, Twitter) .....	1-- 2 --- 3 --- 4 --- 5 --- 6 --- 7 -- 8 -- 9 --- 10	

*Thank you for your support for this research!*



**SELTMP Template Survey**

**Tourists – *in-person survey (iPad, paper)***

**Researcher use:**

Date: \_\_\_\_\_

Location: \_\_\_\_\_

ID if entered: \_\_\_\_\_

**Survey Prompt:** Hi there! Are you a visitor to the GBR region?

(if yes – to tourist survey. If not – to resident survey)

**PREAMBLE / INTRODUCTION**

We are conducting research on the Great Barrier Reef, if and how people use it, and people’s relationship with it. We would like to ask you some questions that will help future management of the Great Barrier Reef.

The research is being conducted by CSIRO and James Cook University as part of a SOCIAL AND ECONOMIC LONG TERM MONITORING PROGRAM.

Would you mind if we were to talk with you for 15 minutes?

Of course, your answers are confidential, and you do not need to answer every question! I can also give you details of how to access the research results when they are out, if you like (*DISTRIBUTE HANDOUT*).

**1. What are the first words that come to mind when you think of the Great Barrier Reef?**

- Please list as many words as you like:

\_\_\_\_\_

\_\_\_\_\_

**Section A.** In this section, we would like to know how you use the Great Barrier Reef. *When we refer to “the Great Barrier Reef”, this includes all land and water from the beaches on the coast, the bays and creeks, the islands, the shoals and seafloor, the open waters, and of course the coral reefs.*

**2. Have you visited the Great Barrier Reef during this current visit to the region?** (including all land and water from the beaches on the coast, the bays and creeks, the islands, the shoals and seafloor, the open waters, and of course the coral reefs)

Please tick one box:  Yes  No – if no, please go to Q.8.

**3. Considering your most recent trip to the Great Barrier Reef:**

a. Where did you visit? (Please mark on the map below, and tell us the name of this place):

\_\_\_\_\_

b. Did you pay to go on an organised tour on this trip?  Yes  No

- c. What were your main activities that you did during this visit?  
\_\_\_\_\_
- d. Was this trip to a mainland beach? **θ Yes** (please go to 3e) **θ No** (please go to 3g)
- e. Have you been on any trips **BEYOND** the beach in the past 12 months? (E.g. to an island and/or coral reef) **θ Yes** (please go to 3f) **θ No** (please go to Q4)
- f. Where was your most recent trip **beyond** the beach? (Please mark on the map above (label with "recent"), and tell us the name of this place):  
\_\_\_\_\_
- g. How did you get there (e.g. ferry, commercial tour, own boat)? \_\_\_\_\_
- h. Where was your point of departure (i.e. which township/city on the mainland)?  
\_\_\_\_\_
- i. What were your main activities on this particular visit?  
\_\_\_\_\_

**4. How long was this trip to the Great Barrier Reef?** (i.e. If you answered **NO** to Q3e, this is about your most recent trip to the beach. **BUT**, if you had a trip beyond the beach, please refer to that)

- ½ day or less     Full day     Overnight     2 to 3 nights     4 nights or more

**5. How many other people went with you in your group?** (Please tick one box)

- 0 (travelled alone)     1 other person     2 to 5 others     6 to 10     more than 10

