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Monitoring human dimensions of the Great Barrier Reef

Social and economic indicators for catchment residents

August 2022



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CSIRO acknowledges the Traditional Owners of country throughout Australia and recognises their continuing connection to land, waters, and community. We pay our respects to them and their cultures; and to elders both past and present.

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Executive summary



The Social and Economic Long-Term Monitoring Program (SELTMP) collects primary data on a subset of Great Barrier Reef (GBR) human dimension indicators relating to social, economic, cultural, and governance aspects of the GBR, as described within the Reef 2050 Long Term Sustainability Plan (Commonwealth of Australia, 2021). These human dimensions are considered to play a pivotal role in resilience-based management of the GBR.

Since its inception in 2011, SELTMP has provided GBR decision-makers and stakeholders with information about how communities and industries in the GBR region perceive, value, and interact with, different parts of the GBR. This information has been used by decision-makers for various management applications. Importantly, SELTMP contributes data to enable the assessment and benchmarking for a subset of the Reef 2050 Plan's human dimension Objectives and Indicators and is also intended to contribute to the Queensland Government's Reef Water Quality social monitoring activity for agriculture in the GBR catchment.

There have been three data collection time points to date for the large-scale SELTMP social survey: 2013, 2017 and 2021. Each time point provides a snapshot of residents' views in the GBR catchment. This technical report presents results from the third iteration in 2021. While a small subset of survey questions has been retained throughout all three time points, with the intent to assess trends, in 2021, our survey instrument underwent a substantial review and redesign. The updated version addresses new objectives and indicators in the Reef 2050 Plan, and provides information required for adaptive management of the changing Great Barrier Reef social-ecological system. The updated broad objectives of SELTMP are to:

1. Monitor changes in community attitudes towards the GBR, its values and management, and the perceived threats to those values.
2. Predict attitudinal and behavioural responses to future management interventions in the Reef, and changes in Reef health.
3. Monitor changes in social and economic well-being of Reef-dependent communities, and the benefits they derive from the GBR.
4. Assess and monitor social and economic vulnerability, and adaptive capacity of GBR communities to changes in Reef condition & the wider system.

The report is structured to enable the assessment and comparison of SELTMP metrics and results against specified Reef 2050 Plan Objectives and Indicators. While SELTMP's core survey metrics partly address both the identified Reef 2050 Plan Objectives, and all four of the above broad SELTMP objectives, the results presented herein are largely descriptive, and further in-depth analyses and surveying will be required to fully achieve these objectives. Further analyses and findings will be reported separately, in forthcoming peer-reviewed scientific papers.

In 2021, SELTMP's primary method of participant recruitment and data collection was also updated, to improve cost-effectiveness and eliminate potential health and safety risks during the COVID-19 pandemic. In 2013 and 2017, surveys were primarily conducted face-to-face with residents in public and tourist spaces (e.g., marinas, lookouts, jetties, caravan parks) at coastal population centres along the GBR coastline (Cooktown to Bundaberg). In 2021, we trialled a new primary method of online surveys, supplemented by telephone surveys. The new approach was successful in achieving a large and geographically representative sample of residents of the GBR catchment region. In June 2021, 2,488 GBR residents completed the SELTMP survey. Among these, 1,535 were recruited through an online panel of research participants, 653 were recruited via social media channels, and 300 were recruited via telephone.

Comparisons with previous SELTMP surveys indicated that there were systematic differences between the samples in key variables. For instance, in 2021, reported levels of lifetime and past-year GBR visitation were lower than previous years. Furthermore, participants in 2021 tended to comprise an older aged demographic, those who had been living in the GBR region for a longer duration, and those who were less dependent on the GBR for household income. While the COVID-19 pandemic may partly explain the reduced past-year GBR visitation, the remaining sample differences are likely due to the different recruitment methods used. In 2021, participants were recruited from the population at large, not specifically at public spaces along the GBR coastline (as in 2013 and 2017), which GBR visitors and users are more likely to frequent. Due to the systematic differences across the samples, time-series analysis could not be performed using the entire sample of participants. Instead, time-series comparisons were conducted on a more comparable sub-sample of participants – that is, those who visited the GBR at least once in the past 12 months. It is important to note that these results are unique to this subset of residents, and as such, should not be considered representative of the broader population of GBR residents. Accordingly, in this report we do not make any claims about changes over time for the full sample, and the results in this report should be considered a new baseline.

As for previous SELTMP surveys, we presented respondents with the following plain English definition of the GBR (broadly encapsulating the extent of the GBR World Heritage Area), as a standard reference underpinning our survey questions:

The 'Great Barrier Reef' or the 'GBR' includes all land and water from the beaches on the coast, the bays and creeks, the islands, the shoals and seafloor, the open waters, and of course the coral reefs.

Results

Overall, our 2021 survey results indicated that residents of the GBR coastal and catchment region highly valued the social, economic, environmental, and cultural services and benefits that the GBR provides. They valued the GBR as a globally significant coral reef ecosystem and World Heritage Area that supports biodiversity, individual livelihoods, lifestyles, and cultural heritage. Participants were also very proud of the GBR's World Heritage status. Many respondents perceived that living in the region contributes positively to their overall wellbeing and they felt a strong sense of belonging to the region. When they visit the GBR, they feel better physically and psychologically.

While residents in 2021 rated the aesthetic beauty of the GBR as outstanding, they were highly cognisant of the threats and problems that face the GBR. In response to our open-ended question 'what do you think are the three most serious threats to the GBR', the top three most frequently mentioned threats were climate change (mentioned by 46% of respondents), pollution (mentioned by 45% of respondents), and (over) fishing (mentioned by 29% of respondents). In a separate question measuring climate change beliefs specifically, most believed that climate change was a threat to the GBR (64%). However, there was a smaller yet sizeable number (approximately 24%) who indicated that they do not have a view on climate change and how it threatens the GBR. Most of these people indicated they need more evidence to form an opinion. Another 12% simply did not believe – either in climate change itself, or that climate changes is a threat to the GBR.

Perception of the health of major habitat types varied. Residents perceived beaches, islands, and the ocean and sea to be in 'good' health on average, while they rated the health of coral reefs and seagrass to be in 'fair' health overall. Participants tended to report feeling sad and disappointed more than any other emotion, when hearing about damage to the GBR.

Support for Reef management interventions was strong. Most participants (71%) felt that additional interventions to help the GBR were greatly or critically needed. Very few ($n=4\%$) felt that additional interventions were not needed at all. The top four highest rated initiatives (on a scale from 1=not at all important to 10=extremely important) were efforts to reduce rubbish and plastics from entering waterways (mean=9.11), increased compliance to reduce illegal fishing (mean=8.56), improved land management to improve GBR water quality (mean=8.30), and, culling crown-of-thorns starfish (COTS) to protect corals (mean=8.29).

Overall ratings of satisfaction with how the GBR is managed were highly variable, indicating the presence of both positive and negative views within the community, as well as a degree of uncertainty (i.e., 'I don't know/I am unsure' ratings) among some respondents. However, respondents indicated a high level of trust in scientists from research institutions (e.g., CSIRO and Universities) and the Great Barrier Reef Marine Park Authority.

When it came to stewardship actions, most participants agreed that reducing impacts on the GBR was not only a personal responsibility but a shared responsibility among people in their local area. While people generally understood that reducing their household waste is something that contributes to reduced impacts on the GBR, they were less aware that reducing electricity consumption also reduces impacts on the GBR. Participants only slightly felt that they could make a personal difference to improving the health of the GBR.

Very few respondents were highly dependent on the GBR for employment or personal income. Therefore, most of the sample reported that their livelihoods (employment and financial situation) would not be impacted by declining GBR health and nor would they take steps to relocate out of the region – though some mentioned their lifestyle could well be negatively affected.

Next steps

The 2021 SELTMP provides an up-to-date snapshot of a wide range of social, economic, cultural and governance aspects of the GBR. The results in this report can be useful for benchmarking and reporting on progress towards the Reef 2050 Plan's human dimension objectives and can contribute to engagement and communications with the GBR community and general public. However, the results also raise new research questions – some of which can be addressed through further in-depth analyses and peer-reviewed scientific reporting, which is planned.

