Australian Government
Great Barrier Reef Marine Park Authority

Reef Authority

AUSTRALIANS, CLIMATE ACTION AND THE GREAT BARRIER REEF

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For the Great Barrier Reef Marine Park Authority

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The Great Barrier Reef Marine Park Authority acknowledges the continuing Sea Country management and custodianship of the Great Barrier Reef by Aboriginal and Torres Strait Island Traditional Owners whose rich cultures, heritage values, enduring connections and shared efforts protect the Reef for future generations.

Aboriginal and Torres Strait Islander readers are advised this publication may contain names and images of deceased persons.

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Project Details

This report outlines work by Griffith University commissioned by the Great Barrier Reef Marine Park Authority.

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Executive Summary

The National Climate Action Survey is the first representative nationwide survey asking about experiences with the Reef, emotions about climate change related damage to the Great Barrier Reef (the Reef), and other threats to the Reef.

With a total yearly sample size of approximately 4,000 participants, and approximately 96% of Australians knowing the Reef, we have captured what Australians know, and how they feel and think about the Reef. Furthermore, we have captured Australians' knowledge and understanding about climate change and related impacts on the Reef.

Our national sample makes it possible to compare people residing in different parts of Australia. For this report, we were able to conduct analyses of people living within the Reef catchment, other areas of Queensland and outside of Queensland.

In 2023 and 2024 and in consultation with CSIRO's Social and Economic Long Term Monitoring Program (SELTMP) team and the Reef Authority's Social Sciences and Communications teams, we included questions about the Great Barrier Reef in recognition of its role in the nation's cultural imagination and as one of the most prominent national gauges of climate change threats and impacts. The Reef continues to feature prominently in news and other media and is thus an important site for public discussion and debate around climate changes and other threats.

This research examined a large national sample and conducted advanced statistical analyses to test 1) the suggested linearity of the tagline See the Reef, Love the Reef, Protect the Reef; 2) if other variables influence that relationship; and 3) conduct person-centred analyses to showcase differences between different types of people and their views of the Reef, and how that is connected to opportunities to take climate action. We also collected qualitative data from open-ended questions to illustrate and deepen our understanding of Australian's, Climate Action and the Great Barrier Reef.

Our results reveal around nine in ten Australians feel a sense of pride in the Reef and a sense of national responsibility for its protection. Around three-quarters of Australians thought the Reef should be placed on the World Heritage In Danger list and that its conservation should be prioritised over the expansion of coal mining. Around half of Australians felt the Reef was being managed well.

In 2023, when hearing about climate-change damage to the Reef, individuals residing in the Reef catchment area generally reported weaker emotional responses compared to those living farther away (both inside and outside of Queensland). Those residing outside of the

Reef catchment have stronger emotions when hearing about climate-change impacts on the Reef. This pattern was particularly evident for the emotions of anger and disappointment, with non-Queensland residents expressing significantly stronger emotional reactions than those living within the catchment. In 2024, people in the Reef catchment felt less angry than those outside of the catchment, and less disappointed and determined than those outside of Queensland. There were no significant differences for the other emotions of sadness, helplessness, feeling afraid or confused.

In contrast to other experiences of natural disasters related to climate impacts, like flooding, where closer proximity heightened concerns (see Paas et al., 2024b), proximity to mass coral bleaching events did not impact concern about climate changes. In our analyses, those residing further away from the Reef had stronger reactions to climate change and mass coral bleaching events than those living closer. Overall, while Australians were aware of mass coral bleaching, the level of seriousness of the threat to the Reef was poorly understood. Mirroring broader survey results about the urgency of climate action, Australians underestimate the threat of mass coral bleaching events to the Reef.

See the Reef, Love the Reef, Protect the Reef. It is a great tagline, but does it hold true that seeing the Reef in person is needed to feel an emotional reaction to it? Our analyses revealed a more complicated relationship where the recency of a person's visit to the Reef or their optimism about the Reef's future did not or only minimally influenced their emotional connection, or 'love' for the Reef. However, a strong positive relationship was observed between individuals' love for the Reef and their sense of responsibility to protect it.

To better explain differences in people's willingness to protect the Reef, and given climate change is its greatest threat, we examined Australian's feelings towards climate change urgency and their climate change concern. We found that stronger feelings about climate change forecast greater love for the Reef and willingness to protect it. Therefore, including climate change perceptions, concerns, and personal responsibility for climate change improve the model. Combined with seeing the Reef, they are a better predictor of Reef love and protection than the recency of a person's visit or their optimism about the Reef's future alone – implied by the linear trajectory of the 'See the Reef, Love the Reef, Protect the Reef' campaign.

Given that climate change is the biggest threat to the Reef, these findings suggest that emotional concern about climate change, rather than simply seeing the Reef, drives the desire to protect it. Therefore, the established See-Love-Protect model may miss an opportunity to encourage a sense of stewardship and care that is more cognisant of the

mediated nature of Reef experiences, rather than inferred direct visual exposure to the Reef as motivation for protection.

To further examine Australian's 'love for the Reef' we adopted a person-centred perspective, to move beyond isolated markers of (say) age, gender and residency and gain a better understanding of people across the sample. We discovered three distinctive subgroups of people: (1) **Reef Ambivalent,** (2) **Reef Aware,** and (3) **Reef Connected**. These profiles also predict how people feel about the Reef, climate change concerns regarding the Reef, and willingness to change their own behaviours. For example, people who felt ambivalence towards the Reef showed the least environmental concern and were least willing to take protective action, while also feeling less personal responsibility for climate change and Reef protection. Those who were aware of the Reef but not deeply connected demonstrated moderate levels of environmental concern and responsibility, recognizing the importance of Reef protection but lacking strong motivation to act, and were notably the most pessimistic about the Reef's future and management. In contrast, people who felt most connected to the Reef displayed the strongest environmental attitudes, greatest willingness to take action, and highest sense of responsibility for both climate change and Reef protection. The findings demonstrate that emotional connection to the Reef is a powerful predictor of environmental engagement, with those who care most about the Reef being most motivated to protect it. Our results suggest national love for the Reef is a likely ally in supporting public understanding of climate changes and the need for action. This project and its findings can thus support other less prominent Australian natures to develop and guide similar protection and/or climate action initiatives.

Part 1 – Introduction

The National Climate Action Survey

Since 2021, Griffith University has conducted its annual National Climate Action Survey (NCAS) to assess Australian adults' understandings, feelings and responses to climate change and related environmental issues. The NCAS is a peerless source of information about Australian's climate actions, attitudes and beliefs as the nation, and the world, embarks upon societal transformations to a sustainable low carbon future. Non-partisan, independent and university-led, carrying the rigour of expert statistical analyses and the depth of a multidisciplinary team, the NCAS supports evidence-based decision and policy making. Advancing national conversations and debates through an annual survey representative across age, gender and State alongside longitudinal data, the NCAS tells a detailed story of Australians and their communities.

The survey aims for approximately 4000 respondents each year, and they are drawn from panels used by an Australian based research company, ensuring anonymous participation. Each year, the new sample is representative of the Australian adult population, stratified by gender, age, and state/territory of Australia.

The survey is conducted online, takes on average, approximately 30-35 minutes to complete, and comprises more than 300 questions. The survey covers a comprehensive range of content, encompassing six major categories (see Figure 1):

1. respondent's socio-demographic characteristics, residential circumstances, and aspects of their social milieu)
2. opinions, self-identity, and worldviews
3. exposure and experience factors (including exposure to/experience of natural disasters, extreme weather and other possible climate change events and conditions, and impacts of these)
4. knowledge, understandings and belief factors (including their knowledge, perceptions, beliefs, etc., about climate change and its causes and consequences, as well as the sources of these understandings)
5. feelings and concerns about climate change and its impacts
6. actions (including past, current, and possible future pro-and anti-environmental acts, including both mitigation and adaptation behaviours, plus their reasons for not acting)

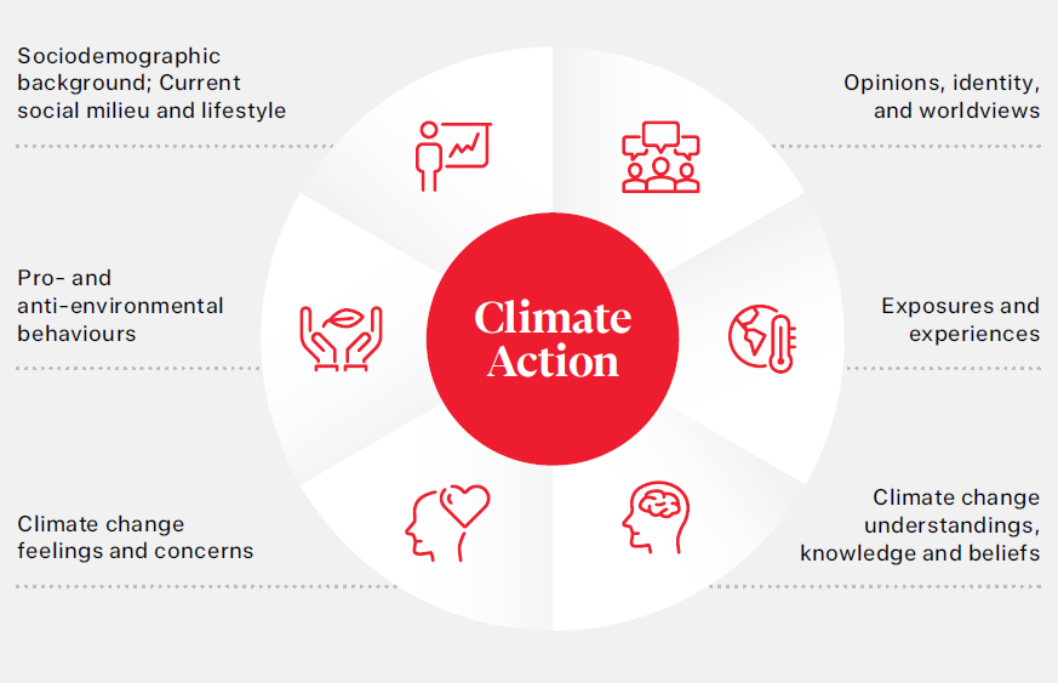


Figure 1. Schematic overview of the six major categories of climate action as measured with the National Climate Action Survey.

Survey Objectives

The National Climate Action Survey provides detailed information regarding what adult Australians think, feel, and do in response to climate change and related environmental and climatic events and conditions. The annual survey captures and documents Australians' knowledge, beliefs, attitudes, and actions, collecting responses towards the end of the year it is conducted, and comparing these with the findings from previous years and other relevant surveys.

More specifically, the survey has several, intersecting objectives:

- Build and test theory, to enhance theoretical understandings of climate change-related phenomena
- Contribute to knowledge derived from research; to fill gaps in this research and resolve inconsistencies/controversies raised by research; and to provide a basis for comparison with findings from past studies and a baseline of evidence for use in monitoring changes over time in climate change-related variables
- Inform the design of inter-disciplinary interventions and the formulation of policy in relation to climate change issues; thereby meeting relevant government and industry needs for up-to-date and authoritative information
- Inform individuals and communities, and stimulate public debate about climate change-related matters

- Meet various objectives of the Climate Action Beacon, inform and complement other Beacon projects; satisfy diverse Beacon member interests, and further establish the Beacon as a national and international leader in climate change research, policy, and practice.

Key Survey Features

The Climate Action Survey is distinctive as an independent, university-led, rigorous and comprehensive approach. It includes:

- A large sample of Australian adults, stratified by gender, age, and state of Australia.
- A longitudinal design: we have collected data annually since 2021, using self-report, questionnaire-based surveys.[1] Since 2022, we have used two separate but overlapping surveys. From 2022 onwards, we sought to (1) re-survey individuals who responded in one or more previous surveys, thereby maintaining a multi-wave longitudinal sample, and (2) complement this longitudinal sample with replacements for those respondents who were not willing and able to continue to participate.
- A sizeable budget: one that was carefully allocated to recognise and balance the multiple factors that affect survey costs, including questionnaire length, types of items/questions, sample size, and number and type of stratification variables. This meticulous budgeting strategy was implemented to ensure the survey's financial management and sustainability, instilling confidence in the stakeholders.
- The Climate Action Survey was meticulously planned and pilot-tested, ensuring a high-quality questionnaire that could be reused over subsequent years.
- An extensive range of content, as befits a multi-wave, multi-disciplinary project. Specifically, the survey content encompassed six major content categories as outlined in Figure 1 above.

[1] Questionnaire-based survey methods have many strengths (e.g., the capacity to collect information – including information that is subjective and/or pertaining to unobservable phenomena – from large, potentially representative samples, and to do so efficiently in terms of both time and money) and limitations (e.g., its susceptibility to response biases and memory lapses, and the often superficial nature of the information collected). These strengths and limitations are acknowledged, but not further elaborated in this report. The contribution of the current survey should be evaluated in the context of it being one of several studies investigating aspects of climate change conducted in parallel and supported by the Beacon. These methodologically diverse studies serve complementary roles, with the limitations of some compensated by the strengths of others.

The Great Barrier Reef and the Climate Action Survey

Over the last decade and more, national conversations about climate change have converged on the Reef. Threats to place the Reef on the World Heritage in Danger list, largely motivated by plans to expand fossil fuel mining and associated shipping infrastructure in its catchments and waters, repeated and frequent mass coral bleaching events amidst rising sea temperatures and consequential impacts on tourism and fishing industries have brought the Reef and climate change impacts to local, national and international attention. And this is duly so with the Great Barrier Reef Outlook Report (2024:162) finding that climate change poses the greatest threat to the Reef via change in ocean pH, sea temperature, and sea level rise. Given the Reef's status as a World Heritage Site, its environmental and economic significance, alongside its cultural and social value for many Australians and distinctively, First Nations Australians, we were interested in exploring nationwide responses to the Reef. The Reef is an established site for Australian public debate and discussion about climate change, possible actions and responses. In 2023, in consultation with scientists from CSIRO's Social and Economic Long Term Monitoring Program (SELTMP) team and the Reef Authority Social Sciences and Communications teams, the survey introduced questions concerning visits to the Great Barrier Reef (the Reef), beliefs regarding climate change impacts to the Reef, and sentiments and attitudes towards the Reef and its threats. In 2024, only new respondents received these questions (not repeat responders). Both 2024 samples included questions on volunteering and coral bleaching (e.g., have you helped an organisation that is involved in protecting the Reef; are you aware of coral bleaching in the Reef in the last 12 months and how serious did you think this bleaching event was). Full details of the Reef specific questions and answer options can be found in Appendix A.

By including the Reef specific questions, we gained a better understanding on Australians' views on climate change through their relationship to the Great Barrier Reef. **The NCAS is the first representative nationwide survey asking about experiences with the Reef, emotions about climate change related damage to the Reef, and other threats to the Reef.** With the current report we provide insight into the human and social dimensions of the Reef and climate change. This work supports and is relevant to Great Barrier Reef Outlook Report 2024, the Reef Blueprint 2030, and the Reef 2050 Plan. This survey is an opportunity to explore national insights, providing an additional dimension to existing information from Reef catchment focussed surveys including the CSIRO's SELTMP (e.g., Hobman et al., 2024) and the Queensland focused (50% of their sample) Internal Reef Authority Project Guardian Market Research (Mosaic Insights, 2024) which sought feedback on Reef

communication strategies and namely the ‘See the Reef, Love the Reef, Protect the Reef’ campaign. We have interspersed the presentation of quantitative data with qualitative data, using answers to the open-ended questions to illustrate and unpack statistical data.

The Reef occupies an important place in the Australian cultural imagination. Repeated surveys of Australians, including our own, underline national pride in this nature superstar. While the Reef’s expanse and biodiversity credentials are peerless, the Reef is a pinnacle cultural symbol in a nation that defines itself in terms of ‘big nature’ and nature more broadly. Another source of Australian pride, our vast natural resources and their extraction has, and continues to present at least a national paradox (see Foxwell-Norton, 2024). The recognition that our love and pride in Australian nature is being damaged by our historical and contemporary reliance and pride in our natural resources is a daily conflict in the national discourse permeating media, governments and politics and of course, communities (Foxwell-Norton and Konkes, 2019). In the Reef then, we can begin to unpack how Australians are navigating their culture/nature relations with the Reef at a time when climate change threatens its health and that of Australian nature much more broadly. This project therefore has application to the Reef and beyond, as a case study to explore Australians, their much-prized nature or environments and climate changes.

There are many tropes that surround the Reef and climate change – and protection and conservation more broadly – that are examined here. The NCAS enables a thorough examination of these tropes, as we try to understand how Reef communities, Queenslanders and Australians are reconciling the blunt reality of the impact of its warming climate on their much-loved Great Barrier Reef. Our data collection and its presentation below move from assumption to evidence, to help guide local, state and national planning and management in activating and engaging Australians in climate action.