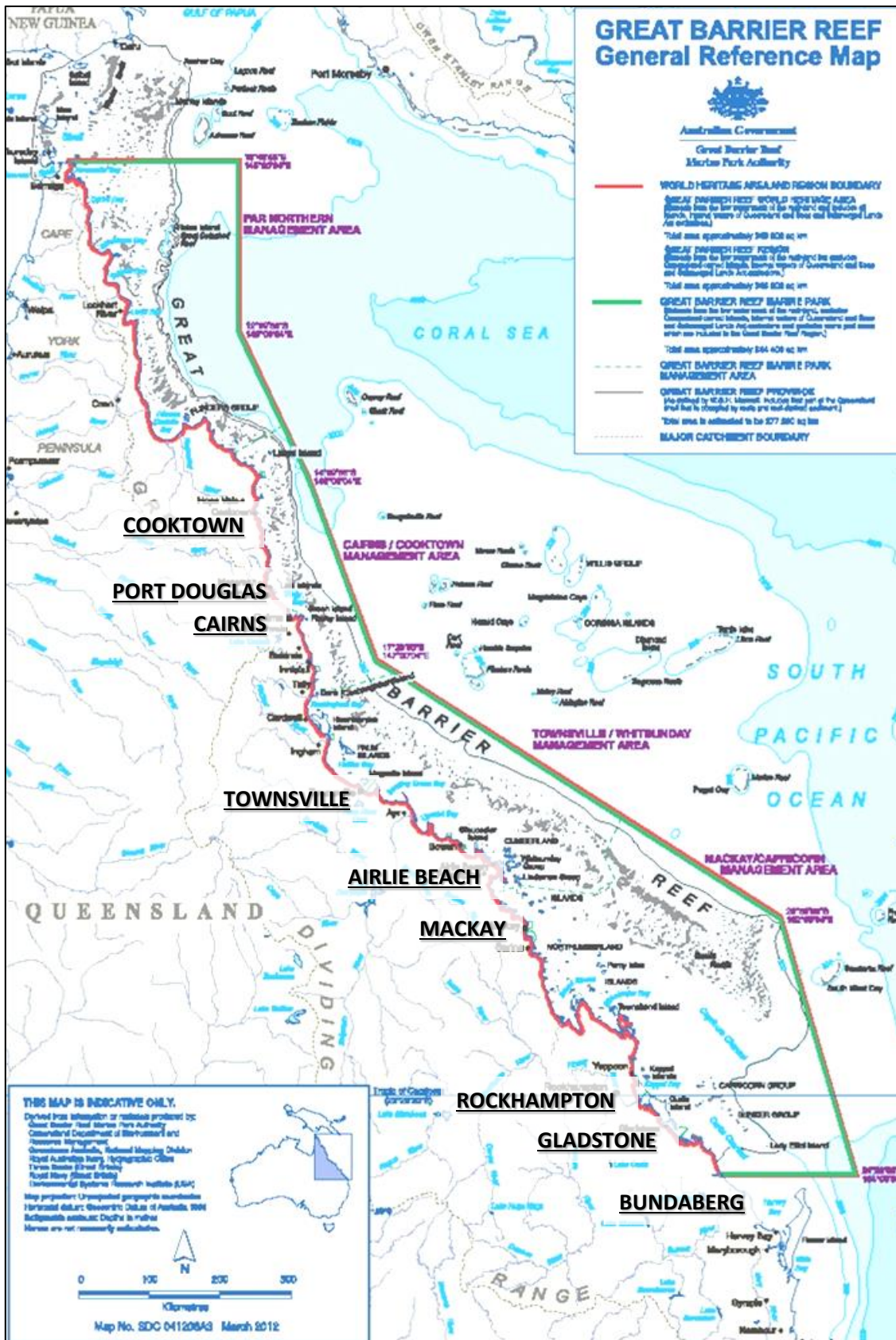
**6. How would you rate your overall satisfaction with this experience of the Great Barrier Reef?**

(Please circle one number)

Extremely  
Dissatisfied    1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7 ---- 8 ---- 9 ---- 10    Extremely  
Satisfied

**7. What had the greatest influence on your satisfaction / dissatisfaction?**  
\_\_\_\_\_

On the map below, please mark the location of the place you visited on your most recent trip to the Great Barrier Reef (Please mark with a dot and/or use an arrow to point to it):



### 8. Activities during this visit to the Great Barrier Reef (GBR) region:

From the following list, please indicate which activities you have done during this visit to the Great Barrier Reef region, and then rate the quality of each experience (on a scale of 1-10 where 1 = very low quality and 10 = very high quality)