The introduction of a range of new metrics in 2021 provides many new insights. These were designed for long-term monitoring, so we expect that future surveys by SELTMP in 2023 (and beyond) will have greater analytical power for exploring changes over time in variables, and for modelling relationships among variables. Such analysis can inform our understanding of important variables related to attitudes, behaviour, and support for GBR management initiatives.

Below, we present a summary 'snapshot' table of 2021 SELTMP survey results, mapped to identified Reef 2050 Plan Objectives and Indicators, to facilitate their use for benchmarking and comparisons. SELTMP survey data is published for open access use, via the CSIRO Data Access Portal (data.csiro.au/collection/csiro:54872), and an interactive dashboard, enabling researchers, Reef managers and other users to explore these data is available at research.csiro.au/seltmp/explore-dashboards-here

Table i Summary of results, aligned to Reef 2050 Plan Objectives and Indicators

REEF 2050 OBJECTIVE	REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SUMMARY RESULTS
Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits	Reef benefits are sustained and maintained within ecologically sustainable limits for the whole system as it changes for Reef dependent users and industries: recreational and tourism visitors; recreational and commercial fisheries; and research	GBR visitation	<ul style="list-style-type: none"> Participants were asked about whether they had ever visited the GBR, and henceforth, whether they had visited the GBR in the last 12 months, for recreation. 82% had visited the GBR at least once in their lifetime. 50% had visited the GBR at least once in the previous 12 months for recreation, with most (35.5%) visiting only once, twice, or every few months and a smaller proportion (14%) making more regular visits (i.e., monthly, fortnightly, weekly, or more than once a week). On average, participants felt that they would choose to visit the GBR over other places in their recreational time (Mean=6.71, SD=2.41). <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p>
Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits	Reef benefits are sustained and maintained within ecologically sustainable limits for the whole system as it changes for Reef dependent users and industries: recreational and tourism visitors; recreational and commercial fisheries; and research	Individual benefits from visiting GBR	<ul style="list-style-type: none"> Participants rated 6 (psychological and physical) benefits associated with visiting the GBR. The mean rating for each of these benefits is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> feel restored and relaxed: Mean=7.79 (SD=2.09) able to unwind and de-stress: Mean=7.78 (SD=2.13) feel better physically: Mean=7.55 (SD=2.18) feel that visiting the GBR is a way of clearing one's thoughts: Mean=7.20 (SD=3.20) feel more alert and able to concentrate when they visited the GBR: Mean=6.81 (SD=2.30) <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p>
Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits	The adoption of environmental best practice for the Reef is increased by agriculture; Reef recreational users; industry and urban sector and marine industries	GBR visitor marine best practices	<ul style="list-style-type: none"> Participants who had visited the GBR at least once in their lifetime rated 6 environmental best practices for the Reef. The mean rating for each of these practices is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> Disposing of food scraps and rubbish: Mean=4.67 (SD=0.96) Avoid touching corals and marine: Mean=4.54 (SD=0.90) Practiced responsible anchoring: Mean=4.41 (SD=1.12) Reported suspicious activity: Mean=2.80 (SD=1.63) Reported participating in GBR-related community activities: Mean=2.14 (SD=1.18) Reported interacting with the 'Eye on the Reef' app: Mean=1.86 (SD=1.27) <p><i>Response scale: 1=never, 2=rarely, 3=some of the time, 4= to 5=all the time</i> <i>'Not applicable' responses were not included in the calculation of the mean</i></p>

REEF 2050 OBJECTIVE	REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SUMMARY RESULTS
Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits	The adoption of environmental best practice for the Reef is increased by agriculture; Reef recreational users; industry and urban sector and marine industries	Resident perceptions of GBR interventions	<ul style="list-style-type: none"> Participants were presented with a list of 11 different initiatives for managing the GBR. The mean rating for each of these interventions is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> Reduce rubbish and plastics from urban areas entering GBR waters: Mean=9.11 (SD=1.52) Increased compliance to reduce illegal fishing (e.g., poaching in protected Marine Park zones): Mean=8.56 (SD=1.93) Improved land management to improve GBR water quality (i.e., efforts to reduce sediments, nutrients and pollution flowing into the sea): Mean=8.30 (SD=2.26) Culling of crown-of-thorns starfish to protect corals on reefs: Mean=8.29 (SD=2.13) Improve on-water practices by recreational users and tourists (e.g., reducing coral damage from anchors and human contact): Mean=8.27 (SD=2.03) Marine park zoning to restrict certain activities (e.g., fishing, collecting) in some areas of the GBR: Mean=8.21 (SD=2.21) Coral restoration (i.e., assisted propagation or 'gardening' of corals) to replenish damaged reefs: Mean=8.16 (SD=2.33) <p><i>Response scale: 1=not at all important to 10=extremely important</i></p> <p><i>'I don't know/I am unsure' responses were not included in the calculation of the mean</i></p> <ul style="list-style-type: none"> Participants were asked to rate the need for additional interventions (such as the ones presented above) to manage the GBR. The mean rating for this question was 3.91 (SD=1.11) <p><i>Response scale: 1=not needed at all, 2=somewhat needed, 3=moderately needed, 4=greatly needed, 5=critically needed</i></p>
Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits	The adoption of environmental best practice for the Reef is increased by agriculture; Reef recreational users; industry and urban sector and marine industries	Agricultural workers' participation in agricultural practice programs	<ul style="list-style-type: none"> Assessment of a small subset of agriculture industry workers (n=115) showed that around half (49%) had participated in at least one agricultural practice program with some (11%) even participating in all four of the programs listed. The participation rates for various programs (noting that participants could select more than one option) were: <ul style="list-style-type: none"> 35% participated in industry best management practice (BMP) programs 27% participated in sediment reduction or gully remediation programs 23% participated in nutrient management planning programs 21% participated in pesticide improvement programs 35% reported that they don't participate in organised programs, but they have improved their practices to reduce run-off. 16.5% reported that they had not done anything to reduce run-off from their farm. Further results are presented for agricultural workers in Appendix G.

REEF 2050 OBJECTIVE	REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SUMMARY RESULTS
Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits	Adaptive capacity of Reef users continues to improve	Resident financial dependence on GBR	<ul style="list-style-type: none"> Participants were asked what proportion of their <i>household</i> income is from GBR-related business or employment and henceforth, what sector of GBR-related business or employment the income comes from. They were also asked whether their personal employment is associated with the GBR. The breakdown of dependence on the GBR for household incomes is provided below: <ul style="list-style-type: none"> - 81% reported 'none' (i.e., not dependent on the GBR for household income) - 10% reported a 'small amount' - 5% reported a 'moderate amount' - 2% reported a large amount - 2% reported 'all my income' The 19% who indicated receiving at least 'a small amount' of household income from GBR-related business/employment worked in the following sectors: <ul style="list-style-type: none"> - 44% tourism - 16% government - 11% science and education - 11% fishing - 19% 'other' 6% reported that their <i>personal</i> income is derived from GBR-related employment.
Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits	Adaptive capacity of Reef users continues to improve	Personal impacts from declining GBR health	<ul style="list-style-type: none"> Participants were asked about the personal impacts of declining GBR health. The mean rating for each of these personal impacts is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> - My lifestyle would be negatively affected: Mean=5.19 (SD=3.21) - Living in the GBR region would become undesirable to me: Mean=4.19 (SD=2.88) - I would take steps to relocate out of the GBR region: Mean=3.44 (SD=2.60) - My financial situation would be negatively affected: Mean=3.24 (SD=2.73) - My employment prospects would be reduced: Mean=3.13 (SD=2.76) <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p>
Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits	Adaptive capacity of Reef users continues to improve	Resident adaptive capacity – flexibility	<ul style="list-style-type: none"> Participants who were employed in GBR-related jobs (6% of the sample) were asked about their job flexibility if their work associated with the GBR was no longer viable, whether they would move out of the region, and whether they had taken steps to change work so that they are not as reliant on the GBR for income. The mean rating for flexibility is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> - I could shift into a different job or role easily: Mean=6.11 (SD=2.96) - I would move out of the region: Mean=5.88 (SD=3.28) - I am already taking, or have taken steps, to change the work I do so that I am not as reliant on the GBR for income: Mean=4.54 (SD=3.31) <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p>