Part 2 – Methods

Ethics

Ethical clearance to conduct the survey was obtained from the Griffith University Human Research Ethics Committee (ref: 2020/806) on 26 August 2021. A variation to this clearance was sought in 2023 and was approved on 21 September 2023 (repeat respondents survey), and 24 October 2023 (new respondents survey); and again in 2024, approved on 1 October 2024 (repeat respondents survey), and 26 November 2024 (new respondents survey).

Data Collection and Sample Size

Since 2021, the panel provider Dynata has been enlisted to distribute the survey. Since 2022, the survey has been conducted in two parts: a repeat survey targeting those that have participated before, and a new respondents survey that is targeted at participants who have not participated before. As such, there are 4 surveys available with Australians' perceptions on the Reef.

In 2023, the survey was conducted in two parts:

- From 10 October - 11 December, panel members who had participated in previous Climate Action Surveys completed a “Repeat Respondent” version of the questionnaire (1,184 respondents),
- from 18 November - 23 December, panel members who had not previously participated in Climate Action Surveys completed a “New Respondent” version of the questionnaire (2,874 respondents).

A total of 984 qualitative responses to open ended questions were collected. These responses were uploaded to NVivo (a qualitative data software tool) and coded to establish recurrent themes across the qualitative data.

In 2024, the survey was also conducted in two parts:

- from 7 October until 12 December, panel members who had participated in previous Climate Action Surveys completed a “Repeat Respondent” version of the questionnaire (1,542 respondents),
- from 28 November until 31 December, panel members who had not previously participated in Climate Action Surveys completed a “New Respondent” version of the questionnaire (2,481 respondents).

A total of 1664 qualitative responses to open ended questions were collected. These responses were uploaded to NVivo (a qualitative data software tool) and coded to establish recurrent themes across the qualitative data.

The new respondent surveys are representative of the Australian population based on age (under and over 40 years), gender, and state/territory distribution.

Technical Reports detailing survey methodology are available on the Climate Action Survey website for the 2023 surveys, with additional reports to be published as they become available.

Who We Surveyed

With new and repeat respondents across 2023 and 2024 surveys, we have four distinct survey samples, each with their own demographic characteristics. For analysis purposes, unless otherwise specified, we focus on two different samples (2023 and 2024), and where possible we categorise participants into three geographical regions: people living in the Reef catchment, those outside of the Reef catchment, but still in Queensland, and those outside of Queensland. Figure 1and Figure 2 show the distribution of respondents in both survey-years.

4,058 and 4,023

Australians participated in 2023 and 2024.

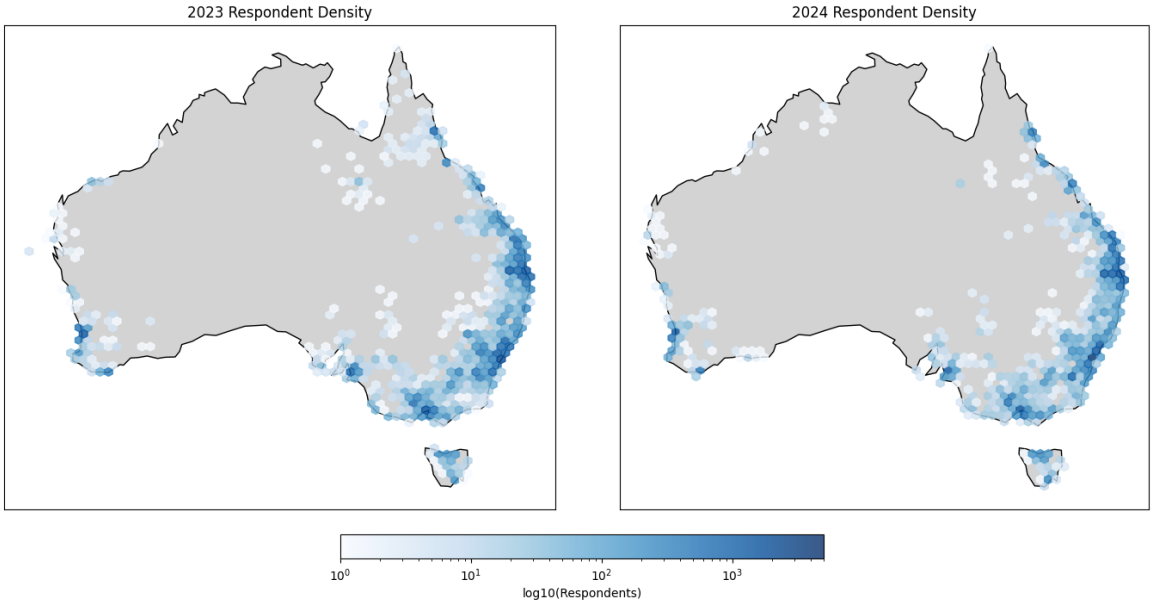


Figure 2. Distribution of respondents in the 2023 (left) and 2024 (right) surveys. The colour shows the density of participants in a certain area, with darker colours showing more dense locations.

Geographical region

Due to survey constraints, we used postcode-level data only, without incorporating locality information, which may limit the granularity of geographic insights (see Figure 3).

Consistent with the distribution of Australia's population according to the Australian Bureau of Statistics (ABS), the majority of participants in this survey reside outside of Queensland. However, nearly 20% of the sample lives in Queensland, and of the Queensland population, approximately 25% resides within the Reef catchment (see Table 1 for full details).

Table 1. Participant Distribution by Geographic Region

	2023	***2024***
Reef Catchment	216	204
Rest of QLD	621	634
Outside of QLD	3221	3185
Total Sample	4058	4023

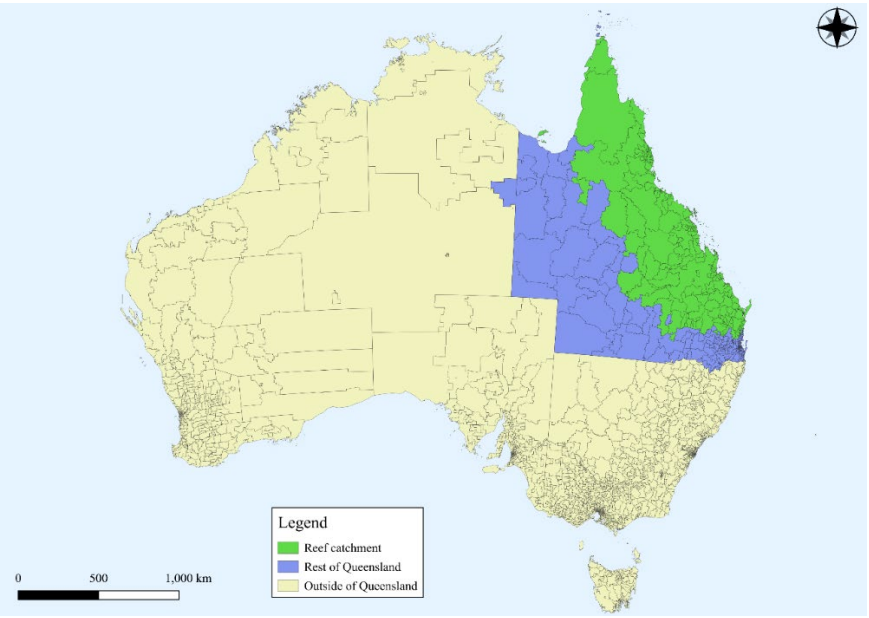


Figure 3. A map of Australia depicting the three different geographical regions we used in our analyses. Due to survey constraints, the map is colour-coded based solely on postcode rather than both postcode and locality.

Gender

The gender composition of our samples closely mirrors the 2021 ABS Census data (49.3% male, 50.7% female), with our yearly samples showing a slightly higher proportion of female participants. A very small proportion of participants across our samples identified as non-binary or other gender, which is also consistent with the 2021 Census data (see Table 2).

Table 2. Participant Distribution by Gender

	 Male	Female	Other/ non-binary
2023	49.3%	50.3%	0.4%
2024	48.9%	50.8%	0.3%

Education level

The educational attainment of our samples (see Table 3) shows slightly higher levels of post-secondary education compared to the general Australian population. Our samples had notably higher rates of university qualifications and slightly higher rates of trade/vocational qualifications than reported in the ABS 2021 Census, suggesting our participants are slightly more highly educated than the broader Australian population.

Table 3. Participant Distribution by Education Levels

	2023	2024
School	26.1%	27.1%
Trade	30.3%	30.5%
University	43.5%	42.2%

Age

Our new respondent samples are broadly representative of the national population with 50% under 40 years of age, and 50% over 40 years of age. Our yearly samples show that the mean age of our samples is substantially older than the national representative sample (by around 10 years, see Table 4). Our 2024 sample is also a slightly older than the 2023 sample.

Table 4. Participant Distribution by Age

	2023	2024
18-29	16.1%	11.4%
30-39	26.1%	21.1%
40-49	12.3%	11.2%
50-59	9.5%	11.8%
60-69	15.5%	19.3%
70-79	16.4%	20.4%
80+	4.1%	4.7%

Location

Our participants are mainly located in suburban regions. The 2021 ABS Census shows that 66.9 percent of the population live in Greater Capital Cities, and 33.1% live in the Rest of Australia, which broadly aligns with the suburban-dominated distribution, given that Greater Capital City areas include substantial suburban populations (Table 5).

Table 5. Participant Distribution by Location

	2023	2024
Inner Urban	16.4%	16.2%
Suburban	60.4%	62.0%
Regional	23.1%	21.8%

Part 3 – Results

The Great Barrier Reef – an Australian Icon

Participants were asked to answer a series of questions about their knowledge on the Reef. Firstly, we asked do you have any idea what the Great Barrier Reef is, and if participants responded affirmatively, they were asked to indicate whether they agreed or disagreed with eight statements about the Reef. Nationally and across these three surveys, we found:

Of Australians know what the Great Barrier Reef is

There were no consistent significant differences between those respondents residing in the Reef Catchment, rest of Queensland, outside of Queensland. Nor were there significant differences between the 2023 and 2024 surveys. In our results, proximity to the Reef is not associated with an overall sense of pride and desire to see the Reef protected.

Full details can be found in Appendix B.

The most recent report that I read suggested that the overall health of the GBR had improved somewhat in recent years. It's hard to know what to believe when you live in Victoria. But I care very much about the GBR. It is beautiful out there
(Respondent outside of Queensland, 2023)

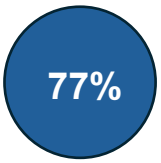
It's on my bucket list and I only hope it survives what nature throws at it! (Respondent outside of Queensland, 2023)

Of those who reported knowing what the Great Barrier Reef is:

Feel proud that the GBR is a World Heritage Site

Feel that it is the responsibility of all Australians to protect the Reef

This pride and feeling of responsibility are visible across Australia, as there are no significant differences found between those residing in the Catchment versus those in the Rest of Queensland or those outside of Queensland.



Feel that conservation of the GBR is more important than the expansion of coal mining

77% of Australians would prefer to **prioritise conservation over the expansion of coal mining**. This preference highlights an appetite for a changed future.

Communities near the GBR that are reliant on coal mining for their industry need different industries to transition to
(Catchment respondent, 2024)

Supporting this finding are results from the National Climate Action Survey in 2023, where a clear majority of Australians (80%) were supportive of assistance to those communities who are currently reliant on coal mining for their livelihood (Paas et al., 2024a).

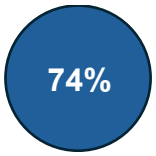
Feel that the GBR should be on the World Heritage In Danger List

Interestingly and in contrast to the efforts of successive Australian and Queensland governments to keep the Reef off the World Heritage In Danger List, 75% of respondents support its listing.

People in the Reef Catchment are significantly less in favour of the Reef being on the World Heritage in Danger List, compared to people in the rest of Australia (respectively 67% in the Catchment, 76% in rest of Queensland, and 80% outside of Queensland).

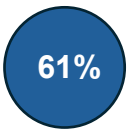
I was disappointed when Australian politicians actively tried to minimise the threat to the GBR and not have it listed as in danger
(Respondent outside of Queensland, 2023)

It should already be in the endangered list. From what I have heard there has been NO positive change in the last 12 months.
(Respondent outside of Queensland, 2023)



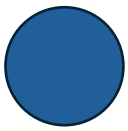
Feel that the GBR is part of their Identity

Although 93% of Australians are proud that the Great Barrier Reef is a World Heritage site, only 74% feel it is a part of their personal identity.



Feel that it is their responsibility to protect the GBR

Despite 90% of Australians feeling that it is the responsibility of all Australians to protect the GBR, only 61% feel they personally are responsible. This contrast highlights a common psychological and social phenomenon known as the diffusion of responsibility. Our research suggests that Australians support the idea of collective responsibility in principle, but feel detached from taking personal action, perhaps assuming others—like governments, organizations, or coastal communities—will take the lead.



Feel optimistic about the future of the GBR

This optimism or lack of optimism is visible across Australia, as there are no significant differences found between those residing in the Catchment versus those in the Rest of Queensland or those outside of Queensland.

Feel confident that the GBR is well-managed

Management of the Reef is not a specific commentary on the Reef Authority and should be interpreted broadly as confidence that governments and Reef focussed institutions are managing Reef health and threats. Around one in two Australian's were confident that the Reef is being managed well though evident in the qualitative data is that 'management' was understood differently by respondents. Recurrent was the call for governments in particular to 'do more' to protect the Reef.

Super disappointed that the state and federal government are not doing more to assist in preserving one of Australia's iconic sites (Respondent outside of Queensland, 2023)

Increased grants and finances need to be used to protect and encourage new growth on the Barrier Reef (Catchment respondent, 2024)

Notably, the qualitative responses across 2023 and 2024 had only one incorrect reference to the Reef Authority:

The Great Barrier Reef Protection Authority received well over five hundred million dollars a few years back. The reef should be well protected and well managed (Respondent outside of Queensland*, 2023)*

Alongside calls for funding and for governments to do 'whatever it takes', more critical commentary referring to the 2018 Turnbull government's $444 million grant (via a non-competitive tender) drew suspicion around Reef funding and management:

The Turnbull government gifted $444,000,000 of OUR Money to some dodgy foundation - what a waste. We should SUE THEM to get it back, to hope to save the GBR (Respondent outside of Queensland*, 2023*)

What happened to the $440 million that was allocated to the Great Barrier Reef, by the last Federal Government? (Respondent outside of Queensland*, 2023)*

There is a lot of money allocated to the Reef. Some of it is missing (Catchment Respondent, 2024)

Other repeated comments also revealed both appreciation and concern about tourism on the Reef its management:

I believe we should stop all tours of the reef as it's slowly contributing to the loss and impact of the GBR. We need to stop now and protect it at all costs (Respondent outside of Queensland*, 2023)*

Although tourism a slight threat, well worth it for the money it brings in to help preserve GBR and raise awareness for preservation efforts (Respondent outside of Queensland*, 2023)*

When did Australians last visit the Reef?

Respondents were asked to indicate when they last visited the Reef (see Figure 4). Those people residing closer to the Reef had visited more recently, with those outside of Queensland visiting much less recently. Surprisingly, near a quarter of Reef Catchment respondents had not visited the Reef, slightly more in those Queenslanders residing outside of the catchment and around half of the sample residing outside of Queensland. While useful as an indication of Reef visits, the response of Reef catchment respondents especially raises issues around understanding of the Reef ecosystem beyond its marine environment to encompass its terrestrial connectivity.