Activity:	Tick ONLY if done during this visit	Very Low	Very High
		QUALITY	QUALITY
		1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Snorkelling	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
SCUBA diving	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Fishing, crabbing or spear-fishing	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Swimming	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Sailing	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Motorised boating	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Non-motorised watersports (e.g. Kayaking, kite surfing, paddle boarding)	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Motorised watersports (e.g. jet-skiing, waterskiing, parasailing)	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Sightseeing / photography	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Wildlife watching	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Camping / hiking	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Flights (helicopter / seaplane)	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10
Eating seafood from the GBR	<input type="checkbox"/>	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10

**Section B.** In the following section we would like to know a bit more about your relationship with the Great Barrier Reef region and perceptions of the Great Barrier Reef.

**Please read through the following statements, and then rate your level of agreement or disagreement with each statement, by circling a number on the 10-point scale below.**

(where 1 = Very Strongly Disagree, and 10 = Very Strongly Agree)

Statement: (GBR = Great Barrier Reef)	Very Strongly DISAGREE	Very Strongly AGREE
	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
9. It means a lot to me that I have been to the GBR.....	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
10. The GBR was an important part of my decision to visit this region	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
11. There are many other places that are better than the GBR for the recreation activities I enjoy	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
12. I feel proud that the GBR is a World Heritage Area	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
13. The GBR is part of my identity	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
14. I value the GBR because it supports a variety of life, such as fish and corals	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
15. I value the GBR because it supports a desirable and active way of life	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
Statement: (GBR = Great Barrier Reef)	Very Strongly DISAGREE	Very Strongly AGREE
	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10

16. I value the GBR because we can learn about the environment through scientific discoveries	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
17. I value the GBR because it attracts people from all over the world	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
18. I value the GBR for the fresh seafood it provides	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
19. The aesthetic beauty of the GBR is outstanding	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
20. The place that I most recently visited in the GBR is <u>not</u> in great condition	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
21. I feel optimistic about the future of the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
22. I would like to do more to help protect the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
23. I would <u>not</u> be personally affected if the health of the GBR declined	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
24. I would like to learn more about the condition of the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
25. I <u>cannot</u> make a personal difference in improving the health of the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
26. I try to encourage other people to reduce their impacts on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
27. It is <u>not</u> my responsibility to protect the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
28. Tourism operators should take steps to reduce their impacts on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
29. It is the responsibility of all Australians to protect the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
30. I have the necessary knowledge and skills to reduce any impact that I might have on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
31. I do not have the time and opportunity required to reduce any impact that I might have on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10
32. It is too expensive for me to reduce any impact I might have on the GBR	1 --- 2 --- 3 --- 4 --- 5 -	- 6 --- 7 --- 8 --- 9 --- 10

**33. What do you think are the three (3) most serious threats to the Great Barrier Reef?**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**Section C.** In this section we would like to know a little more about you.

**34. Where do you normally live? (please give postcode if within Australia)**

**35. For how many days will you be in the Great Barrier Reef region (including the coastal towns) during this visit? \_\_\_\_\_ (days)**

**36. What was the main reason you travelled to the Great Barrier Reef region?**

**37. Are you a backpacker?  Yes  No**

**38. What is your main mode of transport during this visit to the region?**

**39. Is this your first visit to the Great Barrier Reef region?  No  Yes**

**40. After this visit, do you think you will ever return to the Great Barrier Reef region?**

Yes  No

Please give a brief explanation why:

---

41. In what year were you born? \_\_\_\_\_

42. What is your gender? (please tick one box):  Female  Male

43. Do you identify as an Indigenous Australian?  No  Yes  
 or a Torres Strait islander?  No  Yes

44. How often do you do the following? (Please tick one box for each item)

Recycle: .....  Never  Sometimes  Often  Always

Prioritise environmentally friendly products at shopping.  Never  Sometimes  Often  Always

Purchase carbon offsets to counter emissions .....  Never  Sometimes  Often  Always