REEF 2050 OBJECTIVE	REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SUMMARY RESULTS
People maintain or grow their attachment to the Great Barrier Reef	For Great Barrier Reef region residents: Wellbeing and satisfaction associated with the Great Barrier Reef is maintained or improved	Resident perceptions of GBR health	<ul style="list-style-type: none"> Participants rated the health of 8 different parts of the GBR. The mean health rating for each GBR habitat is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> Beaches: Mean=3.98 (SD=0.79) Islands: Mean=3.93 (SD=0.82) Ocean and sea: Mean=3.84 (SD=0.89) Mangroves: Mean=3.76 (SD=0.87) Fish and other marine life: Mean=3.74 (SD=0.87) Creeks and rivers: Mean=3.64 (SD=0.87) Coral reefs: Mean=3.40 (SD=1.09) Seagrass: Mean=3.39, SD=1.01 <p><i>Response scale: 1=very poor, 2=poor, 3=fair, 4=good, 5=excellent</i></p> <p><i>'I don't know/I am unsure' and 'not applicable (have not visited)' responses were not included in the calculation of the mean</i></p>
People maintain or grow their attachment to the Great Barrier Reef	For Great Barrier Reef region residents: Wellbeing and satisfaction associated with the Great Barrier Reef is maintained or improved	Resident emotions when hearing about GBR degradation	<ul style="list-style-type: none"> Participants were presented with 5 emotions (i.e., sad, disappointed, helpless, angry, and afraid) and asked to rate how intensely they experienced these feelings when hearing about damage to the GBR (i.e., not linked to a specific Reef event). The mean rating for each emotion is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> Sad: Mean=3.64 (SD=1.32) Disappointed: Mean=3.62 (SD=1.32) Helpless: Mean=3.33 (SD=1.37) Angry: Mean=3.19 (SD=1.43) Afraid: Mean=2.94 (SD=1.41) <p><i>Response scale: 1=not at all, 2=a little bit, 3=somewhat, 4=quite a bit, 5=a great deal</i></p>
People maintain or grow their attachment to the Great Barrier Reef	For Great Barrier Reef region residents: Wellbeing and satisfaction associated with the Great Barrier Reef is maintained or improved	Resident wellbeing from living in GBR region	<ul style="list-style-type: none"> Participants were asked whether living in the region contributes positively to their overall wellbeing. The mean rating for this question was: Mean=7.81 (SD=2.29). <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p>
People maintain or grow their attachment to the Great Barrier Reef	For Great Barrier Reef region residents: place attachment and identity associated with the Reef is maintained or improved; pride in the Reef is maintained or improved; non-use values for the Reef are maintained or improved	Resident place attachment Resident place identity Resident pride in GBR	<ul style="list-style-type: none"> Participants were asked about their attachment to the GBR region (in terms of belonging, lifestyle dependence, and social bonding), how much the GBR was part of their identity, and how proud they felt that the GBR is a World Heritage Area. The mean rating for each of these variables is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> I feel proud that the GBR is a World Heritage Area: Mean=8.63 (SD=2.09) I feel a strong sense of belonging to where I live: Mean=7.55 (SD=2.43). Living close to the GBR is important to me because of my lifestyle: Mean=6.52 (SD=2.84) I live in this region because those closest to me (family, friends) live here too: Mean=6.13 (SD=2.93) <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p> <ul style="list-style-type: none"> Participants were also presented with a place-related meanings task which asked them 'What are the first words that come to mind when you think about the GBR?'. Some prominent positively-valenced words included: beautiful, wonder, natural and amazing. Some prominent negatively-valenced words included: endangered, dying, bleaching and climate change.

REEF 2050 OBJECTIVE	REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SUMMARY RESULTS
People maintain or grow their attachment to the Great Barrier Reef	For Great Barrier Reef region residents: place attachment and identity associated with the Reef is maintained or improved; pride in the Reef is maintained or improved; non-use values for the Reef are maintained or improved	Resident perceptions of services and benefits associated with GBR	<ul style="list-style-type: none"> • Participants were presented with 13 services and benefits associated with the GBR and asked to rate how much they valued these services and benefits. • The mean rating for each of these services and benefits is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> - Biodiversity (supports variety of marine life): Mean=9.34 (SD=1.21) - Existence (the fact it exists): Mean=9.08 (SD=1.53) - International icon (attracts people from all over the world): Mean=8.75 (SD=1.83) - Scientific heritage (people can learn about the environment): Mean=8.62 (SD=1.83) - Local economy (supports the local economy): Mean=8.55 (SD=1.87) - Individual's socialising (place for me to spend time with family and friends): Mean=7.97 (SD=2.17) - Maritime heritage (historic maritime heritage): Mean=7.88 (SD=2.17) - Bequest culture (pass down wisdom, traditions, and a way of life): Mean=7.78 (SD=2.35) - Food provisioning (provides fresh seafood): Mean=7.54 (SD=2.63) - Individual's lifestyle (supports my lifestyle and recreational interests): Mean=7.40 (SD=2.44) - Indigenous heritage (has rich Traditional Owner Heritage): Mean=7.28 (SD=2.78) - Individual's culture (an important part of my culture): Mean=7.20 (SD=2.62) - Individual's livelihood (supports my livelihood): Mean=5.34 (SD=3.17) <p><i>Response scale: 1=I don't value this at all to 10=I value this extremely highly</i> <i>'Not applicable' responses were not included in the calculation of the mean</i></p>

REEF 2050 OBJECTIVE	REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SUMMARY RESULTS
People and communities take individual and collective action to maintain Reef resilience	Levels of community awareness and education about the Great Barrier Reef is maintained or improved	Resident perceptions of GBR threats	<ul style="list-style-type: none"> Participants were presented with 10 potential threats to the GBR and asked to rate how susceptible or vulnerable they thought the GBR was to these threats. The mean rating for each of these threats is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> - Illegal fishing: Mean=4.08 (SD=0.97) - Land-based runoff: Mean=3.94 (SD=1.16) - Crown of thorns starfish: Mean=3.94 (SD=1.02) - Coastal development: Mean=3.90 (SD=1.07) - Climate change: Mean=3.88 (SD=1.36) - Mining: Mean=3.68 (SD=1.29) - Ports and shipping: Mean=3.67 (SD=1.08) - Population growth: Mean=3.56 (SD=1.08) - Governance: Mean=3.52 (SD=1.20) - Tourism: Mean=3.02 (SD=1.05) <p><i>Response scale: 1=does not represent a threat at all, 2=a minor threat, 3=a moderately serious threat, 4=a serious threat, 5=represents an extremely serious threat</i></p> <p><i>'I don't know' responses were not included in the calculation of the mean</i></p> <ul style="list-style-type: none"> Participants were asked the following open-ended question: 'What do you think are the 3 most serious threats to the GBR?' The most mentioned threats are listed below, ordered from most to least frequently mentioned: <ul style="list-style-type: none"> - Climate change: mentioned by 46% - Pollution: mentioned by 45% - Fishing: mentioned by 29% - Humans: mentioned by 23% - Water quality: mentioned by 21% - Tourism: mentioned by 14% - Coral bleaching: mentioned by 14% - Shipping: mentioned by 12% - COTS: mentioned by 12% Participants were presented with 6 problems that the GBR faces and asked to rate how problematic they thought these problems were. The mean rating for each of these problems is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> - Loss of coral cover: Mean=4.07 (SD=1.13) - Loss of seagrass: Mean=3.89 (SD=1.09) - Low abundance of fish: Mean=3.83 (SD=1.15) - Poor coastal water quality: Mean=3.80 (SD=1.19) - Loss of mangroves: Mean=3.77 (SD=1.17) - Loss of access to parts of the Reef: Mean=2.88 (SD=1.32) <p><i>Response scale: 1=not a problem at all, 2=a small problem, 3=a moderate problem, 4=a big problem, 5=a very big problem</i></p> <p><i>'I don't know' responses were not included in the calculation of the mean</i></p>