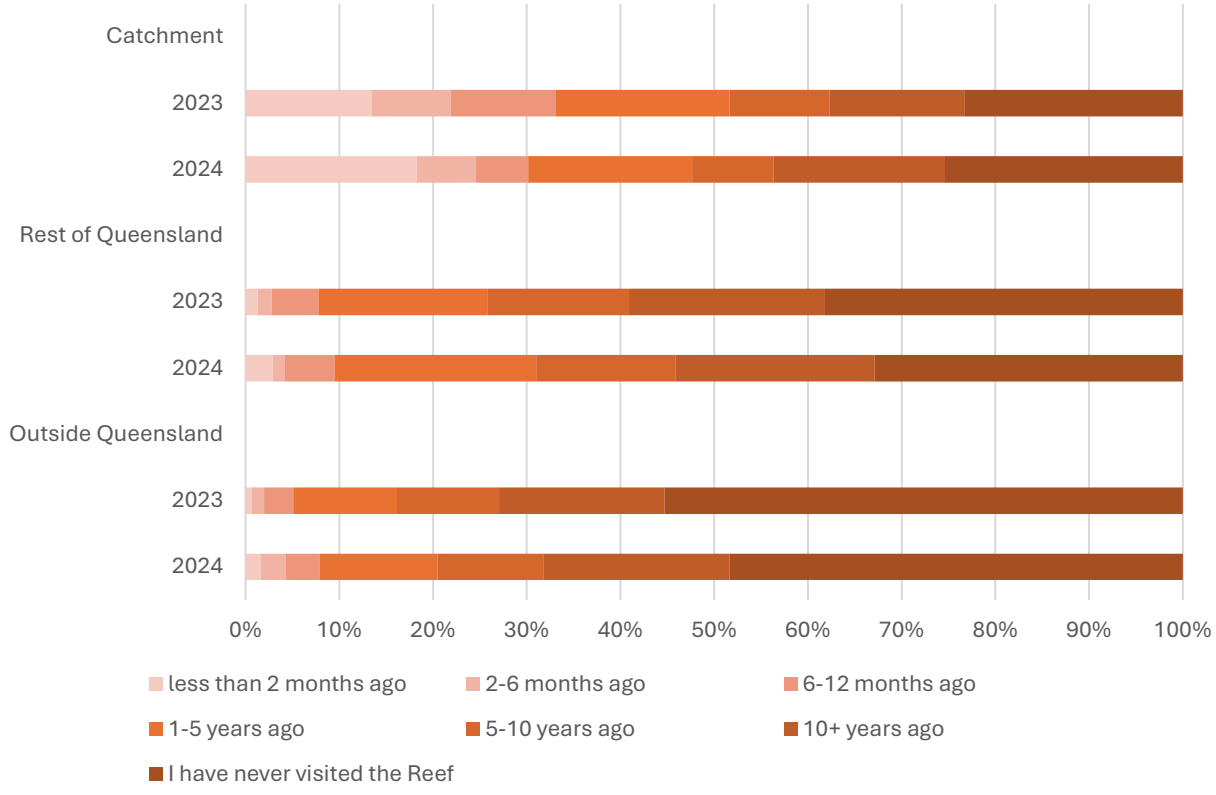


Figure 4. Australians' last visit to the Reef by place of residence

How do people feel about the Reef?

Respondents were asked to indicate the extent to which they experienced specific emotions when hearing about climate-related damage to the Great Barrier Reef (Figure 5). Across the two years of data collection, there were no substantial differences in the emotions reported among all Australians. We found that respondents on average were not experiencing the emotions very strongly. They experienced sadness and disappointment most strongly (somewhat to quite a bit), followed by moderate levels of determination, fear, anger and helplessness (a little bit to somewhat). Almost 50% of respondents reported not feeling confused about the Reef at all.

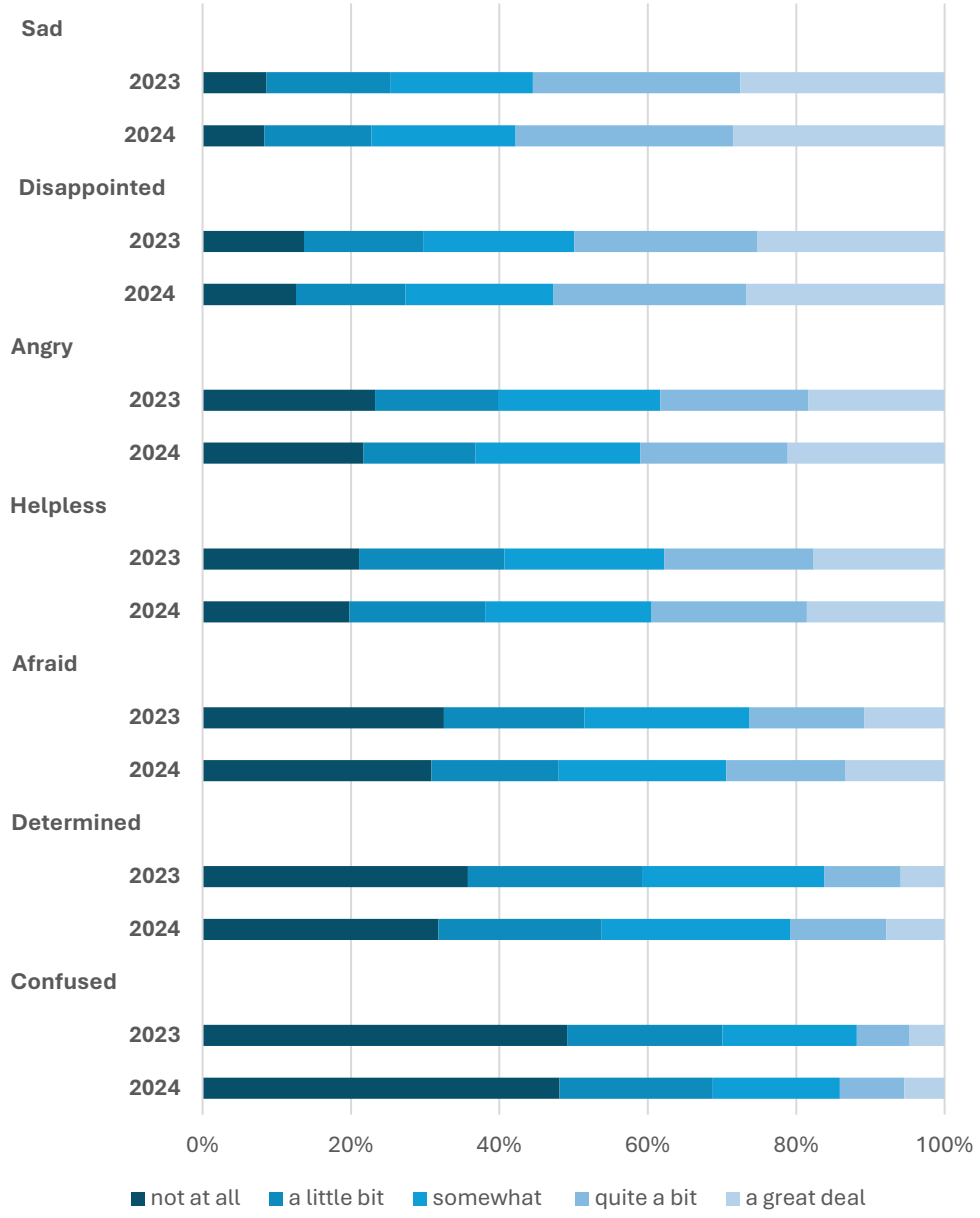


Figure 5. The extent to which each emotion is experienced when hearing about climate-related damage to the Reef in 2023 and 2024.

However, when comparing residents of the different locations (Figure 6), our analysis revealed that in 2023 individuals residing in the Reef catchment area generally reported weaker emotional responses compared to those living farther away (both inside and outside of Queensland), which means that those residing outside of the Reef catchment have stronger emotions when hearing about climate-change damage to the Great Barrier Reef. This pattern was particularly evident for the emotions of anger and disappointment, with (across samples) non-Queensland residents expressing significantly stronger emotional reactions than those living within the catchment.

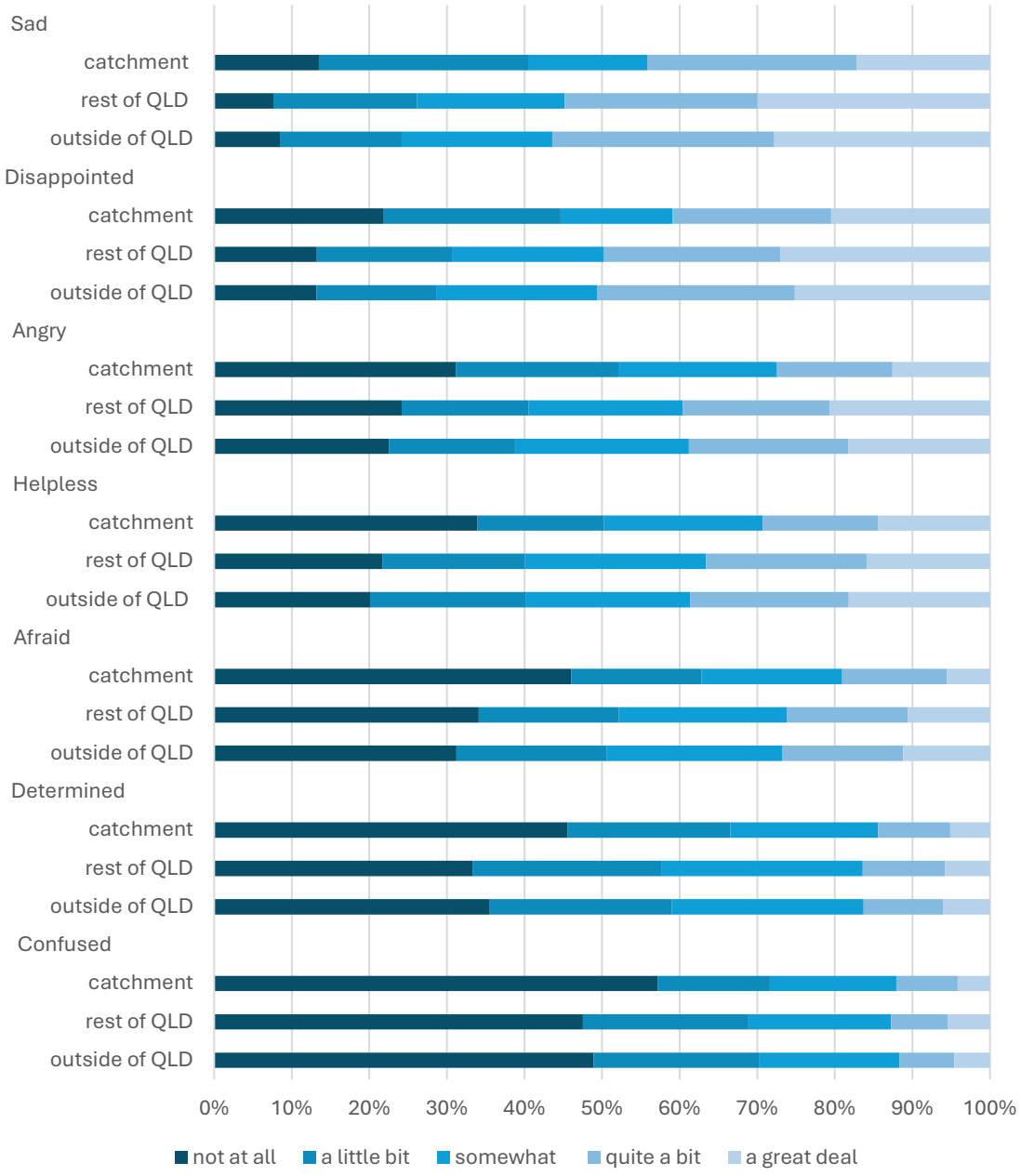


Figure 6. Extent to which each emotion is experienced when hearing about climate-related damage to the Reef in 2023 for different geographical locations.

In 2024 (Figure 7), people in the Reef catchment felt less angry than those outside of the catchment, and less disappointed and determined than those outside of Queensland. There were no significant differences for the other emotions.

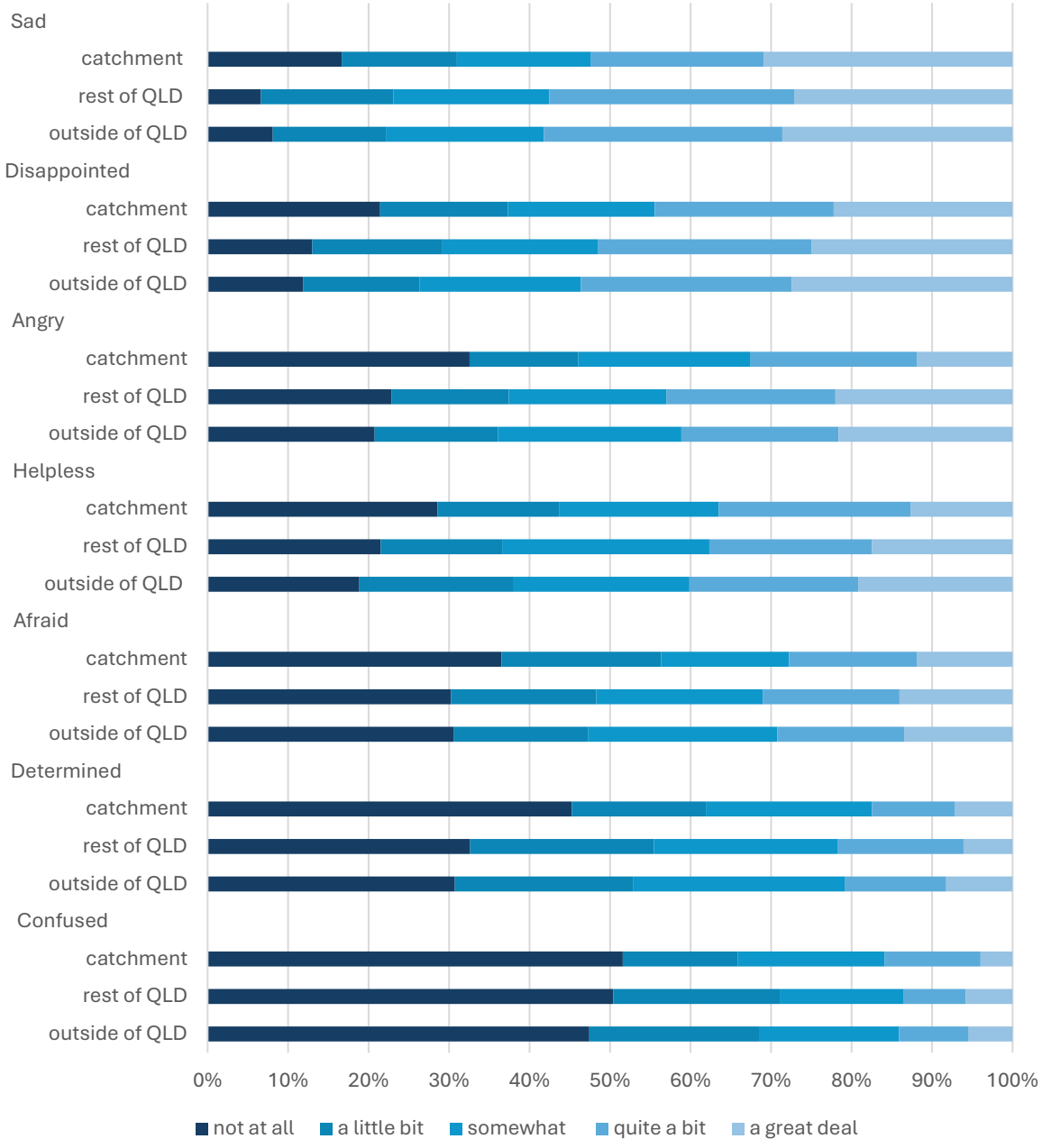


Figure 7. Extent to which each emotion is experienced when hearing about climate-related damage to the Reef in 2024 for different geographical locations.

Our statistical findings are also illustrated by responses to the open-ended questions in both the 2023 and 2024 surveys:

It makes me really angry that this has been an issue for so long and nothing is being done (Respondent outside of Queensland, 2023)

I was very disappointed when I visited the GBR at Port Douglas as most of the coral was bleached and there were very few fish (Respondent outside of Queensland, 2023)

It is sad that something that it so identifiably Australian is dying because of humans (Respondent outside of Queensland, 2023)

It makes me anxious and overwhelmed (Catchment respondent, 2024)

Mass Coral Bleaching in 2024

In 2024, participants were asked to indicate whether they had any knowledge of mass coral bleaching on the Reef in the past 12 months, and their sense of the seriousness of this event (see Figure 8 and Figure 9 respectively). We found that across locations, around 70% of people had at least some understanding of the coral bleaching on the Reef. The remaining people stated they had no knowledge of bleaching on the GBR or not knowing what coral bleaching is in general.

Although Figure 8 suggests that there were proportionally more people in the Reef catchment (compared to other locations) that do not believe coral bleaching happened in the preceding year, and less people in the Reef catchment not aware of what coral bleaching is, the sample size is too small to suggest significant differences between people in the different geographical locations.