Choose accommodation based on 'green' credentials .....  Never  Sometimes  Often  Always

Choose a tour operator based on 'green' credentials .....  Never  Sometimes  Often  Always

45. Which of the following statements best describes your beliefs about climate change?

(Please tick one box)

- Climate change is an immediate threat requiring action.
- Climate change is a serious threat, but the impacts are too distant for immediate concern.
- I need more evidence to be convinced of the problem
- I believe that climate change is not a threat at all
- I do not have a view on climate change

46. On a scale of 1-10, how much do you trust the information you receive about the GBR from the following groups? (1 = Do not trust at all; 10 = Trust very strongly; please circle one number for each group)

Group:	Do not trust at all	Trust Very strongly
Friends, and family, and/or work colleagues.....	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Tourist information centre .....	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Travel agents .....	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Media (i.e. radio, newspapers, TV) .....	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Social media (e.g. Facebook, Twitter) .....	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Clubs / societies / interest groups .....	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Tourism operators .....	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	

47. Are there any comments you would like to make about this survey?

---



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**THANK YOU FOR YOUR HELP WITH THIS RESEARCH!**

## APPENDIX 4: TOURISM OPERATOR SURVEY

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**1. What are the first words that come to mind when you think of the Great Barrier Reef?**

*Please list as many words as you like:*

---

---

**2. What is your role in the company?**     Owner & Mgr     Manager     Other: \_\_\_\_\_

**3. How long have you been involved in the GBR tourism industry?**    (*Total number of years*)

---

**4. How long has your current business been operating?**    (*Total number of years*)

---

**5. What are the primary types of tourism activity that your company offers?**

*(Please choose as many as relevant)*

- Island resort     Ferry     Aircraft / heli tours/charter     Bareboat CHARTER  
 Reef Day trips: SCUBA ONLY     Reef Day trips: SNORKEL ONLY     Reef Day trips: MULTIPLE activities  
 Reef/Island Day trips: CRUISE     Live-aboard: Dive / Snorkel     Live-aboard: Cruise ship  
 Reef/offshore: CHARTER FISHING     Reef/offshore: Multi-purpose CHARTER  
 Inshore/River day trips: CRUISE     Inshore/River trips: CHARTER FISHING  
 Water sport (activity or hire)     Other equipment rental     Guided/specialist tour  
 Other specialist services     Other: *please list below*:

---

**6. Which tourism activity contributes MOST to the total income for your business?**

*(Please choose **one only**)*

- Island resort     Ferry     Aircraft / heli tours/charter     Bareboat CHARTER  
 Reef Day trips: SCUBA ONLY     Reef Day trips: SNORKEL ONLY     Reef Day trips: MULTIPLE activities  
 Reef/Island Day trips: CRUISE     Live-aboard: Dive / Snorkel     Live-aboard: Cruise ship  
 Reef/offshore: CHARTER FISHING     Reef/offshore: Multi-purpose CHARTER  
 Inshore/River day trips: CRUISE     Inshore/River trips: CHARTER FISHING  
 Water sport (activity or hire)     Other equipment rental     Guided/specialist tour  
 Other specialist services     Other: *please list below*:

---

**7. About how many days in the previous 12 months were you operating in the GBR?**

---

**8. Where is your home port? \_\_\_\_\_**

- **Do you use multiple ports?**  Yes  No

**9. (If relevant) How far, on average, do you travel from your home port?** (That is: do you typically operate very close to your home port or do you tend to roam across the region?)