REEF 2050 OBJECTIVE	REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SUMMARY RESULTS
People and communities take individual and collective action to maintain Reef resilience	Levels of community awareness and education about the Great Barrier Reef is maintained or improved	Resident climate change beliefs	<ul style="list-style-type: none"> Participants were asked about their beliefs regarding climate change and the GBR. The breakdown of responses was as follows: <ul style="list-style-type: none"> Climate change is a threat to the GBR, requiring immediate action: 59% Climate change is a threat to the GBR, but does not require immediate action: 5% I need more evidence to form an opinion about climate change and how it may threaten the GBR: 21% Climate change is not a threat to the GBR: 6% I do not have a view on climate change and how it relates to the GBR: 3% I do not believe in climate change: 6%
People and communities take individual and collective action to maintain Reef resilience	Opportunities for community leadership and stewardship are increased or supported	Resident attitudes and beliefs towards GBR stewardship	<ul style="list-style-type: none"> Participants were asked about their attitudes and beliefs regarding stewardship. The mean rating for each of the variables is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> Shared responsibility (responsibility of everyone in local area to reduce impacts): Mean=8.26 (SD=2.16) Moral obligation (feel morally obligated to reduce any impacts on the GBR): Mean=8.00 (SD=2.33) Outcome expectancy – waste reduction (reducing household waste reduces impacts on the GBR): Mean=7.26 (SD=2.71) Social norms (most people in local area try to reduce any impacts on the GBR): Mean=6.49 (SD=2.47) Outcome expectancy – electricity consumption reduction (reducing electricity consumption reduces impacts on the GBR): Mean=6.22 (SD=3.06) Personal agency (can make a personal difference to improving the health of the GBR): Mean=6.03 (SD=2.84) <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p> <p><i>'I don't know/I am unsure' responses were not included in the calculation of the mean</i></p>
Intangible and tangible historic heritage and cultural heritage and contemporary cultural values remain intact	Aesthetic values scores are maintained or improved	Resident aesthetic perceptions of the GBR	<ul style="list-style-type: none"> Participants were asked about their perceptions of the aesthetic beauty of the GBR. The mean rating for this question was: Mean=8.88 (SD=1.71). <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p>

REEF 2050 OBJECTIVE	REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SUMMARY RESULTS
Governance systems to prioritise, adapt and engage communities in systems for Reef management are effective	Planning, management and decision making is more inclusive of rights and interests of stakeholders, Traditional Owners and communities	Resident perceptions of decision-making processes and outcomes related to GBR management	<ul style="list-style-type: none"> Participants were asked about their perceptions of the decision-making processes and outcomes associated with managing the GBR. The mean rating for each of the variables is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> Distributive justice (the benefits and costs of managing the GBR are fairly distributed across different groups of people): Mean=5.49 (SD=2.64) Procedural justice (decisions about the GBR are made in a fair way): Mean=5.13 (SD=2.61) Opportunities for participation in decision-making (opportunities are available to have a say in how the GBR is managed): Mean=4.60 (SD=2.64) Influence (personally have some influence over how the GBR is managed): Mean=3.78 (SD=2.62) <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p> <p><i>'I don't know/I am unsure' responses were not included in the calculation of the mean</i></p>
Governance systems to prioritise, adapt and engage communities in systems for Reef management are effective	Satisfaction with governance and management increases	Resident satisfaction with GBR management	<ul style="list-style-type: none"> Participants were asked about their satisfaction with how the GBR is managed. The mean rating for this question was: Mean=5.08 (SD=2.64). <p><i>Response scale: 1=very strongly disagree to 10=very strongly agree</i></p> <p><i>'I don't know/I am unsure' responses were not included in the calculation of the mean</i></p>
Governance systems to prioritise, adapt and engage communities in systems for Reef management are effective	Satisfaction with governance and management increases	Resident trust in sources of information about GBR	<ul style="list-style-type: none"> Participants were presented with 14 different communication sources, and asked how much they trusted information about the GBR that comes from these sources. The mean rating for each of the variables is listed below, ordered from highest to lowest mean: <ul style="list-style-type: none"> Scientists: Mean=7.55 (SD=2.56) The Great Barrier Reef Marine Park Authority: Mean=7.14 (SD=2.53) Citizen science and community groups: Mean=6.82 (SD=2.47) Local environmental groups: Mean=6.53 (SD=2.67) Australian environmental NGOs: Mean=6.51 (SD=2.71) Family and friends: Mean=6.11 (SD=2.29) International environmental NGOs: Mean=5.74 (SD=3.03) Queensland Government: Mean=5.24 (SD=2.74) Work colleagues: Mean=5.16 (SD=2.47) Local council: Mean=5.15 (SD=2.51) Australian Government: Mean=4.98 (SD=2.74) Television news: Mean=4.35 (SD=2.48) Newspapers: Mean=4.11 (SD=2.41) Social media: Mean=3.62 (SD=2.42) <p><i>Response scale: 1=do not trust at all to 10=trust very strongly</i></p> <p><i>'I don't know/I am unsure' responses were not included in the calculation of the mean</i></p>

Part I Introduction



Background

The Social and Economic Long-Term Monitoring Program (SELTMP) for the Great Barrier Reef (GBR) provides a source of primary data necessary to evaluate progress towards a range of GBR human dimension objectives and indicators within the Reef 2050 Long Term Sustainability Plan (Reef 2050 Plan) (Commonwealth of Australia, 2011). Initiated in 2011, SELTMP has provided GBR managers, partners, and stakeholders with insights into how communities and industries dependent on the Great Barrier Reef perceive its value and condition, and how they describe their relationship with the Reef.

To deliver the information required for adaptive and resilience-based GBR management in a rapidly changing social-ecological system, SELTMP must be adaptable to emerging needs, while continuing to monitor consistent indicators over time that describe the state and trend of core human dimension components. To achieve this, SELTMP involves a program of integrated fit-for-purpose modules for monitoring, understanding, and reporting on the human dimensions of the Great Barrier Reef.

The key objectives of SELTMP are to:

- Monitor changes in community attitudes towards the GBR, its values and management, and the perceived threats to those values.
- Predict attitudinal and behavioural responses to future management interventions in the Reef, and changes in Reef health.
- Monitor changes in social and economic well-being of Reef-dependent communities and the benefits they derive from the GBR.
- Assess and monitor social and economic vulnerability, and adaptive capacity of GBR communities to changes in Reef condition & the wider system.

SELTMP 2021 provides regular biannual representative data for a core set of human dimension objectives and indicators within the updated Reef 2050 Plan. Table 2 presents the SELTMP constructs and metrics that were used to measure these human dimension objectives and indicators. It is noted that the SELTMP metrics were not intended to comprehensively assess these objectives and indicators, but rather to partly contribute to their assessment.

The identification of SELTMP constructs and development of SELTMP metrics was informed by previous SELTMP surveys, consultation with the Great Barrier Reef Marine Park Authority, and relevant empirical literature and social psychological theories and frameworks in the pro-environmental behaviour domain.