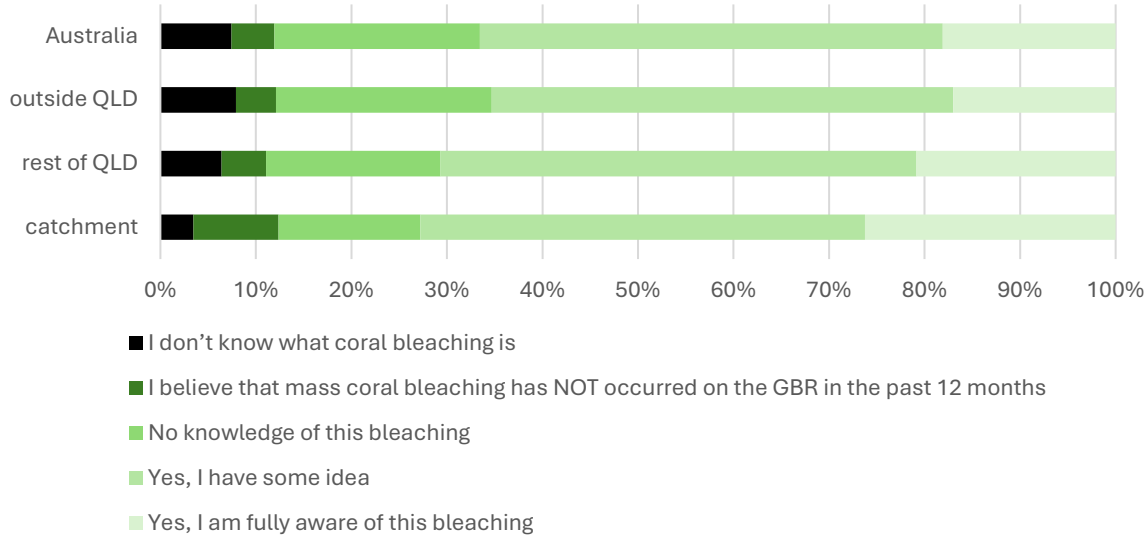


Figure 8. Views on coral bleaching on the GBR in the past 12 months

Responses to the open-ended question asking about climate change and the Reef varied from belief that mass coral bleaching is a natural occurrence to a clear understanding of the relationship between the 2024 mass coral bleaching event and climate impacts:

> *It happened about 50 years ago and before that too. it is a natural occurrence in my opinion and will recover and happen again in the future* (Catchment Resident, 2024)

> *The Great Barrier Reef is severely threatened by climate change, particularly through rising sea temperatures, which cause coral bleaching and weaken the reef's resilience. Ocean acidification, caused by higher carbon dioxide levels, also harms coral growth. These factors, along with extreme weather events, put the reef's biodiversity and ecosystem at risk, making it crucial to address climate change to preserve this natural wonder.* (Catchment resident, 2024)

When respondents were asked about the seriousness of bleaching on the Reef, participants tended to indicate that the bleaching was of moderate to high seriousness. Those in the Reef catchment thought it was less problematic than those residing outside of Queensland. No significant differences were found between any other groups of respondents (Figure 9).

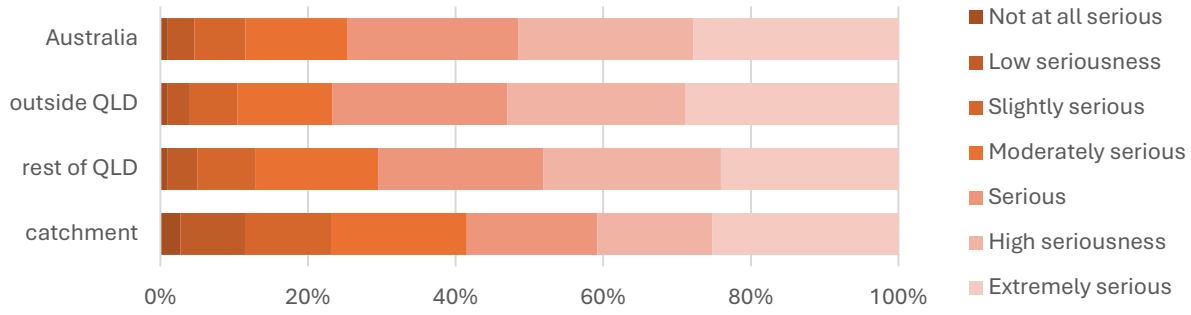


Figure 9. Australians' views on seriousness of bleaching on the GBR by place of residence

> *I saw areas that appeared bleached and perhaps damaged or dying, but other people saw areas alive, thriving with colour, fish, and the difference was only hundreds of metres apart, so I am unsure if the cycle is natural or caused by climate which of course some is a natural cycle also.* (Respondent outside of Queensland, 2023)

Similar to the spatial distancing of climate change, those in closer proximity to the natural disaster of mass coral bleaching report less concern and distress. The 2023 National Survey found that individuals with direct experience of natural disasters or adverse climatic events demonstrated a greater understanding of climate change, heightened awareness, concern, and distress regarding its impacts. Findings from the Reef catchment and Queensland respondents suggest the inverse – that is, their proximity to the natural disaster of a climate change-attributed mass coral bleaching event did not lead to greater awareness, concern and distress. An interesting picture begins to develop around the spatial dimensions of Reef concerns, where given the investment of livelihoods and communities in Reef health, those closest are more conflicted in their response to threat of climate changes than those outside of Queensland.

> *A little confusing when you hear the incessant bleating about CC and the occasional report that then describes the GBR as currently being in robust health. I know which report I believe. (Respondent outside of* Queensland*, 2023)*

> *The Reef is doomed. i live in Cairns and have seen the deterioration over the last 50 years. Nothing will be done to save it.* (Catchment Respondent, 2024)

> *I live there. The risk highly politicized. Coral growth/cover is currently better than ever.* (Catchment Respondent, 2023)

Perceptions of climate risk among respondents are relatively stable between different locations within the same period.

Overall, views on climate change and its impact on the Reef were largely consistent across geographic locations, with one notable exception observed in the representative 2023 sample (see Figure 10). In this sample, individuals residing in the Reef catchment and the broader Queensland region were less likely to view climate change as an immediate threat to the Reef and more likely to indicate that they needed additional information about its effects. The findings of both our 2023 and 2024 catchment samples broadly align with the findings of the CSIRO SELTMP data from 2023 (e.g., Hobman et al., 2024), building our confidence that those in the Reef catchment are indeed less worried about climate change than the rest of Australia, and denial of climate change is more prevalent among respondents living within the Reef catchment compared to those residing outside of it.

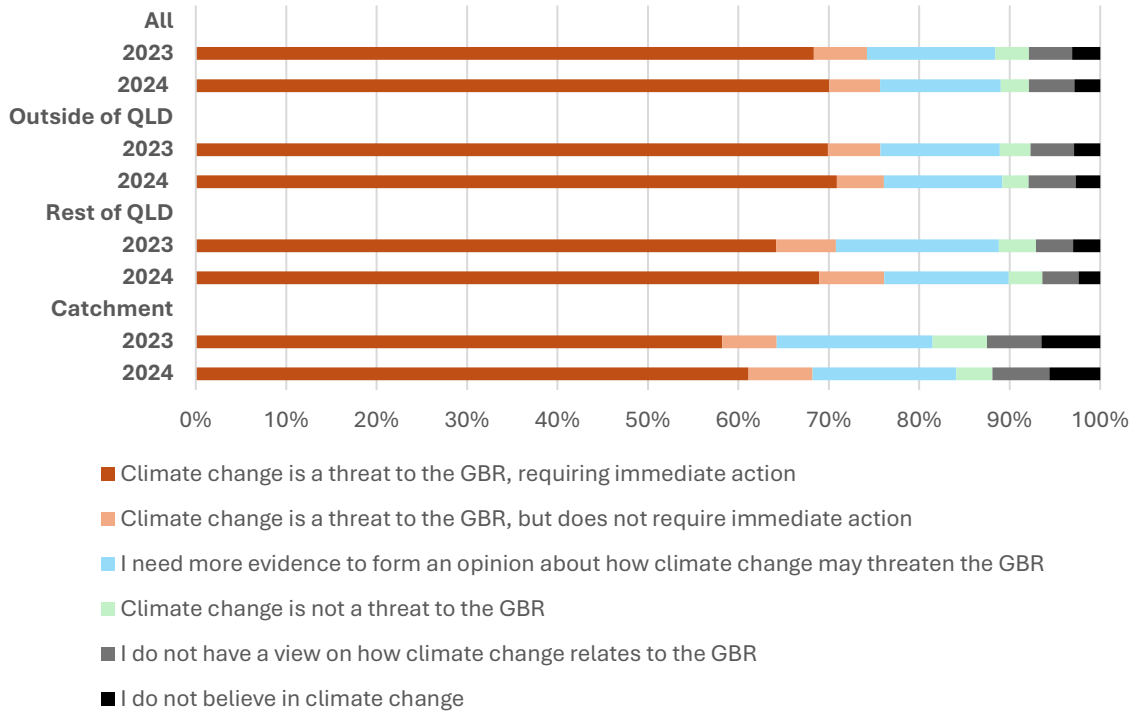


Figure 10. Perceptions of climate risk among respondents displayed per year and geographical location.

Spatial distancing does not impact climate change concerns specifically related to the Reef and in fact, the inverse is more likely – that is, living further from the Reef incited stronger emotions about the immediacy of climate change threats, and its current status, pride and need for protection. Aligning with this finding is the broader National Climate Action Survey results in 2022 (Bradley et al., 2023) that found that around two thirds of Australians rely on

their own observations and experiences for information about climate change, narrowly behind the most popular sources of commercial media (67.96%) and public broadcasters (67.61%). In the absence of direct experience, Australians are more likely to be informed by media (news, social and online) for their information on the Reef.

The reliance on personal observations to determine climate impacts was evident in the open-ended questions:

> *There is no problem with the reef, it dies off and then grows again. When snorkeling you see dead area's but there is still slot around (*Respondent outside of Queensland, 2023)

> *I have been visiting the reef for the past 50 years on a regular basis off North Queensland and I have failed to notice any damage done by climate change* (Catchment Respondent, 2023)

See the Reef, Love the Reef, Protect the Reef?

Since 2019, the Reef Authority has used the tagline *"See the Reef, Love the Reef, Protect the Reef"* to guide its public communication efforts (Mosaic Insights, 2024). The desired outcomes for communication strategies of each element of the tagline are underlining a connected pathway, that is: **"See the Reef"** to promote awareness and education, **"Love the Reef"** to foster emotional connection and advocacy, and **"Protect the Reef"** to encourage action and engagement (See Figure 11 for a conceptual model). To empirically test the effectiveness of this public communication, we have aligned survey questions with the tagline to test the extent to which the intended communication outcomes are being achieved. In Table 6 we present the specific survey items that have been aligned with each component of the tagline.

Figure 11. Expectations for See the Reef, predicting Love for the Reef, which will predict Protect the Reef.

Table 6. Survey questions aligned with Communication Objectives

Objective	Desired outcomes (Source: GBRMPA Communications Strategy 2021 – 2024)	Survey Questions
See the Reef 	People experience the Reef	When was your last visit to the GBR?
	Recognise the issues and opportunities.	To what extent do you agree or disagree with each of the following statements about the Great Barrier Reef (GBR)? • I feel optimistic about the future of the GBR
Love the Reef 	People see the Reef as worth protecting	To what extent do you agree or disagree with each of the following statements about the Great Barrier Reef (GBR)? • I feel proud that the GBR is a World Heritage Area • The GBR is part of my Australian identity
	People love the Reef.	
	People love the Reef.	When/if you hear about climate-related damage to the Great Barrier Reef (e.g., from cyclones, mass coral bleaching, warming waters, ocean acidification), to what extent does it make you feel… • …sad • …angry
Protect the Reef 	people "practically help" and take action	To what extent do you agree or disagree with each of the following statements about the Great Barrier Reef (GBR)? • It is the responsibility of all Australians to protect the GBR • It is my responsibility to protect the GBR (recoded from: It is not my responsibility to protect the GBR) • The conservation of the GBR is more important than the expansion of coal mining (recoded from: The expansion of coal mining is more important than conservation of the GBR)

We conducted two separate analyses[2], each focused on a distinct aspect of the construct "Seeing the Reef." The first analysis used whether individuals had ever visited the Great Barrier Reef as a **physical engagement** indicator. The second analysis focused on the item

[2] For our analysis of See the Reef, Love the Reef, Protect the Reef, we used Structural Equation Modelling. This is a comprehensive statistical approach used to examine complex relationships among observed and unobserved (latent) variables.

"I feel optimistic about the future of the GBR," representing a more **cognitive or attitudinal** dimension, reflecting recognition of the Reef's issues and opportunities. Given the conceptual divergence between these indicators—one reflecting direct, experiential contact and the other capturing perceptions or beliefs—we analysed them independently rather than within a single model.

In the models, both **Love the Reef** and **Protect the Reef** were treated as *latent variables*, each measured using multiple observed indicators. This approach allows for a more robust representation of these underlying constructs by capturing the different dimensions that contribute to them. For example, Love for the Reef is measured by emotional feelings of pride towards the Great Barrier Reef, as well as the feelings of sadness and anger when thinking about the climate change damage to the Reef. Protecting the Reef is measured by indicators for personal and shared responsibility to protect and conserve the Reef.

Our analysis revealed that the physical engagement with the Reef (i.e., recency of a person's visit to the Reef) did not significantly influence their emotional connection, or "love," for the Reef. However, a strong positive relationship was observed between individuals' love for the Reef and their sense of responsibility to protect it. [3]

When looking at the more cognitive dimension of Seeing the Reef, we found that higher levels of optimism about the Reef's future were associated with a decreased emotional response to the Reef. The strong positive relationship between individuals' love for the Reef and their sense of responsibility to protect it remained high. [4]

While this See-Love-Protect the Reef model captures some key relationships, the statistical indicators for model fit suggest the model does not adequately capture the underlying (psychological) structure. Rather it captures only part of a more complex picture. To better understand people's emotional connection to the Reef - and their motivation to protect it - we looked at three different climate change indicators. While there are certainly other personal and external reasons that might influence someone's desire to protect the Reef, these climate-related factors offer a useful starting point for exploring how concern about climate change relates to people's willingness to take action.

[3] Full details of this model and its findings can be found in Appendix C.
[4] Full details of this model and its findings can be found in Appendix C.

What About Climate Change?

Recent publications have concluded that climate change is the biggest threat to the Great Barrier Reef (the Great Barrier Reef Outlook Report, 2024:162). Furthermore, an additional desired outcome of the *See the Reef, Love the Reef, Protect the Reef* campaign is to encourage individuals to take action on climate change (Source: GBRMPA Communications Strategy 2021–2024). Therefore, our analysis incorporated variables related to personal responsibility for addressing climate change. Specifically, we included measures of individuals' **climate urgency perception** (i.e., their belief in climate change and the importance they attribute to this issue), their level of **climate change concern**, and their thoughts on **climate responsibilit**y (i.e., their feelings of personal responsibility for climate change). We incorporated these factors into the model as (in)direct predictors of Australians' perceived personal responsibility for climate change, as well as their emotional connection to the Reef ("love for the Reef") and their motivation to protect it. Details on the items used in the analysis can be found in Table 7.

A key focus of our analysis was to identify factors that influence individuals' willingness to protect the Great Barrier Reef. Aligned with the campaign's central message, we tested a linear, sequential pathway in which *seeing the Reef* fosters *loving the Reef*, which in turn leads to *protecting the Reef* as discussed above. However, given the significant threat climate change poses to the Reef's long-term health, our model also incorporated climate-related variables as additional predictors.

Specifically, we examined how individuals' **belief in climate change**, **perceptions of its importance**, and **levels of concern** might influence their emotional connection to the Reef. For instance, individuals who report stronger concern about climate change, or who feel sad or angry about its impacts on the Reef, may be more likely to develop a deeper emotional bond with the Reef—ultimately motivating greater protective behaviours.

Moreover, we hypothesised that heightened **climate change concern** and stronger **emotional responses** toward the Reef would also increase individuals' sense of **personal responsibility for addressing climate change**, which in turn could enhance their willingness to take action to protect the Reef.

These complex interrelationships were assessed using Structural Equation Modelling (SEM), as illustrated in Figure 12.

Table 7. Survey questions aligned with climate change variables to help with predicting people's need to protect the Reef.