**Please tick one:**

- Very local to home port (i.e. <50km)  Close to my home port (50-100km)  
 Roam quite some distance from home port (>100km)  Other: \_\_\_\_\_

---

**Please read through the following statements, and then rate your level of agreement or disagreement with each statement, by circling a number on the 10-point scale below.**

(where 1 = Very Strongly Disagree, and 10 = Very Strongly Agree)

Statement: (GBR = Great Barrier Reef)	Very Strongly DISAGREE	Very Strongly AGREE
	1 --- 2 --- 3 --- 4 --- 5 - 	- 6 --- 7 --- 8 --- 9 --- 10 
There are many other places that are better than the GBR for the tourism operations I do	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I feel proud that the GBR is a World Heritage Area	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
The GBR is part of my identity	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I wouldn't want to be anything other than a tourism operator	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
The tourism industry to me is not just a job – it is my lifestyle	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I plan to still be a tourism operator in 5 years time	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I live in this region because of the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I do <u>not</u> plan to be a resident of this region in five years time	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I am <u>not</u> likely to remain operating in this region if events such as cyclones and floods occur more frequently	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I value the GBR because it supports a variety of life, such as fish and corals	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I value the GBR because it supports a desirable and active way of life	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I value the GBR because we can learn about the environment through scientific discoveries	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I value the GBR because it attracts people from all over the world	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10



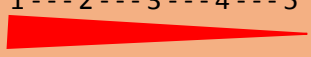

The GBR is a valuable asset for the economy of this region	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
The GBR contributes to my quality of life and well-being	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
The aesthetic beauty of the GBR is outstanding	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
The areas that my operation uses in the GBR are <u>not</u> in great condition	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I am optimistic about the future of the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10

What do you think are the three (3) most serious threats to the Great Barrier Reef?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**Again, please read through the following statements, and then rate your level of agreement or disagreement with each statement, by circling a number on the 10-point scale below.**

(where 1 = Very Strongly Disagree, and 10 = Very Strongly Agree)

Statement: (GBR = Great Barrier Reef)	Very Strongly <u>DISAGREE</u>	Very Strongly <u>AGREE</u>
	1 --- 2 --- 3 --- 4 --- 5 	- 6 --- 7 --- 8 --- 9 --- 10 
I feel confident that the GBR is well managed	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I support the current rules and regulations that affect access and use of the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I feel optimistic about the future of <i>my business</i> in the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
My business has not performed as well this year as it did last year	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I do <u>not</u> have fair access to the GBR compared to other user groups	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
Industry rules and regulations create too great a burden on my time	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I would like to do more to help protect the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I would <u>not</u> be personally affected if the health of the GBR declined	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I regularly get involved in research and/or management activities for the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I <u>cannot</u> make a personal difference in improving the health of the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I try to encourage other people to reduce their impacts on the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
It is <u>not</u> my responsibility to protect the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
Tourism operators should take steps to reduce impacts on the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
Industry expectations are that tourism operators should reduce impacts on the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
Tourists do NOT expect that tourism operators will take steps to reduce impacts on the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10

It is the responsibility of all Australians to protect the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I have the knowledge and skills to reduce any impact that my business might have on the GBR.	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I do not have the time and opportunity to reduce any impact that my business might have on the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
It is too expensive for me to reduce any impact I might have on the GBR	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I am confident things will turn out well FOR ME regardless of future events such as floods, cyclones or financial crises	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I am uncertain how to plan for changes in the GBR that may affect me, such as floods, cyclones or financial crises	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I am good at developing scenarios for the future and planning for them	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I discuss new ways of solving problems with others	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I am more likely to adapt to changes as a result of floods or cyclones compared to other coastal residents I know	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I have planned for my financial security	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10
I am interested in learning how to better prepare for significant events, such as the global financial crisis, cyclones and floods	1 --- 2 --- 3 --- 4 --- 5	- 6 --- 7 --- 8 --- 9 --- 10

Do you:

- Have fuel efficient engines?  Yes  No
- Use an emissions calculator to plan your business operations?  Yes  No
- Use carbon offsets to counter emissions?  Yes  No
- Use green energy, such as solar panels, for any part of your business?  Yes  No
- Use alternative fuels such as biodiesel and ethanol?  Yes  No
- Participate in industry best practices, via a code of practice or MOU?  Yes  No
- Participate in GBRMPA's Reef Guardian Program?  Yes  No
- Provide interpretation for tourists that promotes conservation or sustainable use of the GBR?  Yes  No
- Separate waste created by tourists for recycling?  Yes  No

Which one of the following statements best describes your beliefs about climate change?