Table 1 SELTMP 2021 constructs and metrics aligned to Reef 2050 Plan Objectives and Indicators

REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS	SELTMP METRICS RETAINED FROM SELTMP 2013/SELTMP 2017
Reef 2050 Objective 1: Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits			
Reef benefits are sustained and maintained with ecologically sustainable limits for the whole system as it changes for Reef dependent users and industries: recreational and tourism visitors; recreational and commercial fisheries; and research	<ul style="list-style-type: none"> • GBR visitation • Individual benefits from visiting GBR 	<ul style="list-style-type: none"> • Choose to visit GBR for recreation • Psychological benefits: <ul style="list-style-type: none"> - Stress relief - Restoration outcomes (relaxation and calmness; attention restoration; clearing one's thoughts) • Physical benefits 	<ul style="list-style-type: none"> • GBR visitation
The adoption of environmental best practice for the Reef is increased by agriculture, Reef recreational users, industry and urban sector and marine industries	<ul style="list-style-type: none"> • GBR visitor marine best practices • Resident perceptions of GBR interventions • Agricultural worker's participation in agricultural practice programs 	<ul style="list-style-type: none"> • List of best practices in the marine sphere • Need for additional GBR interventions • Importance of GBR interventions • List of agricultural practice programs 	
Adaptive capacity of Reef users continues to improve	<ul style="list-style-type: none"> • Resident financial dependence on GBR • Resident personal impacts • Adaptive capacity (flexibility) of those dependent on GBR for employment 	<ul style="list-style-type: none"> • Household income derived from GBR-related employment • Sector of GBR-related business/employment • Personal employment is GBR-related • Personal impacts of declining GBR health • Adaptive capacity (flexibility) 	

REEF 2050 INDICATOR	SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS	SELTMP METRICS RETAINED FROM SELTMP 2013/SELTMP 2017
Reef 2050 Objective 2: People maintain or grow their attachment to the Great Barrier Reef			
For Great Barrier Reef region residents: <ul style="list-style-type: none"> Wellbeing and satisfaction associated with the Great Barrier Reef is maintained or improved 	<ul style="list-style-type: none"> Resident perceptions of GBR health Resident emotions when hearing about GBR degradation Resident wellbeing from living in GBR region 	<ul style="list-style-type: none"> Perceived health of GBR Emotional response to GBR degradation Wellbeing from living in GBR region 	
For Great Barrier Reef region residents: <ul style="list-style-type: none"> Attachment and identity associated with the Reef is maintained or improved Pride in the Reef is maintained or improved Non-use values for the Reef are maintained or improved 	<ul style="list-style-type: none"> Resident place attachment Resident place identity Resident pride in GBR Resident perceptions of services and benefits associated with GBR 	<ul style="list-style-type: none"> Place attachment (Place affect, Place dependence and Place social bonding) GBR services and benefits (additional services and benefits) 	<ul style="list-style-type: none"> Place meaning (GBR word association task) Place identity Pride in GBR GBR services and benefits (selected and modified wording and response scale)
Reef 2050 Objective 3: People and communities take individual and collective action to maintain Reef resilience			
Levels of community awareness and education about the Great Barrier Reef is maintained or improved	<ul style="list-style-type: none"> Resident perceptions of GBR threats and problems Resident climate change beliefs 	<ul style="list-style-type: none"> Threat susceptibility (list of threats) Threat severity 	<ul style="list-style-type: none"> Threat perceptions (open-ended) Climate change beliefs (modified wording and additional response option)
Opportunities for community leadership and stewardship are increased and supported	<ul style="list-style-type: none"> Resident attitudes and beliefs towards GBR stewardship 	<ul style="list-style-type: none"> Ascription of shared responsibility (local) Social norms Moral obligation Outcome expectancy 	<ul style="list-style-type: none"> Personal agency
Reef 2050 Objective 4: Intangible and tangible historic heritage and cultural heritage and contemporary cultural values remain intact			
Aesthetic values scores are maintained or improved	<ul style="list-style-type: none"> Resident aesthetic perceptions of the GBR 		<ul style="list-style-type: none"> Aesthetic perceptions
Reef 2050 Objective 5: Governance systems are inclusive, coherent and adaptive			
Planning, management and decision making is more inclusive of rights and interests of stakeholders, Traditional Owners, and communities	<ul style="list-style-type: none"> Resident perceptions of decision-making processes and outcomes related to GBR management 	<ul style="list-style-type: none"> Perceived fairness (distributive justice, procedural justice) Voice (opportunities for participation in decision-making, influence) 	
Satisfaction with governance and management increases	<ul style="list-style-type: none"> Resident satisfaction with GBR management Resident trust in sources of information about GBR 	<ul style="list-style-type: none"> Satisfaction with GBR management Trust in information sources (additional sources) 	<ul style="list-style-type: none"> Trust in information sources (selected and modified wording)

Part 2 Methods



Participants

Our 2021 sample included 2,488 residents of the GBR region. The GBR region population was 1,282,724 as at 30th June, 2020 (The State of Queensland, 2022). Eligible participants included residents aged 18 years and over, living in the same catchment areas surveyed in previous SELTMP surveys. Figure 1 provides a geographical representation of participation across the GBR regions. Participants had lived in the GBR region for an average of 27 years (SD=18 years, range 0 to 80 years). The sample comprised slightly more females (56% female, 43% male, 1% other) and a range of educational levels, and household income categories (see Appendix B for more detail on sample characteristics).

Sample differences

Comparisons with previous SELTMP surveys revealed that there were differences between the samples in demographics and other key variables relevant to the topic of the survey (see Appendix B for a comparison of participant demographics in the 2013, 2017, and 2021 SELTMP surveys). These differences likely arose due to the different recruitment methods that were used and have important implications for our time-series analysis, where comparable samples are a prerequisite for making valid claims about changes over time.

Some of the observed differences between the samples are summarised below:

- The 2021 sample comprised an older-age demographic:
 - Age 60 and over: 21.8% in 2013 and 13.5% in 2017 vs. 38.1% in 2021.
 - Age 18-34 years: 34.3% in 2013 and 52.8% in 2017 vs. 19.3% in 2021.
- The 2021 sample had been living in the region for a longer duration:
 - 20.70 years in 2013 and 17.20 years in 2017 vs. 27.17 years in 2021.
- The 2021 sample also comprised a slightly lower proportion of respondents' dependent on the GBR for household income:
 - In 2013, 25% reported that the GBR contributes at least a small amount to their household income.
 - In 2021, 19% reported that the GBR contributes at least a small amount to their household income (Note: financial dependency was not asked in 2017).
- The 2021 sample also had lower GBR visitation rates:
 - Lifetime GBR visitation: 95% in 2013 and 94% in 2017 vs. 82% in 2021.
 - Past-year GBR visitation: 82% in 2013 and 85% in 2017 vs. 50% in 2021.
 - Also, in 2021, most respondents who had visited the GBR in the past year, had only done so once, twice, or every few months. While in 2013 and 2021, respondents tended to visit the GBR more regularly. Figure 2 provides a comparison of the percentage of respondents visiting the GBR at different intervals (or not at all) across the years.