Objective	Questions used
Climate urgency perception 	How important is the issue of climate change to you personally? How serious a problem do you think climate change is right now? How serious a problem do you think climate change will be in 2050? To what extent do you agree or disagree with this statement: Climate change is an issue that requires urgent action NOW. Using the above definition, to what extent do you agree or disagree with this statement? • I am certain that climate change is really happening When, if at all, do you think Australia will start feeling the effects of climate change?
Climate concern 	How concerned, if at all, are you about climate change? Considering any potential effects of climate change that might affect you personally, how concerned, if at all, are you about climate change? Considering any potential effects of climate change that there might be on society in general, how concerned are you about climate change? How concerned are you that each of the following threats might directly affect you, your family, or your local environment in the foreseeable future? • Impacts of climate change, generally
Climate Responsibility (i.e., personal responsibility for climate change) 	To what extent do you agree or disagree with each of these statements? • Climate change is partly due to the way I choose to live my life • I feel partly responsible for contributing to the exhaustion of non-renewable energy resources • I feel partly responsible for climate change • I feel a sense of urgency to change my behaviour to help to reduce climate change

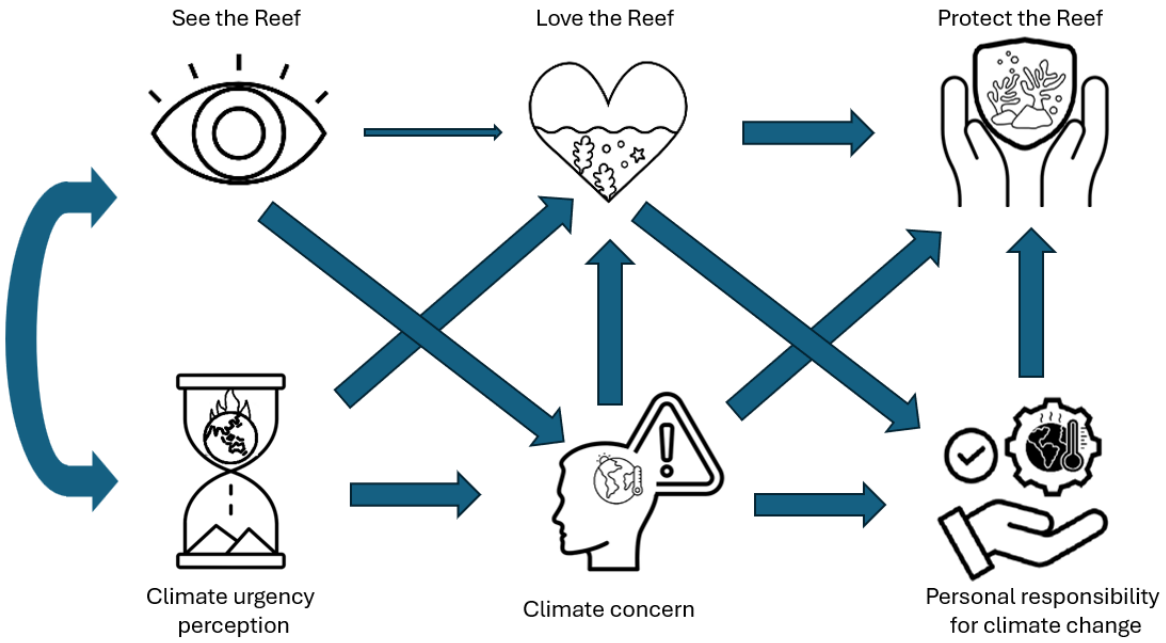


Figure 12. Underlying model for testing the relationships between See, Love, Protect the Reef, and our 3 climate change variables: climate urgency perception, climate concern, and personal responsibility for climate change.

As before, we ran two different models with a different predictor for Seeing the Reef.

Our findings indicate that by adding in these climate change variables, the model improves in predicting willingness to protect the Reef, showing acceptable-good model fit (for full details on model fit, see Table C.12 **Table C.12**in Appendix C).

When focusing on all the different direct effects in the model, we can conclude there is no relationship between seeing the reef (cognitively) and loving the reef, and only a very weak (negligible) negative relationship between seeing the Reef (physically) and emotions about the Reef.

There are also a very weak/negligible relationship ($\beta < 0.10$), between physically seeing the Reef, and Australians' perceptions of climate urgency, and – in both models – between climate urgency and love for the Reef; and love for the Reef and feeling personal responsibility for climate change, as well as between feeling personal responsibility for climate change and feeling the need to protect the Reef. Full details can be found in Appendix C, Figure C.18.

As in Models 1 and 2, these models show that people who felt a stronger emotional connection to the Reef—described as "Love for the Reef"—were more likely to believe it needs protection. There was also a strong positive link between perceptions of climate urgency and concern about climate change: individuals who saw climate change as more

urgent also expressed greater concern. This concern was in turn linked to a heightened sense of personal responsibility to take action and to stronger emotional attachment to the Reef.

While these climate-related variables were interconnected, their direct impact on people's willingness to protect and conserve the Reef was limited or weak. As shown in Figure 12, climate concern appears to be the key driver—shaping both emotional responses toward the Reef and the motivation to protect it. In contrast, people's cognitive understanding or direct experience of the Reef ("seeing" it) play only a very small role.

Given that climate change is the biggest threat to the Reef, these findings suggest that emotional concern about climate change, rather than simply seeing the Reef, drives the desire to protect it. Therefore, the established See-Love-Protect model may miss an opportunity to encourage a sense of stewardship and care that is more cognisant of the mediated nature of Reef experiences, rather than inferred direct visual exposure to the Reef as motivation for protection.

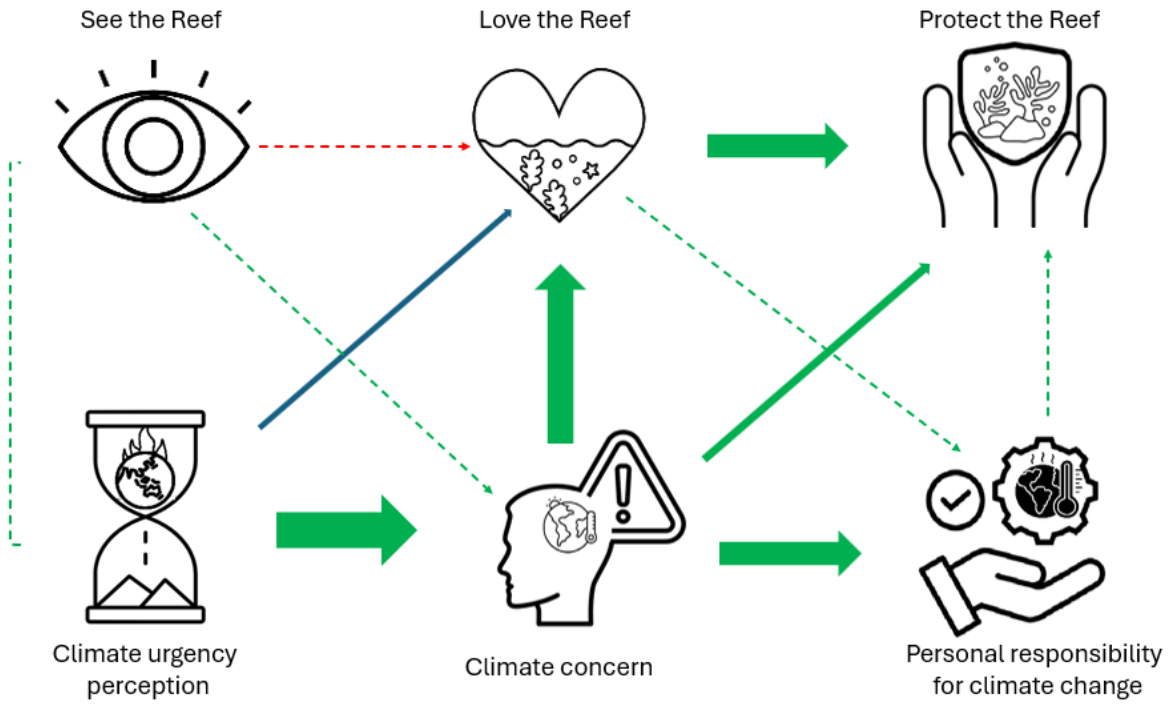


Figure 13. Results of a model testing the relationships between See, Love, Protect the Reef, and our three climate change variables: climate urgency perception, climate concern, and personal responsibility for climate change.
Blue arrows depict non-significant links, green arrows/lines depict positive relationships, red arrows depict negative relationships. Thickness of arrows depict strength of the relationship. Dotted lines depict only a significant relationship in one of the two models (either physical having seen the Reef, or seeing the Reef cognitively, and feeling optimistic about its future), as well as negligible relationships (i.e., standardised coefficients < .10).

Although the statistical fit of the model has improved, it still only captures part of a more complex reality. Future research could explore additional factors that may influence people's willingness to protect the Reef, including social, cultural, psychological and contextual elements that go beyond emotional connection or climate concern alone.

Given that Australians' emotions toward the Reef play such a crucial role in motivating protection—whether on their own (Figure 11) or as part of a more complex model that includes climate-related variables (Figure 13), we now turn to exploring ways to classify people into different categories based on their "love for the Reef".

What Type of Person Loves the Reef?

Having explored the relationships between seeing, loving, and protecting the Reef, we now turn our attention to understanding the different types of people in the community and their Reef connection. That is, rather than examining variables in isolation, we took a person-centred approach to identify distinct profiles of reef love and connection[5].

We found *three types of people* who love the Reef, see Figure 14 and Figure 15. Please see Appendix D for the full breakdown of the latent profile analyses.

The first group are **Reef Ambivalent**; these individuals have limited emotional responses to the Reef's issues (low levels of sadness and anger about climate change impacts on the Reef) but still somewhat recognise the Reef's broader significance (moderate pride in its World Heritage status and connection to Australian identity). This group is 29.8 % of the sample (the smallest group).

The second group are **Reef Aware**; this group sits around the middle of our measures, meaning they have moderate emotional responses to the Reef's threats (somewhat sad and angry about climate change impacts) and moderately value the Reef's importance (somewhat proud of its World Heritage status and see it as part of Australian identity). This group of people like the Reef but are not its most dedicated lovers and are32% of the sample fall into this group.

The third group are **Reef Connected**; they show strong emotional investment in the Reef's issues (feel quite sad and angry about climate change impacts on the Reef). They also strongly value the Reef's significance, expressing clear pride in its World Heritage status and viewing it as an important part of Australian identity. These are the people who are typically *the lovers of the Reef,* and they are38.2% of the sample (the largest group).

[5] We used latent profile analysis to identify the profiles/ groups. The analyses were conducted in Mplus

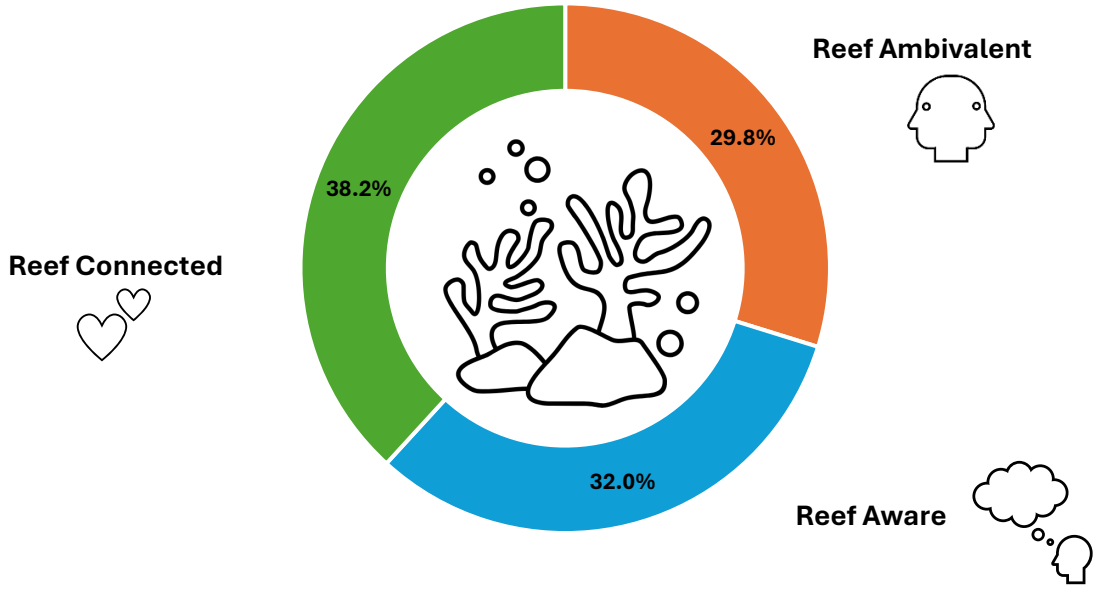


Figure 14. Distribution of Australians in each of the three groups.

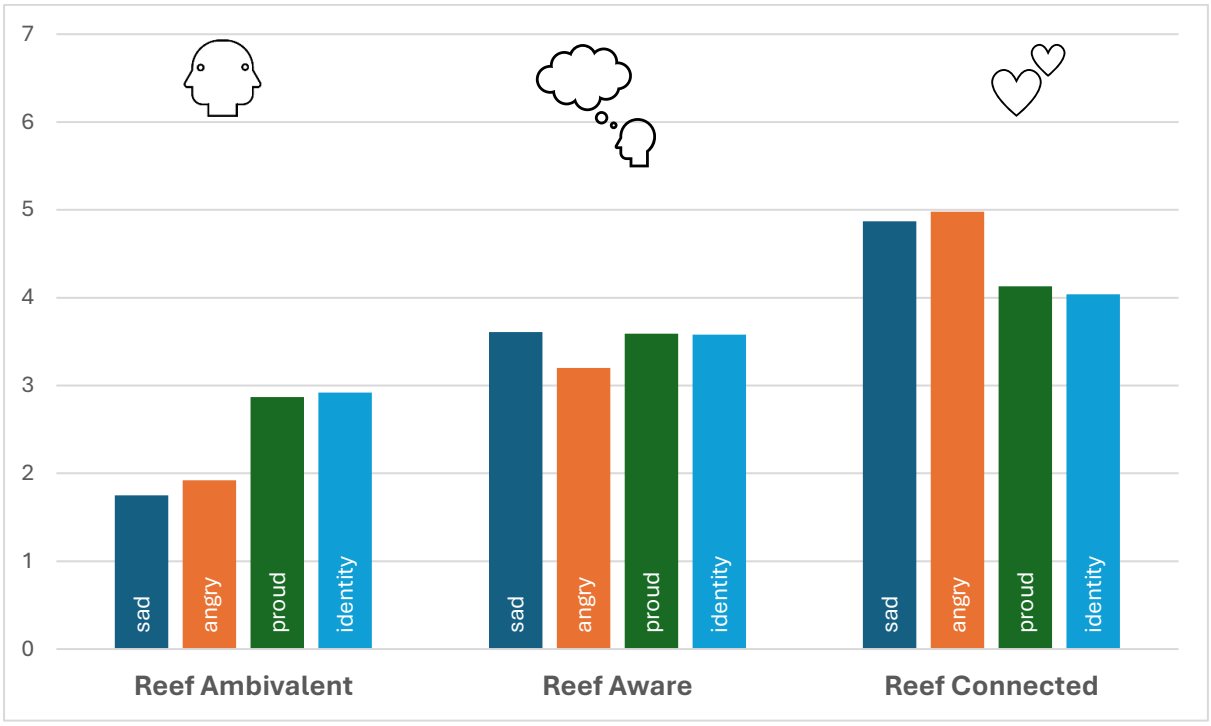


Figure 15. Groups (profiles) of people based on their love for the Reef

The Outcomes of Loving the Reef

Using the three profiles of Reef Ambivalent, Reef Aware, and Reef Connected individuals, we explored how these different groups varied across outcome variables of interest. The results suggest that emotional connection to the Reef is strongly linked to environmental concern and willingness to act, with those who care most about the Reef also being most motivated to protect it. These findings are also displayed in Figure 16. (see Appendix D for a detailed breakdown.)

Reef Ambivalent

People who felt less connected to the Great Barrier Reef, our ‘Reef Ambivalent’, showed the least concern about environmental issues and were least likely to take action to protect the Reef. They also felt less responsible for addressing climate change and protecting the Reef.

Reef Aware

Those who were more aware of the Reef but not deeply connected fell somewhere in the middle. This group showed moderate levels of environmental concern and responsibility, suggesting they recognise the importance of Reef protection but are not as motivated to act. Interestingly, they were the most pessimistic about the Reef's future and had the least confidence that it's being well managed.

Reef Connected

People who felt most connected to the Reef showed the strongest environmental attitudes and were most willing to take action. They felt the greatest responsibility for protecting the Reef, were most concerned about climate change and were also most worried about the Reef's future.