(Please tick one box)

- Climate change is an **immediate** threat requiring action.
- Climate change is a **serious threat**, but the impacts are too distant for immediate concern.
- I **need more evidence** to be convinced of the problem
- I believe that climate change is **not a threat** at all
- I **do not have a view** on climate change

On a scale of 1-10, how much do you trust the information you receive about the GBR from the following groups?	Very Low Trust	Very high Trust
Friends, and family, and/or work colleagues	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
GBRMMPA	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Research institutions (e.g. CSIRO, Universities)	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Industry Groups/representatives (e.g. from AMPPTO, Dive QLD, WCBIA)	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Non-Government Organisations/other community groups (e.g. NRM regional bodies)	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Media (i.e. radio, newspapers, TV)	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Social media (e.g. Facebook, Twitter)	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	
Other tourism operators	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10	

**Section C.** In this section we would like to know a little more about you.

- a) In what year were you born? 19\_\_\_\_\_
- b) What is your current home postcode? \_\_\_\_\_
- c) For how many years have you lived in the Great Barrier Reef region?  
(i.e. all coastal areas between Cape York and Bundaberg) \_\_\_\_\_ (years)
- d) Are you currently married or have a partner?  Yes  No
- e) Do you have any dependent children?  Yes  No
- f) Do you have university or TAFE education (beyond high school)?  Yes  No
- g) What proportion of your household income came from tourism in the last financial year?  
\_\_\_\_\_ (%)

How many employees (full-time equivalents) did your operation employ over the previous 12 months?  
\_\_\_\_\_

Do you have insurance for your business assets?  Yes  No

(If relevant) When did you last purchase a main vessel? \_\_\_\_\_ (year)

- a) What proportion of your customers came from your LOCAL region? \_\_\_\_\_ %
- b) What proportion of your customers came from elsewhere in QLD? \_\_\_\_\_ %
- c) What proportion of your customers came from INTERSTATE? \_\_\_\_\_ %
- d) What proportion of your customers came from OVERSEAS? \_\_\_\_\_ %

Could you please indicate (*approximately*) your business turnover (entire revenue) for the past 12 months, in broad categories?

(Please tick one box)

- < \$20,000       \$20,001 to \$100,000       \$100,001 to \$500,000  
 \$500,001 to \$1m       Between \$1m and \$5m       more than \$5m

May we please contact you in the next 12-24 months to participate in a follow-up study?

Yes  No

What is your gender? (please tick one):  Female  Male

*Thank you for your support for this research!*

## APPENDIX 5: TOURISM OPERATOR FOLLOW UP SURVEY

**Section A.** In this section we would like to know a little more about your experience working in the tourism industry and the messages that your business provides to guests.

- 1) How many years have you worked in the tourism industry?
- b) How many years have you lived in the Great Barrier Reef region? *i.e., Coastal areas, Cape York - Bundaberg*
- c) As a tourism operator in the GBR, what do you feel are your top three responsibilities around your job?

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- d) If interpretation isn't mentioned, ask them "In terms of your other responsibilities, how would you rank 'providing interpretation to guests'?"

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- e) What are the main themes of the interpretation about the GBR that you provide for your guests? For example, what are the key messages that you try to get across?

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- f) What is the main thing that you want to accomplish by providing interpretation to your guests?

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2. On a scale of 1-10, where 1 is 'not at all important' and 10 is 'the highest importance', how important is it for you to inform tourists about:
  - a. The biodiversity of the GBR such as the corals and fish that live there
  - b. The threats to the GBR like COTS, water quality or overfishing
  - c. The impacts of climate change on the GBR
3. Please indicate which of these statements best describes your beliefs about climate change.
  - a. Climate change is an **immediate threat** requiring **action**
  - b. Climate change is a **serious threat**, but the **impacts are too distant** for immediate concern
  - c. I **need more evidence** to be convinced of the problem
  - d. I believe that climate change is **not a threat** at all
  - e. I **do not have a view** on climate change

4. On a scale of 1-10 where 1 is 'not a threat at all' and 10 is 'an extreme threat', do you think that...
- a. Why or why not?