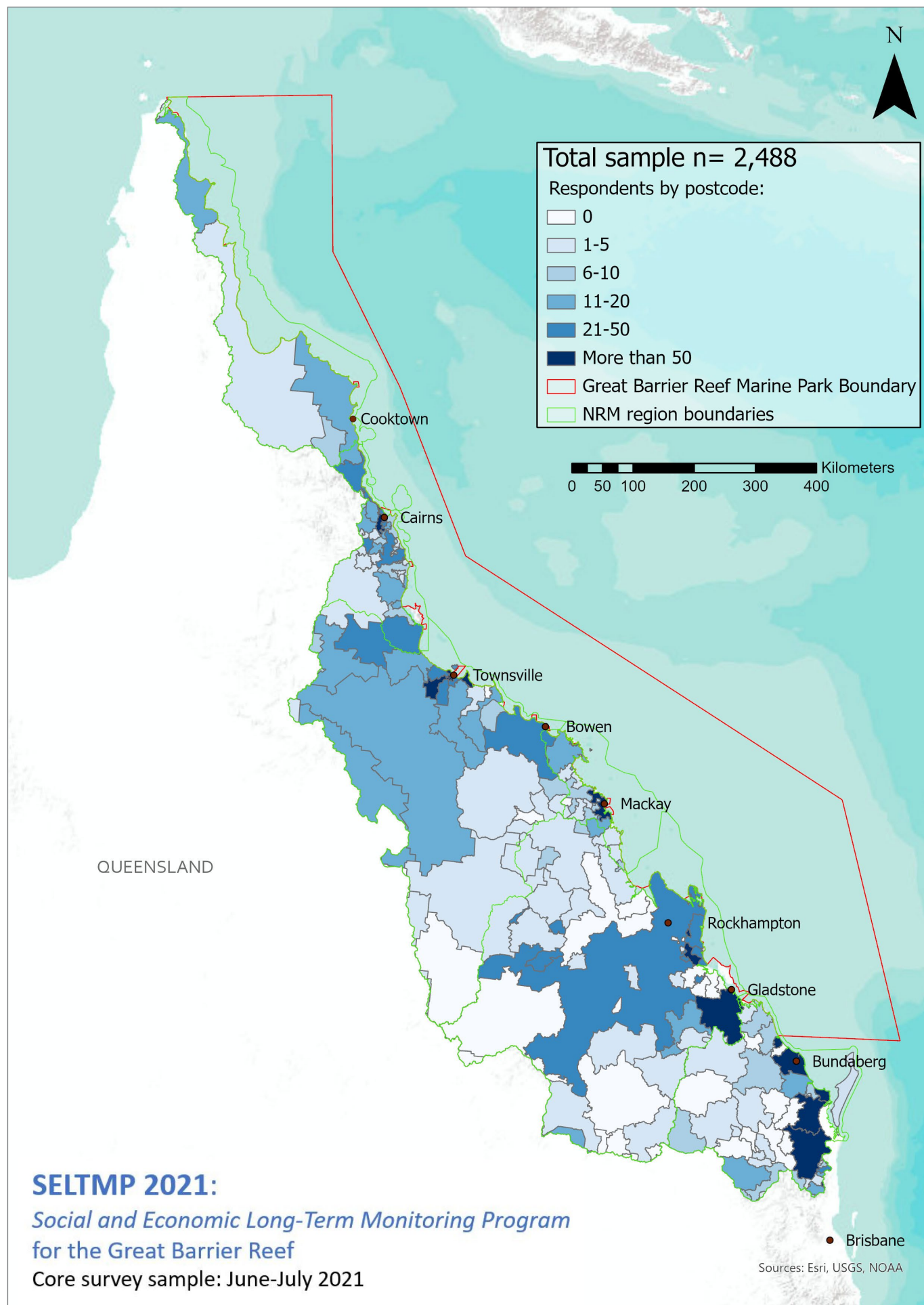


Figure 1 Geographical distribution of survey participants, broken down by postcode

Notes: For the geographical distribution of survey participants broken down by survey completion method, see Appendix A.

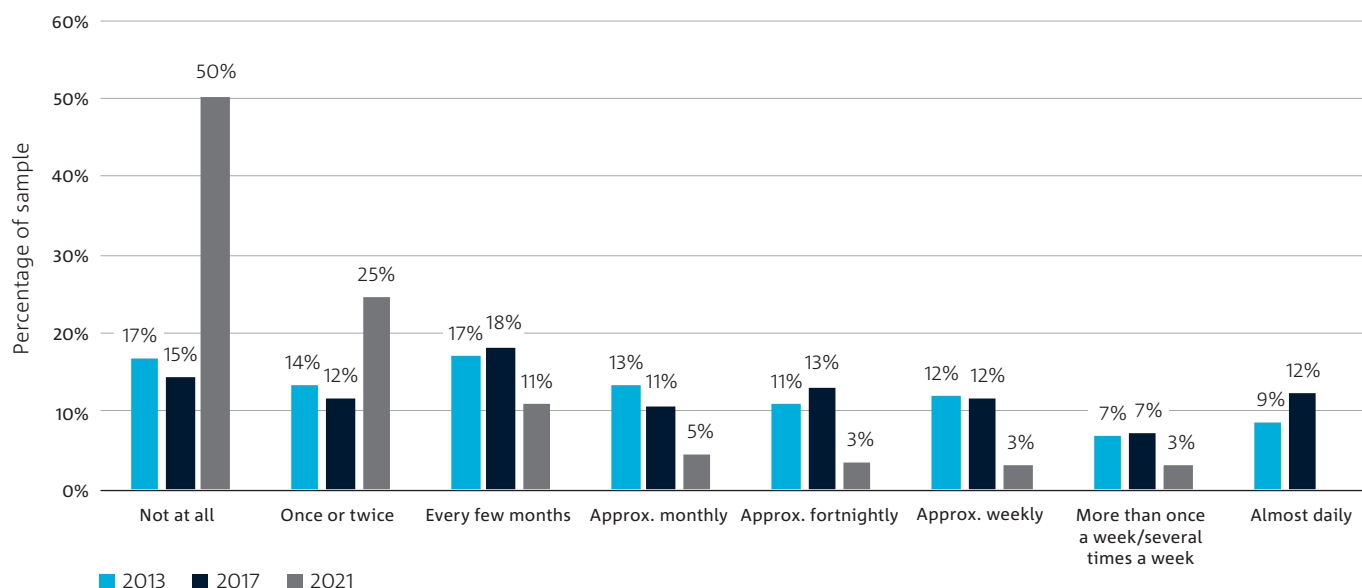


Figure 2 Percentage of respondents visiting the GBR in the previous 12 months for recreation across the 2013 ($n=3,181$), 2017 ($n=1,934$) and 2021 ($n=2,488$) SELTMP surveys

Notes: $n=3,181$ in 2013; $n=1,934$ in 2017; $n=2,488$ in 2021. Respondents were asked ‘In the previous 12 months, how often did you visit the Great Barrier Reef for recreation?’. Those who answered ‘no’ to another question ‘Have you ever visited the Great Barrier Reef?’ were included in the count of responses for ‘not at all’. The ‘almost daily’ response was not provided in 2021.

While mandated social restrictions associated with the COVID-19 pandemic may partly explain the lower past-year GBR visitation rate in 2021, it does not explain the remaining observed differences in sample characteristics (i.e., age, time living in GBR region, GBR lifetime visitation rate, and financial dependence on GBR). Instead, the differences between the samples are very likely due to the different recruitment methods that were used, resulting in samples with fundamentally different characteristics. Previously, participants were recruited face-to-face, at various locations (e.g., recreational and picnic areas, shopping centres and libraries), some of which were tourist locations (e.g., marinas, jetties, parks) where the possibility of sampling GBR visitors and users is high. However, in 2021, a more general sample of residents in the GBR region were recruited via online and telephone channels. Since the full samples were systematically different on such fundamental variables as GBR visitation, we decided that comparisons across the time-series of surveys could not be performed on the entire sample. If we were to proceed with time-series analysis, any observed differences in the survey questions across the time-series could well be due to differences between the samples, rather than a real ‘over time’ difference, which is what we are seeking to establish when performing comparisons across time. In lieu of time-series comparisons across the entire sample, we decided to conduct time-series analysis on a small subset of participants who could be considered more like each other – that is, respondents who had visited the GBR in the past year.

A similar socio-demographic comparison was performed on the subsamples of participants who had visited the GBR in the past year in 2013, 2017 and 2021 (see Table 2). While there were still observed differences in age and years living in the GBR region across these sub-samples, we observed greater comparability in financial dependence on the GBR for household income between the 2013 and 2021 samples with approximately 30% in each year reporting at least some dependence on the GBR. Unfortunately, the question about financial dependence on the GBR for household income was not asked in 2017, so we cannot ascertain whether this sample is similarly comparable. However, the fact that all samples had visited the GBR at least once in the past 12 months, provides us with some confidence that the samples may be comparable.

Table 2 Socio-demographic breakdown across the 2013, 2017 and 2021 subsamples of participants who had visited the GBR at least once in the past 12 months (prior to survey)

	2013	2017	2021
Sample size	2,609 (82.0% of entire sample)	1,649 (85.3% of entire sample)	1,236 (49.7% of entire sample)
Gender			
Male	50%	39%	45%
Female	50%	49%	54%
Other	0%	0.3%	1%
Missing	0%	12%	0%
Age			
18-24	14.7%	24.6%	6.1%
25-29	10.3%	13.3%	5.6%
30-34	9.6%	13.2%	7.1%
35-39	8.3%	8.4%	7.7%
40-44	10.2%	5.2%	8.7%
45-49	8.4%	7.1%	8.5%
50-54	9.4%	6.1%	11.1%
55-59	8.3%	7.2%	10.4%
60-64	7.6%	5.2%	13.8%
65-69	5.7%	3.3%	11.2%
70-74	2.9%	1.7%	6.6%
75-79	1.0%	1.0%	2.5%
80-84	0.5%	0.3%	0.5%
85-89	0.2%	0.2%	0.2%
90 and over	0.8%	0.4%	0.0%
missing	2.2%	2.9%	0.0%
Aboriginal or Torres Strait Islander origin	3.30%	4.72%	3.96%