Figure 16

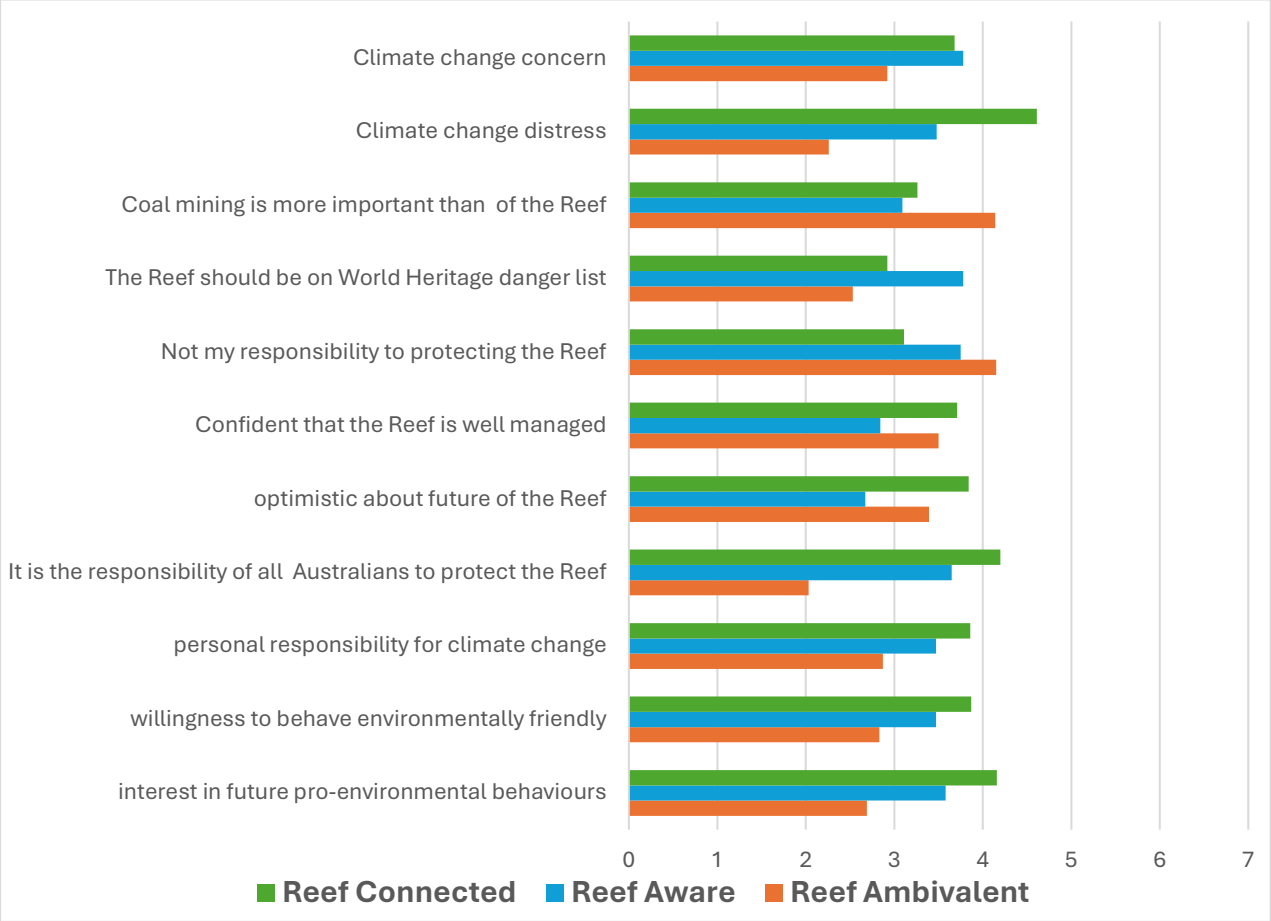


Figure 16. Outcomes of the Love the Reef profiles

Part 4 – Conclusion

This research is the first national survey to encapsulate Australian's perceptions about the World Heritage Listed Great Barrier Reef, climate change, and climate action. As a national survey, the number of people residing in the Reef Catchment area is relatively low, especially compared to those residing outside of Queensland. This can make statistical comparisons indicative rather than conclusive. However, having undertaken the design of our Reef questions in consultation with existing Reef survey experience alongside our broader expertise in climate surveys, our work is both complementary and innovative, bringing fresh local and national insights.

This research offers valuable insights into how Australians perceive and connect with the Reef, and how that connection influences their willingness to engage in climate action. By examining the linear progression of *See the Reef, Love the Reef, Protect the Reef*, testing additional climate factors, and identifying distinct audience segments through person-centred analyses, we provide a more nuanced understanding of the emotional and cognitive drivers behind pro-environmental behaviour to protect the Reef.

Our analyses paint a clear picture of the Reef, Australians and climate changes. As with Australians and climate change generally (see previous National Climate Action Survey; see Bradley et al, 2022, Deshpande et al, 2023, and Paas et al, 2024b), at first glance, there is general agreement amongst Australians that climate change is a threat to the Reef that requires immediate action. Also evident is the sense of national pride for the Reef alongside a sense of national responsibility to protect and care for the Reef. Optimism about the Reef's future and confidence in the management efforts of governments and official Reef organisations is less convincing.

On climate change and the Reef, distinguishing Reef catchment, rest of Queensland and outside of Queensland (i.e., the rest of Australia) illuminated geographical similarities and distinctions across the sample. Over 2023 and 2024 within the Reef catchment, emotions were generally less strong when thinking about climate change and the Reef – less anger, sadness, disappointment. Those outside of the catchment, both within and outside of Queensland felt stronger emotions about the Reef and climate change. However, it did not matter where Australians live, emotions about climate change and the Reef were not particularly pronounced given the threat of climate change to the Reef. Sad and disappointed were the two emotions that rated highest across the sample pointing to a national resolve on the Reef and its current predicament.

Understanding the complexities of these results and response requires consideration of context beyond individual survey responses. For example, the impact of media cannot be underestimated nor can the difficulty for Reef institutions and organisation's efforts to control local and national public narratives. In the open-ended responses, this was clearly evident in the 2024 sample where results from the AIMS Long Term Monitoring Program (AIMS, 2024) that found an increase in hard coral cover post the March mass coral bleaching event were seized upon by climate sceptics and reported in national syndicated media (see Lloyd, 2024; Ridd 2024). Alongside emboldening climate science deniers, this reporting had clearly reached respondents and impacted their understanding of climate impact on the Reef.

> *The Great Barrier Reef is thriving according to scientists whose opinions I respect* (Respondent outside of Queensland, 2023)

Communicating Reef science remains a challenge for all Reef organisations. Indeed, the greatest confusion and conjecture in the open-ended responses related to accuracy and trust in Reef and climate science. Responses oscillated between hope generated by coral cultivation projects to distrust in climate science and pseudoscience:

> *Pleased to hear of the coral being grown to replace coral lost (Respondent outside of* Queensland*, 2023)*

> *The Great Barrier Reef is THRIVING and there is NO SUCH THING as Climate Change!!!!!!!!!* (Respondent outside of Queensland, 2023)

> *The lies told about the deterioration of the reef are a disgrace. The reef is currently flourishing. The reef is a natural part of the area and goes in cycles. There has been a lot of lies told about the reef in the last 20 years*. (Respondent outside of Queensland, 2023)

> *Some millions of years ago, sea levels were more than 100 METRES above what they are now. MANKIND /INDUSTRIALISATION DID NOT CAUSE THAT. Some responsible scientists have stated that one day's volcanic activity would negate10 years of man's emission savings. Reefs around the world are recognised for self healing. WHAT WOULD THE REACTION BE IF WE WERE ENTERING A MINI ICEAGE* (Catchment Respondent, 2024)

Taken together with the quantitative results, the fraught nature of Reef science communication is evident (see Foxwell-Norton & Konkes, 2021; Konkes and Foxwell-Norton, 2021). The 2023 and 2024 NCAS Summary Reports (e.g., Paas et al., 2024b) provide some alternatives that can be pursued to support public communication and existing initiatives. Possibilities for different storytelling that appeals to those elements upon which

Australians agree, like national pride and identity may better support Reef communication broadly, including and beyond science communication.

The complicated relationships towards loving and protecting the Reef can also be used to garner public support, awareness and action around the Reef and climate change threats. Rather than stoking divisions between Reef catchment residents and especially, the rest of the Australia beyond Queensland, our results can be used to develop communication and engagement strategies that appeal across residences and better leverage Reef love. It is clear from our project that Reef love is not necessarily connected to 'seeing the Reef' and loving the Reef extends far beyond proximity to the Reef. Grouping 'Reef lovers' as we have done here – as Ambivalent, Aware or Connected – provides new pathways for how Reef focussed institutions and organisations might engage Australians in Reef management initiatives and climate change discussions more broadly. Our results suggest national love for the Reef is a likely ally in supporting public understanding of climate changes and the need for action. This project and its findings can thus support other less prominent Australian natures to develop and guide similar climate action and/or protection initiatives.

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Ridd 2024 COMMENTARY The Great Barrier Reef is in rude health — but why let facts get in the way By PETER RIDD 5:00am August 12, 2024

Appendix A

The Reef Specific Questions in the National Climate Action Survey

Question	2023 Repeat	2023 New	2024 Repeat	2024 New
	N ≤ 1184	N ≤ 2874	N ≤ 1542	N ≤ 2481
Do you have an idea of what the Great Barrier Reef (GBR) is?	Yes	Yes	No	Yes
Statement of GBR	Yes	Yes	Yes	Yes
Have you ever visited the GBR?	Yes	Yes	No	no
My last visit to the GBR was: *Answering options:* - *In the last 2 months* - *2-6 months ago* - *6-12 months ago* - *1-5 years ago* - *5 – 10 years ago* - *More than 10 years ago* In 2024 New, in order to combine questions 2 and 3, one option was added: *I have never visited the GBR*	Yes	Yes	No	Yes,
Which of the following statements best describes your beliefs about climate change and the GBR? *Answering options:* - *Climate change is a threat to the GBR, requiring immediate action* - *Climate change is a threat to the GBR, but does not require immediate action* - *I need more evidence to form an opinion about how climate change may threaten the GBR* - *Climate change is not a threat to the GBR* - *I do not have a view on how climate change relates to the GBR* - *I do not believe in climate change*	Yes	Yes	No	Yes
When/if you hear about climate-related damage to the Great Barrier Reef (e.g., from cyclones, mass coral bleaching, warming waters, ocean acidification), to what extent does it make you feel… - …sad - …angry - …afraid - …helpless - …disappointed - …confused - …determined *(Answering options: not at all, a little bit, somewhat, quite a bit, a great deal)*	Yes	Yes	No	Yes

Question	2023 Repeat	2023 New	2024 Repeat	2024 New
To what extent do you agree or disagree with each of the following statements about the Great Barrier Reef (GBR)? - I feel proud that 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 feel optimistic about the future of the GBR - I would not be personally affected if the health of the GBR declined - I feel confident that the GBR is well managed - It is not my responsibility to protect the GBR - The GBR should be on the World Heritage in danger list - The expansion of coal mining is more important than conservation of the GBR *(10 point answering scale from 1 very strongly disagree, to 10 very strongly agree, with the option to indicate I don't know)*	Yes	Yes	No	Yes
Please indicate whether you have taken action by helping an organisation (e.g., by volunteering your time) that is involved in protecting the Great Barrier Reef, in the last 12 months. *Answering options:* - *Yes, I engage/have engaged in this behaviour* - *No, I do not / have not engaged in this behaviour*	No	No	Yes	Yes
Are you aware of mass coral bleaching events in the GBR in the last 12 months? *Answering options:* - *Yes, I am fully aware of this bleaching* - *Yes, I have some idea* - *No, not at all* - *I believe that mass coral bleaching has NOT occurred on the GBR in the past 12 months* - *I don't know what coral bleaching is*	No	No	Yes	Yes
How serious an issue do you think these recent mass coral bleaching events are to the GBR? *(Answering options: Not at all serious, Low seriousness, Slightly serious, Moderately serious, Serious, High seriousness, Extremely serious)*	No	No	Yes	Yes
Do you have any further comments about the Great Barrier Reef and climate change? **(***open ended question)* _____	Yes	Yes	Yes	Yes

Other Relevant Questions in the Climate Action Survey

Construct	Question	2023 Repeat	2023 New	2024 Repeat	2024 New
		N ≤ 1184	**N ≤ 2874**	**N ≤ 1542**	**N ≤ 2481**
Demographics	Postcode (for location purposes)	Yes	Yes	Yes	Yes
	Gender	Yes	Yes	Yes	Yes
	Age	Yes	Yes	Yes	Yes
	Location (inner-urban, suburban, rural)	Yes	Yes	Yes	Yes
	Education level (university, trade, school)	Yes	Yes	Yes	Yes
Belief in Climate Change	**As far as you know, do you personally think that the world's climate is changing?** *Answering options:* - *Yes* - *No* - *Do not know* **Thinking about the causes of climate change, which of the following best describes your opinion?** *Answering options:* - *Climate change is entirely caused by natural processes* - *Climate change is mainly caused by natural processes* - *Climate change is partly caused by natural processes and partly caused by human activity* - *Climate change is mainly caused by human activity* - *Climate change is entirely caused by human activity* - *I think there is no such thing as climate change* - *Do not know* - *No opinion* **Using the above definition, to what extent do you agree or disagree with this statement?** - I am <u>certain</u> that climate change is really happening *(Answering options: Strongly disagree, Disagree, Slightly disagree, Neither agree nor disagree, Slightly agree, Agree, Strongly agree)*	Yes	Yes	Yes	Yes

Construct	Question	2023 Repeat	2023 New	2024 Repeat	2024 New
	When, if at all, do you think Australia will start feeling the effects of climate change? *Answering options:* - *We are already feeling the effects* - *In the next 10 years* - *In the next 25 years* - *In the next 50 years* - *In the next 100 years* - *Beyond the next 100 years* - *Never* - *Don't know/No opinion*				
Personal responsibility of CC	**To what extent do you agree or disagree with each of these statements?** - Climate change is partly due to the way I choose to live my life - I feel partly responsible for contributing to the exhaustion of non-renewable energy resources - feel partly responsible for climate change - I feel a sense of urgency to change my behaviour to help to reduce climate change *(Answering options: Strongly disagree, Disagree, Slightly disagree, Neither agree nor disagree, Slightly agree, Agree, Strongly agree)*	Yes	Yes	Yes	Yes
Spatial distance of CC	**To what extent do you agree or disagree with each of the following statements about climate change?** - Climate change will mostly affect areas that are far away from here - Climate change will mostly affect other countries *(Answering options: Strongly disagree, Disagree, Slightly disagree, Neither agree nor disagree, Slightly agree, Agree, Strongly agree)*	Yes	Yes	Yes	Yes

Construct	Question	2023 Repeat	2023 New	2024 Repeat	2024 New
Climate change risk perception	**Please indicate the extent to which you agree or disagree with each of these statements. Climate change will have a noticeably negative impact on …** - … my health (over the next 25 years) - … my economic and financial situation (over the next 25 years) - … the environment in which my family and I live *(Answering options: strongly disagree, disagree, slightly disagree, slightly agree, agree, strongly agree)* **In your opinion, what is the risk of climate change exerting a significant impact on …** - … public health in your state or territory? - … economic development in your state or territory? - … the environment in your state or territory? *(Answering options: low risk, slight low risk, moderate low risk, slight high risk, moderate high risk, high risk)*	Yes	Yes	Yes	Yes
Importance of CC issue	**How important is the issue of climate change to you personally?** *(Answering options: Not at all important, Low importance, Slightly important, Moderately important, Important, High importance, Extremely important)* **How serious a problem do you think climate change is right now?** *(Answering options: Not at all serious, Low seriousness, Slightly serious, Moderately serious, Serious, High seriousness, Extremely serious)* **How serious a problem do you think climate change will be in 2050?** *(Answering options: Not at all serious, Low seriousness, Slightly serious, Moderately serious, Serious, High seriousness, Extremely serious)* **To what extent do you agree or disagree with this statement: Climate change is an issue that requires urgent action NOW.** *(Answering options: Strongly disagree, Disagree, Slightly disagree, Neither agree nor disagree, Slightly agree, Agree, Strongly agree)*	Yes	Yes	Yes	Yes

Construct	Question	2023 Repeat	2023 New	2024 Repeat	2024 New
CC Distress	**Some people may feel that climate change is distressing. It may or may not be like this for you. Please indicate the extent to which each of the following statements reflects your own feelings about the threat of climate change** - I feel distressed when I see or read media coverage of the likely impacts of climate change - At times, I worry about what the world will be like in the future because of climate change - I feel guilty when I think of how the lifestyle of my family and friends contributes to climate change - It upsets me when I think that there is so little I can do about climate change and other environmental problems - The more I learn about the threat of climate change, the more anxious I become - At times, I feel overwhelmed when thinking about the future impact of climate change *(Answering options: Strongly disagree, Disagree, Slightly disagree, Neither agree nor disagree, Slightly agree, Agree, Strongly agree)*	Yes	Yes	Yes	Yes
CC Concern	**How concerned, if at all, are you about climate change?** *Answering scale: Not At All Concerned, Not Very concerned, Fairly Concerned, Very Concerned)* **Has your level of concern about climate change increased, decreased, or remained the same over the past year (i.e., since September-October last year)?** *(Answering options: Decreased substantially, decreased moderately, Decreased slightly, Remained the same, Increased slightly, Increased moderately, Increased substantially)* **Considering any potential effects of climate change that might affect you personally, how concerned, if at all, are you about climate change?** *(Answering options: Not at all concerned, Not very concerned, Fairly concerned, Very concerned, Do not know, No opinion)* **Considering any potential effects of climate change that there might be on society in general, how concerned are you about climate change?** *(Answering options: Not at all concerned, Not very concerned, Fairly concerned, Very concerned, Do not know, No opinion)*	Yes	Yes	Yes	Yes

Construct	Question	2023 Repeat	2023 New	2024 Repeat	2024 New
	How concerned are you that each of the following threats might directly affect you, your family, or your local environment in the foreseeable future? - Impacts of climate change, generally *(Answering options: Not at all concerned, a little concerned, slightly concerned, moderately concerned, concerned, greatly concerned, extremely concerned)*				

Appendix B

Table B.8. Responses in % for the questions “To what extent do you agree or disagree with each of the following statements about the Great Barrier Reef (GBR)?”