Statement: (GBR = Great Barrier Reef)	Not a threat at all	An extreme threat
	1---2---3---4---5-	-6---7---8---9---10
a. Climate change is a threat to my business.	1---2---3---4---5-	-6---7---8---9---10
b. Climate change is a threat to the tourism industry of the GBR.	1---2---3---4---5-	-6---7---8---9---10
c. Climate change is a threat to the GBR.	1---2---3---4---5-	-6---7---8---9---10
d. Climate change is a threat to me personally.	1---2---3---4---5-	-6---7---8---9---10

5. a) Do you think tourism operators have a role to play in influencing public opinions about the conservation of the GBR?

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b) Why or why not?

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C) (If Yes) Does this include informing them about the likely impacts of climate change on the Reef?

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6. Does your business mention climate change in the interpretative materials you show/distribute?

a. If yes, please tell me a bit more about the interpretation you provide.

b. 

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c. With respect to the interpretation on climate change that you provide for tourists, what are the main messages you try to convey?

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d. How effective do you think your interpretation about climate change is?

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e. Could it be better, and if so, how?

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f. Has anyone ever evaluated the success or impact of your interpretation program? If so, who and how?

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g. Was this effective?

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h. Have you had any input from the GBRMPA to develop your interpretation materials?

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i. If no, is there a specific reason that you didn't?

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7. If materials and information were provided for you to distribute, would you use them?

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**Section B.** In this section I would like to know a little more about your thoughts on some activities that tourism operators can do to help protect the GBR.

8. I have compiled a short list of things that tourism operators might do to help protect the GBR. Please rank each action on a 10-point scale where 1 is 'very difficult to do' and 10 is 'very easy to do'.

- Provide interpretation for tourists that promotes conservation and sustainable use of the GBR
- Have fuel efficient engines
- Separate waste by tourists for recycling
- Participate in industry best practices, via a code of practice or MOU
- Participate in GBRMPA's Eye on Reef program
- Use green energy (e.g. solar)
- Use an emissions calculator
- Use carbon offsets
- Use alternative fuels such as biodiesel and ethanol
- Provide interpretation such as best practice guidelines - to help your guests/passengers minimise their impacts on the Reef?
- Other \_\_\_\_\_

9. Now, please rank each action on a 10-point scale where 1 is 'not at all effective to address climate change on the GBR' and 10 is 'really effective to address climate change on the GBR'.
- Provide interpretation for tourists that promotes conservation and sustainable use of the GBR
  - Have fuel efficient engines
  - Separate waste by tourists for recycling
  - Participate in industry best practices, via a code of practice or MOU
  - Participate in GBRMPA's Eye on Reef program
  - Use green energy (e.g. solar)
  - Use an emissions calculator
  - Use carbon offsets
  - Use alternative fuels such as biodiesel and ethanol
  - Provide interpretation such as best practice guidelines - to help your guests/passengers minimise their impacts on the Reef?
  - Other \_\_\_\_\_

10. Now I'd like to ask you about what makes those behaviours difficult.
- a. For any answer that is a 5 or lower in question 7, I will ask, "Why do you think this behaviour is difficult to do? Is it due to lack of money, time, resources, knowledge, or something else?"
  - b. For any answer that is a 5 or lower in question 8, I will ask, "Why do you think this behaviour is not effective to address climate change?"

11. One of the most interesting findings from last year's surveys was that tourists think that tourism is the most severe threat to the GBR - 41% of tourists listed tourism as a threat to the GBR. Why do you think so many tourists perceive tourism as a major threat to the Reef?

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12. How do you think we could help tourists to understand what the REAL threats to the Reef are?

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**Section C.** In this section I would like to know a little more about your thoughts on interpretation about climate change and the messages about it that you provide to your guests.