	2013	2017	2021
Household income (per year)			
\$1 to \$20,000	9.5%	13.6%	3.0%
\$20,001 to \$40,000	26.5%	26.3%	10.8%
\$40,001 to \$60,000	(\$20,001 to \$60,000)	(\$20,001 to \$60,000)	11.4%
\$60,001 to \$80,000	28.7%	4.2%	10.8%
\$80,001 to \$100,000	(\$60,001 to \$100,000)	(\$60,001 to \$100,000)	14.9%
\$100,001 to \$200,000	28.4%	20.8%	27.2%
\$200,001 to \$300,000	5.5%	16.6%	6.1%
More than \$300,000	1.5%	0.9%	2.0%
Prefer not to say	Not available	Not available	13.8%
Missing	20.5%	17.7%	0.0%
Years living in GBR region			
	20.21 years (SD=17.24)	17.13 years (SD=15.95)	27.10 years (SD=18.42)
	Range from 0 to 84 years	Range from 0 to 90 years	Range from 1 to 84 years
	50 missing responses	65 missing responses	0 missing responses
GBR contribution to household income			
	None=69.3%	Not available	None=71.8%
	A small amount=16.4%		A small amount=12.5%
	A moderate amount=7.2%		A moderate amount=7.5%
	A large amount=3.9%		A large amount=4.2%
	85 missing responses		All my income=4.0%
			0 missing responses

Measures

A redesigned version of previous SELTMP surveys was developed in 2021 to enable the evaluation of progress towards human dimension objectives and indicators in the updated Reef 2050 Plan (see Appendix C for the survey items, tabulated against the Reef 2050 indicators).

Participants were presented with the same definition of the GBR that was used in previous SELTMP surveys:

For the following questions, when we refer to the 'Great Barrier Reef' or the 'GBR', this includes all land and water from the beaches on the coast, the bays and creeks, the islands, the shoals and seafloor, the open waters, and of course the coral reefs.

The survey development process involved the following steps:

1. Identification of Reef 2050 Plan 'human dimension' objectives and indicators that could be monitored using social survey methods.
2. Identification of specific and measurable survey constructs to address relevant Reef 2050 Plan Indicators (via a literature review and review of previous SELTMP surveys).
3. Prioritisation of constructs. SELTMP researchers and members of our end-user reference group scored constructs using the following evaluative criteria:
 - a. The construct is central to addressing one (or more) Reef 2050 Plan Human Dimension Objectives, Management Goals, and/or Indicators.
 - b. The construct addresses one (or more) of SELTMP's 4 core objectives.
 - c. The construct provides useable information and/or addresses an identified management question for GBR managers & end-users.
 - d. SELTMP is the best and/or only tool to address this construct (i.e., the construct is not being measured elsewhere, or is being measured elsewhere but is not being measured very well).
4. Prioritisation of constructs and further deliberation and review by the end-user reference group. Individual meetings were conducted with group members to discuss their ratings further. A final set of higher priority constructs were then identified.
5. Operationalisation of constructs with published metrics, the development of new metrics, and/or prior SELTMP metrics (i.e., survey questions).

The metrics/survey questions were designed to measure each construct appropriately, using the principles of reliability (consistency of measurement) and construct validity (the question/s measure the intended construct). Given that the survey was a largely quantitative instrument, most items were closed-ended. Closed-ended items are relatively quick for participants to complete. A Likert (Likert, 1932) rating scale indicating level of agreement was the typical response option.

The SELTMP team was also mindful that survey responding is a psychological process that requires individuals to interpret the question, retrieve the cognitive information, form an opinion (judgement), and fit the opinion into the confines of the response scale provided (Sudman et al., 1996). Therefore, item construction must be done with care and thought, to maximise internal reliability (consistency) in the way individuals are responding to each item. Items that are not grounded in theory can lead to unintended influences on respondents' answers, resulting in poor quality data. Items were written using the BRUSO model, where survey items are 'brief', 'relevant', 'unambiguous', 'specific' and 'objective' (Peterson, 2000).

6. Fine-tuning of survey questions through end-user reference group deliberation and review.
7. Pilot testing of survey, prior to launch.

Procedure

Data collection for the survey ran from mid-June to late July 2021. In contrast to previous SELTMP surveys which primarily used face-to-face recruitment, alternative recruitment channels were used to maximise the reach of the survey, with the goal of enhancing sample representativeness. These recruitment channels were also used due to the mandates imposed on face-to-face contact by the state government's response to the COVID-19 pandemic. Further assessment of sample representativeness will take place after publication of the Australian Bureau of Statistics 2021 Australian census.

The three data collection channels were:

SURVEY TYPE	RECRUITMENT CHANNEL	METHOD	SAMPLE <i>n</i> (%)
Online survey	Third-party online survey panel provider	Emails sent to prospective participants. Quotas were applied to ensure the sample was representative on age and gender for the GBR region (ABS).	1,535 (61.70%)
	Facebook paid ads Partner agency Facebook post	Survey advertisement with link to online survey, posted on Facebook.	653 (26.25%)
Telephone	Third-party telephone survey provider	Random digit-dialling of households living in a specified list of postcodes.	300 (12.06%)

Analytic method

Each of the 3 datasets, along with a subset of merged data (matched by question) from SELTMP 2013 and SELTMP 2017, were imported into the statistical data analysis program, STATA/MP 17.0 (StataCorp, 2021). The data was reviewed for missing values, and all data manipulation and coding, and descriptive and inferential analysis was performed in STATA/MP 17.0. Certain maps and figures were produced using ESRI ArcGIS/ArcMap 10.5 and R software (R Core Team, 2021).

Inferential analyses (i.e., Analysis of Variance with post-hoc pairwise comparisons using the Bonferroni method to correct for family-wise error rate) were performed on a merged SELTMP 2013, 2017 and 2021 dataset, to compare means across the three SELTMP surveys for respondents who had visited the GBR in the past 12 months. In addition to assessing the statistical significance of effects by comparing the p-value to the conventional alpha (α)=0.05 threshold (adjusted for multiple comparisons using Bonferroni's method), Cohen's d was calculated to determine the size of an effect. Cohen's d reflects the difference between the means in standard deviation units.

- Cohen's d=0.2 (i.e., 0.2 of a standard deviation difference between the means) was considered a small effect
- Cohen's d=0.5 (i.e., 0.5 of a standard deviation difference between the means) was considered a moderate effect
- Cohen's d=0.8 (i.e., 0.8 of a standard deviation difference between the means) or greater was considered a large effect.

However, the practical meaningfulness of any observed difference is something that should be evaluated by an expert practitioner such as a community reef program manager, who can refer to their experience in determining whether the difference is in fact, meaningful in practice.

Interpretation of results

A combination of 10-point and 5-point Likert rating scales were used in the survey. 10-point Likert rating scales were used for questions that were retained across the time-series, and for agreement-based statements. 5-point Likert rating scales with behavioural anchors were used for questions that asked people to rate a certain quality (e.g., the size of a problem, the health of marine habitats, the intensity of emotion) or frequency (e.g., the frequency of performing certain best practices).

When it came to communicating the results for the 10-point rating scales, to simplify and improve interpretability, responses on the scale were grouped into a smaller number of ranges as illustrated in the examples 1 to 4 below.

Example 1

Thinking about your visits to the GBR in general, please rate your level of agreement with the following statements.

I choose to visit the GBR over other places in my recreation time	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree
	1 — 2	3 — 4	5	6	7 — 8	9 — 10

Example 2

How much do you trust information about the GBR that comes from the following groups?

The Australian Government	No/very low trust	Low trust	Moderate trust	High trust	Very high trust
	1 — 2	3 — 4	5 — 6	7 — 8	9 — 10

Example 3

In your opinion, how important are the following initiatives for managing the GBR?

Marine Park zoning to restrict certain activities (e.g. fishing, collecting) in some areas of the GBR	No/very low importance	Low importance	Moderate importance	High importance	Very high importance
	1 — 2	3 — 4	5 — 6	7 — 8	9 — 10

Example 4

How much do you value the following aspects of the GBR?