	2023 repeat			2023 New			2024 new		
	catchment	QLD	Aus	catchment	QLD	Aus	catchment	QLD	Aus
n=	**65**	**183**	**895**	**150**	**421**	**2181**	**126**	**377**	**1856**
I feel proud that the GBR is a World Heritage Area									
1 = very strongly disagree	0.0	1.1	0.6	0.7	0.5	0.9	0.0	0.8	0.7
2	0.0	0.5	0.1	0.0	0.5	0.1	0.0	0.0	0.2
3	0.0	0.5	0.3	0.7	1.2	0.7	0.8	0.3	0.6
4	1.5	0.0	0.2	0.7	0.7	0.6	0.0	0.5	0.6
5	9.2	2.7	3.4	5.3	2.9	2.2	5.6	2.7	2.5
6	7.7	4.4	5.8	12.0	6.2	7.1	4.8	5.0	7.0
7	4.6	4.4	6.7	7.3	9.0	6.5	4.8	5.8	6.5
8	10.8	16.9	18.8	14.0	14.3	18.3	18.3	19.6	16.9
9	10.8	16.9	15.0	12.0	15.9	13.9	14.3	14.6	14.0
10 = very strongly agree	50.8	51.4	47.2	45.3	47.3	48.0	49.2	47.5	49.1
I don't know	4.6	1.1	2.0	2.0	1.7	1.6	2.4	3.2	1.9
It is the responsibility of all Australians to protect the GBR									
1 = very strongly disagree	3.1	0.0	1.1	1.3	1.2	1.0	1.6	1.1	1.0
2	0.0	0.5	0.4	0.0	0.2	0.4	1.6	0.0	0.5
3	1.5	0.5	1.5	4.7	0.7	1.1	0.8	1.3	1.0
4	1.5	1.1	0.6	0.0	2.1	1.3	0.0	1.1	1.1
5	6.2	4.9	4.5	3.3	3.8	4.1	5.6	4.2	3.3
6	7.7	4.4	7.3	15.3	7.4	9.3	9.5	5.6	7.0
7	6.2	10.4	8.0	8.0	10.7	9.0	9.5	6.4	8.5
8	12.3	17.5	16.6	14.0	14.3	17.1	13.5	16.7	17.0
9	18.5	16.9	14.5	11.3	12.1	12.8	5.6	14.6	13.6
10 = very strongly agree	40.0	42.1	43.5	41.3	46.6	42.5	49.2	47.7	45.4
I don't know	3.1	1.6	2.0	0.7	1.0	1.3	3.2	1.3	1.7
The GBR is part of my Australian identity									
1 = very strongly disagree	1.5	3.8	4.7	4.0	3.3	4.2	5.6	4.2	4.4
2	3.1	2.7	2.0	0.7	1.7	2.3	1.6	2.7	2.2
3	1.5	2.7	3.9	2.7	3.3	4.4	1.6	3.7	3.6
4	3.1	1.6	3.6	4.0	5.0	4.4	3.2	2.7	3.1
5	13.8	8.2	9.1	6.0	8.6	9.1	5.6	9.0	7.8
6	12.3	8.2	11.3	12.0	11.9	12.0	11.9	9.0	10.8
7	4.6	10.9	8.4	8.0	8.8	9.2	6.3	5.8	8.9
8	10.8	15.3	13.5	13.3	12.6	13.2	13.5	14.1	14.8

	2023 repeat			2023 New			2024 new		
	catchment	QLD	Aus	catchment	QLD	Aus	catchment	QLD	Aus
9	15.4	10.4	10.4	12.7	9.0	10.9	7.1	13.3	10.8
10 = very strongly agree	30.8	35.0	29.1	35.3	33.3	27.3	41.3	32.6	30.2
I don't know	3.1	1.1	4.1	1.3	2.6	3.1	2.4	2.9	3.4

I feel optimistic about the future of the GBR

1 = very strongly disagree	7.7	6.0	5.1	4.0	6.7	5.9	6.3	8.0	6.0
2	0.0	2.7	3.0	1.3	5.2	4.2	2.4	2.1	4.1
3	3.1	7.1	7.2	7.3	7.6	9.3	6.3	8.5	7.7
4	4.6	8.7	6.1	6.0	9.3	10.1	9.5	8.2	9.9
5	16.9	8.7	14.6	14.0	12.6	13.8	10.3	18.3	13.6
6	7.7	8.2	15.5	15.3	14.3	13.9	10.3	12.5	14.9
7	10.8	8.7	10.1	15.3	12.6	11.2	11.9	9.8	11.6
8	21.5	19.1	14.4	9.3	13.1	11.2	15.9	11.7	10.6
9	6.2	8.7	8.6	7.3	8.3	6.6	8.7	7.2	6.6
10 = very strongly agree	16.9	16.4	10.8	17.3	7.4	8.9	15.1	10.1	10.7
I don't know	4.6	5.5	4.5	2.7	3.1	4.8	3.2	3.7	4.2

I would not be personally affected if the health of the GBR declined

1 = very strongly disagree	16.9	16.4	12.3	19.3	14.3	11.7	24.6	14.6	15.3
2	7.7	7.1	5.7	6.0	7.1	6.7	4.0	6.4	7.0
3	9.2	12.6	11.2	10.7	11.6	11.0	9.5	14.9	10.7
4	6.2	8.2	8.6	6.7	11.2	10.4	9.5	9.0	9.7
5	12.3	14.8	12.7	15.3	14.7	14.2	15.9	14.3	12.8
6	6.2	4.9	13.0	11.3	10.7	12.5	7.1	13.8	10.6
7	7.7	5.5	6.5	8.7	6.4	7.5	4.0	5.8	7.3
8	12.3	12.6	11.1	4.7	11.6	9.0	10.3	8.2	8.9
9	6.2	6.6	5.0	5.3	5.0	5.2	4.0	3.2	4.5
10 = very strongly agree	7.7	3.3	6.5	7.3	2.9	5.8	5.6	5.3	7.2
I don't know	7.7	8.2	7.5	4.7	4.5	6.0	5.6	4.5	6.0

I feel confident that the GBR is well managed

1 = very strongly disagree	3.1	6.6	6.1	4.0	5.0	6.1	7.1	6.9	6.2
2	4.6	5.5	4.6	3.3	6.4	4.5	4.8	4.2	5.4
3	9.2	9.3	6.0	5.3	12.1	10.2	6.3	8.2	7.8
4	1.5	2.7	7.2	12.0	9.5	10.5	5.6	12.5	9.1
5	13.8	12.0	13.0	17.3	15.7	15.2	16.7	15.4	14.9
6	10.8	12.0	14.9	14.0	15.0	16.3	12.7	14.3	15.2

	2023 repeat			2023 New			2024 new		
	catchment	QLD	Aus	catchment	QLD	Aus	catchment	QLD	Aus
7	12.3	13.1	11.8	14.0	8.6	9.2	9.5	11.4	11.6
8	15.4	13.1	12.4	12.0	13.1	10.7	13.5	12.2	9.9
9	10.8	11.5	7.9	7.3	5.2	5.4	9.5	4.8	6.5
10 = very strongly agree	15.4	7.1	8.4	6.0	5.7	4.8	7.9	6.4	6.3
I don't know	3.1	7.1	7.7	4.7	3.8	7.0	6.3	3.7	7.0
It is not my responsibility to protect the GBR									
1 = very strongly disagree	15.4	14.8	13.5	20.7	13.8	15.2	22.2	20.7	18.4
2	4.6	7.1	8.2	8.7	9.7	8.3	6.3	8.5	8.2
3	10.8	17.5	10.6	8.0	11.4	12.4	14.3	13.8	10.5
4	10.8	10.4	11.5	10.7	11.9	10.7	8.7	9.8	10.0
5	20.0	18.0	15.3	24.0	18.5	18.3	11.9	17.2	16.8
6	13.8	6.6	12.1	12.0	12.6	12.2	12.7	10.1	11.7
7	4.6	6.0	6.3	3.3	6.2	6.1	5.6	6.6	5.4
8	1.5	8.2	6.4	3.3	6.7	5.2	5.6	3.7	5.8
9	3.1	4.4	4.8	4.0	2.6	3.6	3.2	2.9	3.6
10 = very strongly agree	4.6	2.7	5.3	2.7	4.0	4.3	3.2	3.4	5.6
I don't know	10.8	4.4	6.1	2.7	2.6	3.7	6.3	3.2	4.0
The GBR should be on the World Heritage in danger list									
1 = very strongly disagree	10.8	4.9	3.8	6.0	3.8	2.8	5.6	4.8	3.0
2	4.6	1.6	1.3	3.3	1.2	1.4	0.8	1.6	0.8
3	4.6	3.3	1.5	4.7	1.9	1.7	3.2	1.9	1.5
4	6.2	2.7	1.7	1.3	2.9	1.5	4.8	1.3	1.7
5	7.7	9.3	5.5	9.3	6.2	5.1	7.9	8.0	4.4
6	12.3	9.3	5.8	12.0	8.8	8.9	11.1	9.3	8.8
7	6.2	7.7	8.6	12.0	10.0	9.1	7.9	7.4	9.9
8	6.2	9.8	14.9	14.0	12.1	14.4	11.1	17.8	14.0
9	4.6	14.2	14.4	7.3	12.4	12.8	11.1	9.8	12.4
10 = very strongly agree	27.7	29.5	34.0	23.3	34.4	34.4	29.4	32.4	36.1
I don't know	9.2	7.7	8.6	6.7	6.4	7.8	7.1	5.8	7.6
The expansion of coal mining is more important than conservation of the GBR									
1 = very strongly disagree	41.5	36.1	44.2	37.3	43.7	42.2	37.3	41.4	45.3
2	12.3	8.7	8.3	4.7	6.9	9.1	9.5	10.3	9.2
3	7.7	15.3	9.2	10.7	8.8	10.1	11.1	9.5	9.3
4	3.1	4.9	5.7	6.0	7.8	7.6	5.6	7.2	6.1
5	10.8	11.5	10.2	18.7	11.2	9.7	11.1	12.2	7.3
6	6.2	5.5	4.0	4.0	3.8	3.9	7.9	5.6	4.3
7	4.6	1.1	2.7	4.0	4.0	2.5	4.0	2.1	2.9
8	4.6	3.3	3.0	2.0	2.9	2.4	0.8	2.9	2.5
9	0.0	1.1	1.0	0.0	1.4	1.7	1.6	0.5	2.2

	2023 repeat			2023 New			2024 new		
	catchment	**QLD**	**Aus**	**catchment**	**QLD**	**Aus**	**catchment**	**QLD**	**Aus**
10 = very strongly agree	3.1	1.6	1.9	4.7	2.4	2.2	2.4	1.9	2.2
I don't know	6.2	10.9	9.8	8.0	7.1	8.7	8.7	6.4	9.0

Table B.9a. Responses for the Climate questions in 2023

	2023 repeat (n=1184)									2023 new (N=2874)								
	catchment			QLD			Aus			catchment			QLD			Aus		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
Belief in Climate Change	66	20.45	6.70	186	21.88	6.30	932	22.45	5.75	150	21.05	6.69	435	22.30	5.60	2289	22.67	5.31
Personal Responsibility of CC	66	13.14	6.50	186	14.30	6.78	932	15.42	6.36	150	14.25	6.18	435	15.34	6.42	2289	15.97	5.96
spatial distance of Climate Change	66	5.79	2.81	186	5.94	3.07	932	6.07	2.96	150	5.72	3.01	435	6.29	3.17	2289	6.39	3.01
Climate change risk perception	66	22.26	7.59	186	22.32	8.63	932	23.46	7.68	150	22.57	8.22	435	23.83	7.62	2289	24.19	7.43
Importance of climate change issue	66	16.21	7.54	186	17.82	7.87	932	19.04	7.10	150	17.10	7.36	435	19.03	7.03	2289	19.48	6.50
Climate change Distress	66	21.27	10.11	186	22.96	9.74	932	23.96	9.50	150	22.83	10.00	435	25.15	9.93	2289	25.78	9.17
Climate change concern	66	20.71	8.63	186	21.55	8.33	932	22.81	7.84	150	21.37	8.08	435	23.15	7.84	2289	23.64	7.35

Table B.10b. Responses for the Climate related constructs in 2024

	2024 repeat (N=1542)									2024 new (N=2481)								
	catchment			QLD			Aus			catchment			QLD			Aus		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
Belief in Climate Change	76	18.74	7.73	247	21.30	6.46	1219	21.68	6.39	128	21.43	6.03	387	22.58	5.57	1966	22.76	5.31
Personal Responsibility of CC	76	12.18	6.57	247	14.11	6.26	1219	14.96	6.37	128	14.39	6.54	387	15.59	6.09	1966	16.17	6.17
spatial distance of Climate Change	76	5.62	2.70	247	5.93	3.04	1219	6.22	3.05	128	5.77	2.97	387	5.98	3.08	1966	6.38	3.12
Climate change risk perception	76	19.03	8.61	247	21.68	8.12	1219	21.95	8.06	128	22.23	8.64	387	23.87	7.71	1966	24.40	7.44
Importance of climate change issue	76	15.17	8.30	247	17.00	7.59	1219	17.93	7.35	128	17.52	7.27	387	18.87	6.74	1966	19.47	6.56
Climate change Distress	76	19.89	10.29	247	23.11	9.93	1219	23.35	9.59	128	24.19	10.28	387	25.17	9.45	1966	25.97	9.35
Climate change concern	76	19.18	9.05	247	21.62	8.34	1219	22.34	8.16	128	22.26	8.68	387	23.85	7.69	1966	24.43	7.70

Appendix C

We conducted Structural Equation Modelling (SEM) in IBM SPSS AMOS version 30, using maximum likelihood estimation procedures to test the proposed models for See, Love, Protect the Reef.

The first SEM conducted was to test the direct effect from See the Reef, Love the Reef, Protect the Reef. The model was specified to only have two direct paths: 1) from See to Love the Reef, and 2) from Love to Protect the Reef (Figure 10). For model testing, “See the Reef” was treated as a manifest or observed variable, and “Love the Reef” and “Protect the Reef” were seen as latent variables. Indicators of these latent variables are listed in Table 7.

For these models, we used the combined 2023 sample (N=3895), as distinguishing between the different geographical locations would not give us enough power. In this model we also looked at the fit for the individual constructs within the latent variables, and their standardised loadings on the latent variables. These standardised regression coefficients can be found in Table C.11 as well as the standardised regression coefficients for these two direct paths.

We found that all our observed variables were significant indicators of our latent variables. We further found that in Model 1: Seeing the Reef did not predict Love for the Reef (β = -.015, p = .773). Love for the Reef was a strong predictor for protecting the Reef (β = .847, p < .001; see Figure C.17).

Our second model tested how *optimism* for the Reef’s future predicted people’s emotions towards the Reef (i.e., Love for the Reef), and in turn their willingness to protect the Reef. We found that higher optimism lead to lower emotions (i.e., sad, anger, proud, and part of their Australian Identity) about the Reef, (β = -.244, p < .001), with higher emotions leading to more willingness to protect the Reef (β = .830, p < .001; see Figure C.17)

Model fit was assessed using five fit indices: 1) chi-square (χ^2; the value of which, ideally, should be non-significant), 2) root mean square error of approximation (RMSEA; where values below .05 indicate a good fit and values between .05 and .08 indicate a good fit, with scores higher than .08 indicating acceptable, and scores higher than.10 indicating a poor fit), 3) comparative fit index (CFI; where values greater than .95 indicate a good fit, and values higher than .90 indicate acceptable fit), and 4) standardised root mean square residual (SRMR; where values below .08 indicate a good fit; Hair, Black, Babin, & Anderson, 2010; Hu & Bentler, 1999). We found that Model 1 and model 2 had a poor model fit, with significant χ^2, relatively high RMSEA, relatively low CFI, and relatively high SRMR, meaning

that they do not adequately represent the data in our observed data, and we might have missed key variables. Full details of our SEM model fit statistics for all tested models can be found in Table C2.