Q13:

- a. **Attitudes:** What do you see as the advantages or good things that could happen by providing interpretation for tourists about climate change and the GBR?

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- b. **Attitudes:** What do you see as the disadvantages or bad things that could happen by providing interpretation for tourists about climate change and the GBR?

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- c. **Norms:** Who do you think would support or approve of you providing interpretation for tourists about climate change and the GBR? **Note:** If they ask 'who do you mean' say, "Individuals or groups whose opinions you consider personally influential."

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- d. **Norms:** Who do you think would object or disapprove of you providing interpretation for tourists about climate change and the GBR?

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- e. **Control:** What factors or circumstances enable or make it easy for you to provide interpretation for tourists about climate change and the GBR?

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- f. **Control :** What factors or circumstances make it difficult for you to provide interpretation for tourists about climate change and the GBR?

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**Section D.** In this section I would like to know a little more about your desire to help protect the GBR.

14. Would you like to do more to help protect the GBR from the impacts of climate change?

- a. (If No) Why not?

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- b. (If Yes) What would you do? **Prompt:** How would you do it?

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- c. How would you do it?

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- d. Why is/are that activity/those actions particularly important?

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- e. Is there anything stopping you?

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15. Should the Commonwealth Government do more to help protect the GBR from the impacts of climate change?



a. (If No) Why not?

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b. (If Yes) What should they do?

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16. Should the Queensland Government do more to help protect the GBR from the impacts of climate change?

a. (If No) Why not?

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b. (If Yes) What should they do?

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17. Is there anything else you would like to tell me about how the outlook for the GBR could be improved?

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## APPENDIX 6: TOURISM OPERATOR FOLLOW UP SURVEY INFORMATION SHEET




### Social and Economic Long Term Monitoring Program (SELTMP) Great Barrier Reef Tourism Operator Surveys



For more information about this project, please contact  
Jeremy Goldberg (CSIRO): [jeremy.goldberg@csiro.au](mailto:jeremy.goldberg@csiro.au) or 07.4753.8627,  
Nadine Marshall (CSIRO) 4753 8537, or Alastair Birtles (4781 4736).

If you wish to raise a concern or make a complaint about the research  
you can contact CSIRO's Human Research Ethics Committee on  
[cshrec@csiro.au](mailto:cshrec@csiro.au) or 07 3833 5693.



### Survey of Marine Tourism Operators of the Great Barrier Reef

Principal Investigators: Jeremy Goldberg, PhD student at JCU/CSIRO, Dr Nadine Marshall (CSIRO) and Dr Alastair Birtles (JCU)

#### What is this survey about?

In this follow up survey from last year's SELTMP surveys we are exploring how tourism operators feel about climate change, conservation behaviours, and resource management of the Great Barrier Reef (GBR) World Heritage Area. This information will help us understand the needs and values of people living near and/or working along the GBR, and will help Reef managers make more informed decisions for the future of the Great Barrier Reef. The survey should take about 30 minutes of your time.

#### What details will be recorded?

The information you provide will be strictly confidential. However, personal details will be collected to allow for data matching with the previous SELTMP survey conducted last year. Your name, business, or responses will not be publically released and nobody will be able to identify your responses based upon the data we present.

#### Do I have to answer every question?

Your participation is entirely voluntary; if you don't want to answer a particular question you do not have to. Please note that there are no right or wrong answers – we are interested in your own perceptions and experiences. Your knowledge and values of the GBR are important to us and we greatly appreciate your involvement in the survey.

#### Where can I find the results?

Key findings from the surveys (conducted from Cairns, Townsville, and Airlie Beach) may be published in local newspapers, and updates posted on the CSIRO website and CSIRO Facebook page. If you would like to find out more about the research, please contact the Project Leader, Jeremy Goldberg (details overleaf).

This is a collaborative project between CSIRO and James Cook University, and is funded by the Great Barrier Reef Marine Park Authority and JCU.