Table C.11. The standardised regression weights in our models.

		Model			
Latent variable	**Observed variable**	**1 – See (physical), Love, Protect**	**2 – See (optimism), Love, Protect**	**3 – See (physical), Love, Protect, including climate variables**	**4 – See (optimism), Love, Protect, including climate variables**
Love the Reef	Proud	0.499	0.477	0.460	0.460
	Part of identity	0.413	0.386	0.375	0.375
	Sad	0.867	0.881	0.880	0.880
	Angry	0.823	0.829	0.837	0.838
Protect the Reef	Responsibility of all Australians	0.666	0.651	0.616	0.616
	My responsibility	0.545	0.552	0.567	0.566
	Conservation more important than coal mining	0.496	0.509	0.538	0.538
Climate Urgency	How important is the issue personally	n/a	n/a	0.886	0.884
	How serious right now	n/a	n/a	0.919	0.919
	How serious in 2050	n/a	n/a	0.925	0.927
	Climate change requires urgent action NOW	n/a	n/a	0.916	0.916
	Certain climate change is happening	n/a	n/a	0.810	0.811
	When do you feel Australia will start feeling the effects of climate change	n/a	n/a	0.779	0.779
Climate concern	How concerned are you about climate change	n/a	n/a	0.938	0.938
	Considering personal impacts of climate change, how concerned?	n/a	n/a	0.875	0.875
	Considering societal impacts of climate change, how concerned?	n/a	n/a	0.898	0.898
	How concerned are you about climate change, generally	n/a	n/a	0.897	0.897
Climate responsibility	Climate change is partly due to how I live my life	n/a	n/a	0.815	0.815
	I feel partly responsible for contributing to the exhaustion of non-renewable energy sources	n/a	n/a	0.911	0.911
	I feel partly responsible for climate change	n/a	n/a	0.927	0.927
	I feel a sense of urgency to change my behaviours to reduce climate change	n/a	n/a	0.840	0.840

Note: all observed variables load significantly onto their latent variables

Figure C.17. Findings for Models 1 and 2: See the Reef, predicting Love for the Reef, which will predict Protect the Reef. With the top number on a path being the standardised coefficient for physically having seen the Reef (model 1), and the bottom number on a path being the standardised coefficient for being optimistic about the Reef's future (model 2). Bolded numbers are significant at the .001 level, regular (non-bold) numbers are not statistically significant.

Since climate change is the biggest threat to the Reef, and our first two models had very low fit statistics to explain Protect the Reef, we decided to include climate change related indicators into our model. More specifically, we included indicators for Australians' belief in climate change and the **urgency** of this problem (now and in the future), their **concerns** about climate change (personally, societal), and their feelings of **responsibility** towards climate and climate change (directly, or indirectly for contributing to exhaustion of non-renewable energy).

Two more models were conducted, with model 3 focusing on seeing the Reef physically (like model 1), and model 4 focusing on optimism for the Reef's future (like model 2); see Figure 12 for the underlying model.

Firstly, we found that all our observed variables were significant indicators of our latent variables (see Table C.11 for the standardised regression coefficients). We further found that in Models 3 (similar to Model 1), the effect of See the Reef, to Love for the Reef (i.e., emotions about the Reef), was very small (instead of non-significant). In model 4, this standardised effect became non-significant, rather than small and significant compared to the direct effect in model 2. The associations between Love and Protect the Reef became smaller, most likely because the differences in Protect the Reef are now explained due to the climate change variables. Full details of all the standardised path coefficients and their significance levels can be found in Figure C.18. A more simplistic version of these models can be found in the main text in Figure 13.

Based on our model fit data, the models including climate change variables are better than those without these climate variables, and are showing good SRMR, acceptable CFI, and acceptable RMSEA. The χ^2 of both models is still significant. Since the models are only

showing acceptable to good fit indices, further improvements might be made by including additional predictors/variables into the model.

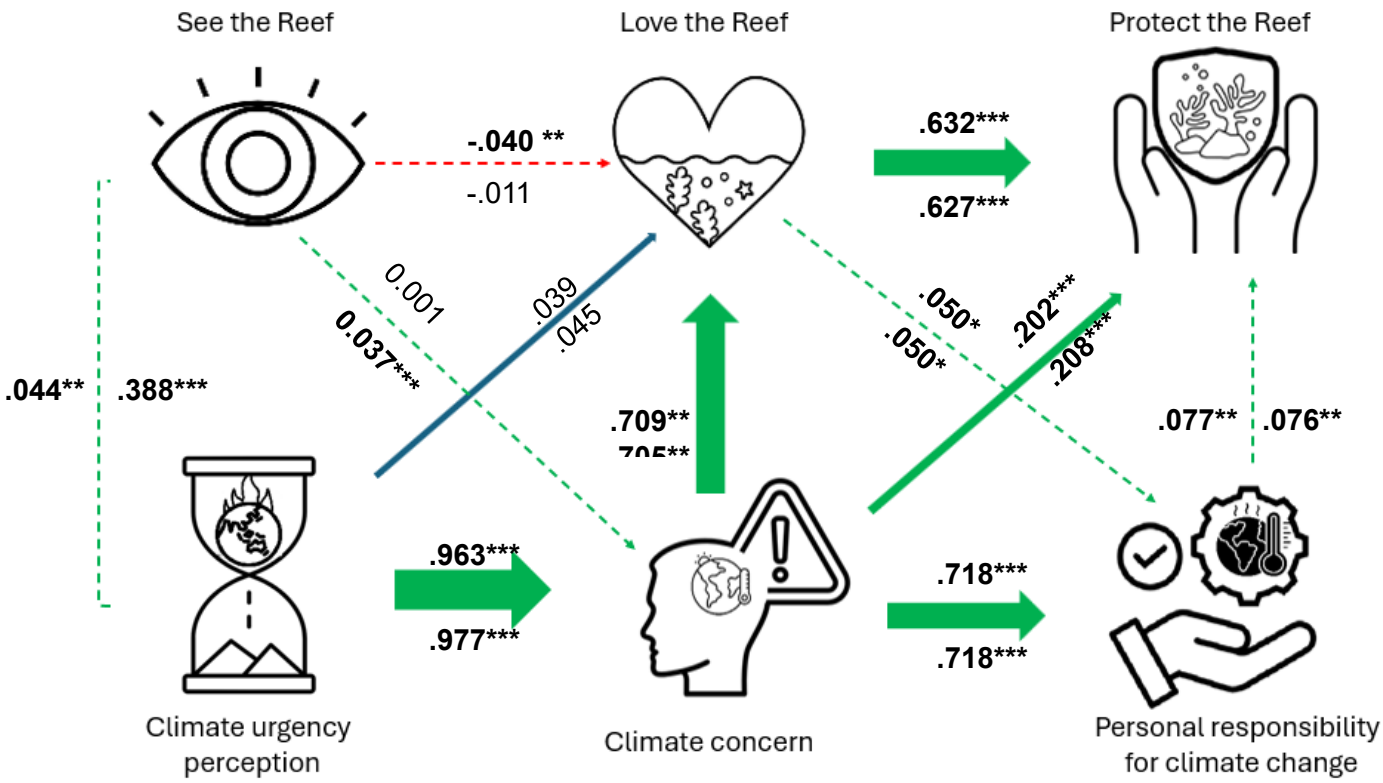

Figure C.18. Findings for Models 3 and 4: See the Reef, predicting Love for the Reef, which will predict Protect the Reef; as well as the direct effects of climate change variables. With the first number on a path being the standardised coefficient for physically having seen the Reef (model 1), and the bottom number on a path being the standardised coefficient for models focusing on being optimistic about the Reef's future as indicator of "seeing the Reef" (model 4). Bolded numbers are significant, with *** significant at p < .001, ** p < .01, and * p < .05, regular (non-bold) numbers are not statistically significant.

Table C.12. Model fit indices for each of our models.

Model	χ^2	***RMSEA***	***CFI***	***SRMR***
1 – See (physical), Love, Protect	2233.265, p<.001	.173	.765	.0958
2 – See (optimism), Love, Protect	3106.366, p<.001	.204	.705	.1276
3 – See (physical), Love, Protect, including climate variables	5969.046, p<.001	.086	.925	.0597
4 – See (optimism), Love, Protect,	6719.798, p<.001	.092	.916	.0666

including climate variables	

Appendix D

We conducted a Latent Profile Analysis (LPA) in Mplus version 8.6 (Muthén & Muthén, 1998–2017), using four items that reflect peoples love for the reef (When/if you hear about climate-related damage to the Great Barrier Reef (e.g., from cyclones, mass coral bleaching, warming waters, ocean acidification), to what extent does it make you feel…sad, … angry, I feel proud that the Great Barrier Reef is a World Heritage Area, The Great Barrier Reef is part of my Australian identity) as indicators to determine the profiles.

We could not run a multi-group LPA or conduct tests of invariance between the three regions (Reef catchment, Queensland and rest of Australia), as this would require sufficient sample sizes to first test the model separately in each region (at least 500 participants). As such we conducted the analyses using the full sample.

Model best fit was determined by a smaller value on the Akaike's Information Criterion (AIC), Bayesian information criterion (BIC) and adjusted BIC and a significant ($p < .05$) Vuong–Lo–Mendell–Rubin test (VLMR) and bootstrapped likelihood ratio test (BLRT) indicating that the model has better fit than the previous iteration with fewer profiles (Asparouhov & Muthén, 2012; Tein et al., 2013). We also considered theoretical fit such that, for instance, the final solution should not have multiple profiles with little conceptual differentiation.

We concluded that the three-profile solution had the best fit with the data (Table D.13). The three-profile solution had a significant VLMR and lower AIC, BIC and aBIC than the two-profile solution.

Table D.13. LPA model fit

k	AIC	BIC	aBIC	VLMR, p =	BLRT, p =	Entropy	size of profiles	optseed
1 profile	53771.886	53822.025	53796.605	-	-	-	-	195763
2 profiles	49426.446	49507.923	49466.615	< .001	< .001	0.853	56.9% / 43.1%	563002
3 profiles	48435.293	48548.107	48490.912	< .001	< .001	0.801	29.8% / 38.2% / 32%	636396
4 profiles	45992.089	46136.24	46063.157	Does not converge			25.4% / 27.9% / 19.2% / 27.6%	314084
5 profiles	37242.778	37418.253	37329.281	Does not converge			1.81% / 11.93% / 29.05 %	358488

/ 12.58%
/ 44.64%

Note. The three profile solution (blue) fit the data best and is used for the rest of the analyses.

The indicator means (standard error and variance) for the three profiles are displayed in Table D.14 and illustrated in Figure 13 in the main report.

Table D.14. LPA Means and Variance for Three Profile Solution

	Profile 1 - low Reef Ambivalent		**Profile 2 - middle Reef Aware**		**Profile - 3 Reef Connected**	
Indicator	Mean (SE)	Variance (SE)	Mean (SE)	Variance (SE)	Mean (SE)	Variance (SE)
Sadness	1.75 (.04)	.43 (.03)	3.61 (.05)	.43 (.03)	4.87 (.03)	.43 (.03)
Anger	1.92 (.04)	.65 (.05)	3.2 (.06)	.65 (.05)	4.98 (.04)	.65 (.05)
Proud the Reef is World Heritage Listed	2.87 (.05)	1.30 (.03)	3.59 (.05)	1.30 (.03)	4.13 (.03)	1.3 (.03)
Great Barrier Reef Australian Identity	2.92 (.05)	1.68 (.03)	3.58 (.05)	1.68 (.03)	4.04 (.04)	1.68 (.03)

After determining the optimal solution, we used the AUXILIARY option in Mplus to examine an array of outcome variables. The Outcome variables we explored were: Interest in future pro-environmental behaviours, Willingness to behave environmentally friendly, Personal responsibility for climate change, It is the responsibility of all Australians to protect the Reef, Optimistic about future of the Reef, Confident that the Reef is well managed, Not my responsibility to protecting the Reef, The Reef should be on World Heritage danger list, The expansion of coal mining is more important than conservation of the Reef, Climate change distress and Climate change concern.

Table D.15 shows the means for the profiles whilst Table D.16 displays the chi-square difference tests that indicate where there are significant differences between the profiles on the outcome variables.

Table D.15. LPA Outcomes Means and Standard Errors

outcome variable	Reef Ambivalent		Reef Aware		Reef Connected	
	Mean	Standard Error	Mean	Standard Error	Mean	Standard Error
interest in future pro-environmental behaviours	2.69	0.05	3.58	0.05	4.16	0.04
willingness to behave environmentally friendly	2.83	0.04	3.47	0.06	3.87	0.03
personal responsibility for climate change	2.87	0.04	3.47	0.06	3.86	0.03
It is the responsibility of all Australians to protect the Reef	2.03	0.04	3.652	0.04	4.2	0.02
optimistic about future of the Reef	3.39	0.04	2.67	0.05	3.84	0.03
Confident that the Reef is well managed	3.5	0.05	2.84	0.06	3.71	0.03
Not my responsibility to protecting the Reef	4.15	0.05	3.75	0.06	3.11	0.03
The Reef should be on World Heritage danger list	2.532	0.05	3.78	0.04	2.92	0.04
Coal mining is more important than the Reef	4.14	0.05	309	0.05	3.26	0.03
Climate change distress	2.26	0.03	3.48	0.03	4.61	0.02
Climate change concern	2.92	0.04	3.78	0.06	3.68	0.03

Table D.16. Chi-square difference tests of the outcome variable between the profiles

Outcome variable	Ambivalent vs Aware X^2 (df) =, *p* =	Ambivalent vs Connected X^2 (df) =, *p* =	Aware vs Connected X^2 (df) =, *p* =
Interest in future pro-environmental behaviours	(1) 179.422, p < .001	(1) 568.839, p < .001	(1) 87.900, p < .001
Willingness to behave environmentally friendly	(1) 84.049, p < .001	(1) 428.240, p < .001	(1) 38.446, p < .001
personal responsibility for climate change	(1) 67.63, p < .001	(1) 352.269, p < .001	(1) 33.955, p < .001
It is the responsibility of all Australians to protect the Reef	(1) 1053.718, p < .001	(1) 2822.617, p < .001	(1) 191.947, p < .001
Optimistic about future of the Reef	(1) 106.968, p < .001	(1) 71.234, p < .001	(1) 359.522, p < .001
Confident that the Reef is well managed	(1) 80.180, p < .001	(1) 14.422, p < .001	(1) 170.955, p < .001
Not my responsibility to protecting the Reef	(1) 25.758, p < .001	(1) 354.558, p < .001	(1) 85.151, p < .001
The Reef should be on World Heritage danger list	(1) 102.601, p < .001	(1) 651.123, p < .001	(1) 230.978, p < .001
Coal mining is more important than the Reef	(1) 215.917, p < .001	(1) 222.905, p < .001	(1) 8.715, p = .003
Climate change distress	(1) 671.610, p < .001	(1) 3109.179, p < .001	(1) 776.793, p < .001
Climate change concern	(1) 165.924, p < .001	(1) 267.658, p <. 001	(1) 2.258, p = .133

Reef ambivalent individuals consistently demonstrated the lowest levels across most pro-environmental measures compared to both other groups. They showed significantly lower interest in future pro-environmental behaviours, willingness to behave environmentally friendly, and personal responsibility for climate change compared to both Reef aware and Reef connected groups. Reef ambivalent participants also reported the lowest sense that all

Australians have a responsibility to protect the Reef and exhibited the least climate change distress compared to the other groups.

The Reef aware profile fell between the other two groups on most measures, showing significantly higher pro-environmental attitudes and behaviours than the Reef ambivalent profile but lower than the Reef connected profile. They demonstrated moderate levels of interest in future pro-environmental behaviours, willingness to act environmentally friendly, and personal responsibility for climate change.

The Reef connected profile reported the highest levels across most pro-environmental measures. They showed the greatest interest in future pro-environmental behaviours, highest willingness to behave environmentally friendly, strongest sense of personal responsibility for climate change, and the most agreement that all Australians should protect the Reef. This group also exhibited the highest levels of climate change distress.

However, the pattern reversed for some measures related to optimism and management confidence. The Reef aware profile showed the lowest optimism about the Reef's future and least confidence in its management, while both Reef ambivalent, and Reef connected groups reported higher levels on these measures. Additionally, the Reef connected profile were least likely to view protecting the Reef as not their responsibility and showed the strongest opposition to prioritising coal mining expansion over reef conservation.