The GBR supports a variety of marine life, such as fish and corals	No/very low value	Low value	Moderate value	High value	Very high value
	1 — 2	3 — 4	5 — 6	7 — 8	9 — 10

For the 5-point rating scales, the behavioural descriptors attached to each response category were retained in the communication of results, as shown in examples 5 to 7 below.

Example 5

When you visit the GBR, how often do you engage in the following actions?

Practice responsible anchoring (e.g., anchoring in sandy areas away from corals)	Never	Rarely	Some of the time	Most of the time	All the time
	1	2	3	4	5

Example 6

When you hear about damage to the GBR (e.g., from cyclones, coral bleaching), to what extent does it make you feel...

Sad?	Not at all	A little bit	Somewhat	Quite a bit	A great deal
	1	2	3	4	5

Example 7

For the following list of issues, please rate the extent to which you think they represent a threat to the GBR.

Crown of thorns starfish	Does not represent a threat at all	A minor threat	A moderately serious threat	A serious threat	An extremely serious threat
	1	2	3	4	5

Part 3 Results and discussion

This section presents and discusses the results from the survey, in line with selected Reef 2050 Objectives and Indicators. While it is recognised that some metrics may align with more than one objective and/or indicator, to avoid repetition, each metric has been assigned to a single indicator and objective.



Objective 1

Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits

Indicator: Reef benefits are sustained and maintained within ecologically sustainable limits for the whole system as it changes for Reef dependent users and industries: recreational and tourism visitors; recreational and commercial fisheries; and research

To contribute to the assessment of this indicator, the following SELTMP constructs, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS	SELTMP METRICS RETAINED FROM SELTMP 2013/ SELTMP 2017
GBR visitation	Choose to visit GBR for recreation <ul style="list-style-type: none"> • 'I choose to visit the GBR over other places in my recreation time' (1=very strongly disagree to 10=very strongly agree) 	GBR visitation <ul style="list-style-type: none"> • 'Have you ever visited the Great Barrier Reef?' (1=yes, 2=no) • 'In the previous 12 months, how often did you visit the Great Barrier Reef for recreation?' (1=not at all, 2=once or twice, 3=every few months, 4=approximately monthly, 5=approximately fortnightly, 6=approximately weekly, 7=more than once a week)
Individual benefits from visiting GBR	Psychological benefits (1=very strongly disagree to 10=very strongly agree) <ul style="list-style-type: none"> • Stress relief: 'Visiting the GBR helps me unwind and de-stress' • Restoration outcomes (Korpela et al., 2008) <ul style="list-style-type: none"> - Relaxation and calmness: 'After visiting the GBR, I feel restored and relaxed' - Attention restoration: 'I feel more alert and able to concentrate when I visit the GBR' - Clearing one's thoughts: 'Visiting the GBR is a way of clearing and clarifying my thoughts' Physical benefits <ul style="list-style-type: none"> • 'Visiting the GBR makes me feel better physically' 	<i>Not available</i>

GBR visitation

Most people ($n=2,048$, 82%) had visited the GBR at least once in their lifetime, leaving 440 (18%) who had never visited the GBR in their lifetime.

Figure 3 displays the breakdown of visitation frequency in the past 12 months in 2021. For completeness, the graph includes those 440 respondents who indicated in the earlier question that they had never visited the GBR in their lifetime – these respondents are included in the ‘not at all’ category. Around 50% ($n=1,236$) had visited the GBR in the last 12 months (combining all responses from ‘once or twice’ up to and including ‘more than once a week’). As shown, most respondents visited the GBR once, twice, or every few months in the last year. There were far fewer who visited the GBR on a more frequent basis. It is possible that the past-year visitation rate has been impacted by the presence of lockdowns and other social restrictions associated with the COVID-19 pandemic, which occurred prior to, and during the survey period.

As shown in Figure 4, participants who had visited the GBR at least once in their lifetime tended to agree that they choose to visit the GBR over other places, in their recreational time (Mean=6.71, SD=2.41) with a little over half (54%) agreeing or strongly agreeing (i.e., scoring 7 and above) and 16% disagreeing or strongly disagreeing (i.e., scoring 4 or less).

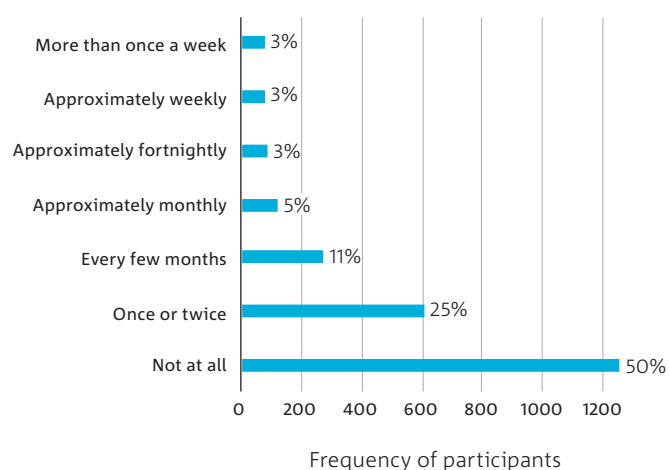


Figure 3 Frequency of visitation of the GBR in the previous 12 months for recreation (2021)

Notes: $n=2,488$. The 440 respondents who indicated that they had never visited the GBR in their lifetime are included in the ‘not at all’ category. Participants were asked: ‘In the previous 12 months, how often did you visit the Great Barrier Reef for recreation?’. Percentages are calculated based on the number who selected that response divided by 2,488. Percentages are rounded to the nearest whole number.

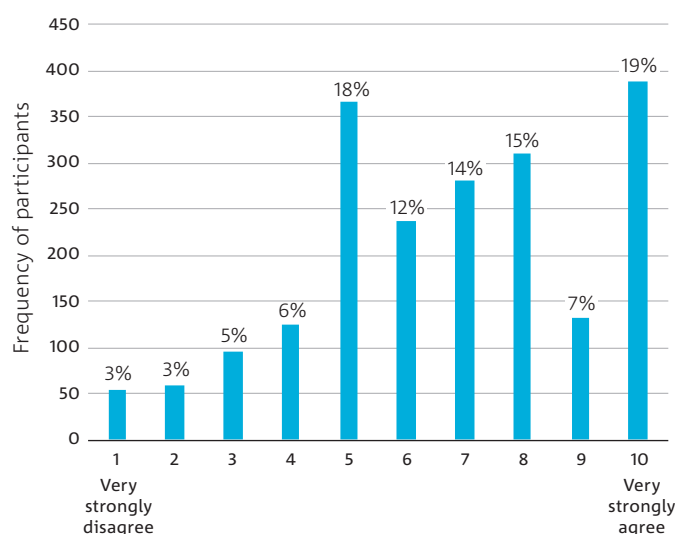


Figure 4 Participant ratings of choosing to visit the GBR over other places in recreation time

Notes: $n=2,048$. These questions were only presented to 2,048 participants who had ‘ever’ visited the GBR. Participants were asked: ‘I choose to visit the GBR over other places in my recreation time’. Percentages are calculated based on the number of people who selected that option divided by 2,048. Percentages are rounded to the nearest whole number. The total percentage does not sum to 100% due to rounding to the nearest whole number.

Individual benefits from visiting GBR

People who had visited the GBR at least once in their lifetime, on average, agreed that they experienced physical and psychological benefits when visiting the GBR (see Figure 5). They agreed that they felt better physically (Mean=7.55, SD=2.18), were able to unwind and de-stress (Mean=7.78, SD=2.13), felt restored and relaxed (Mean=7.79, SD=2.09), were more alert and able to concentrate (Mean=6.81, SD=2.30), and agreed that visiting the GBR provided a way for them to clear and clarify their thoughts (Mean=7.20, SD=2.3).

The distribution of responses showed that most people (between 55% and 76%) agreed or strongly agreed (by scoring 7 and over) that they experienced these benefits, while fewer people (between 6% and 16%) disagreed or strongly disagreed (by scoring 4 and below) that they experienced such benefits when visiting the GBR. The remainder of responses (ranging from 8% to 20%) fell in the slight agreement (score of 6) or slight disagreement (score of 5) category.

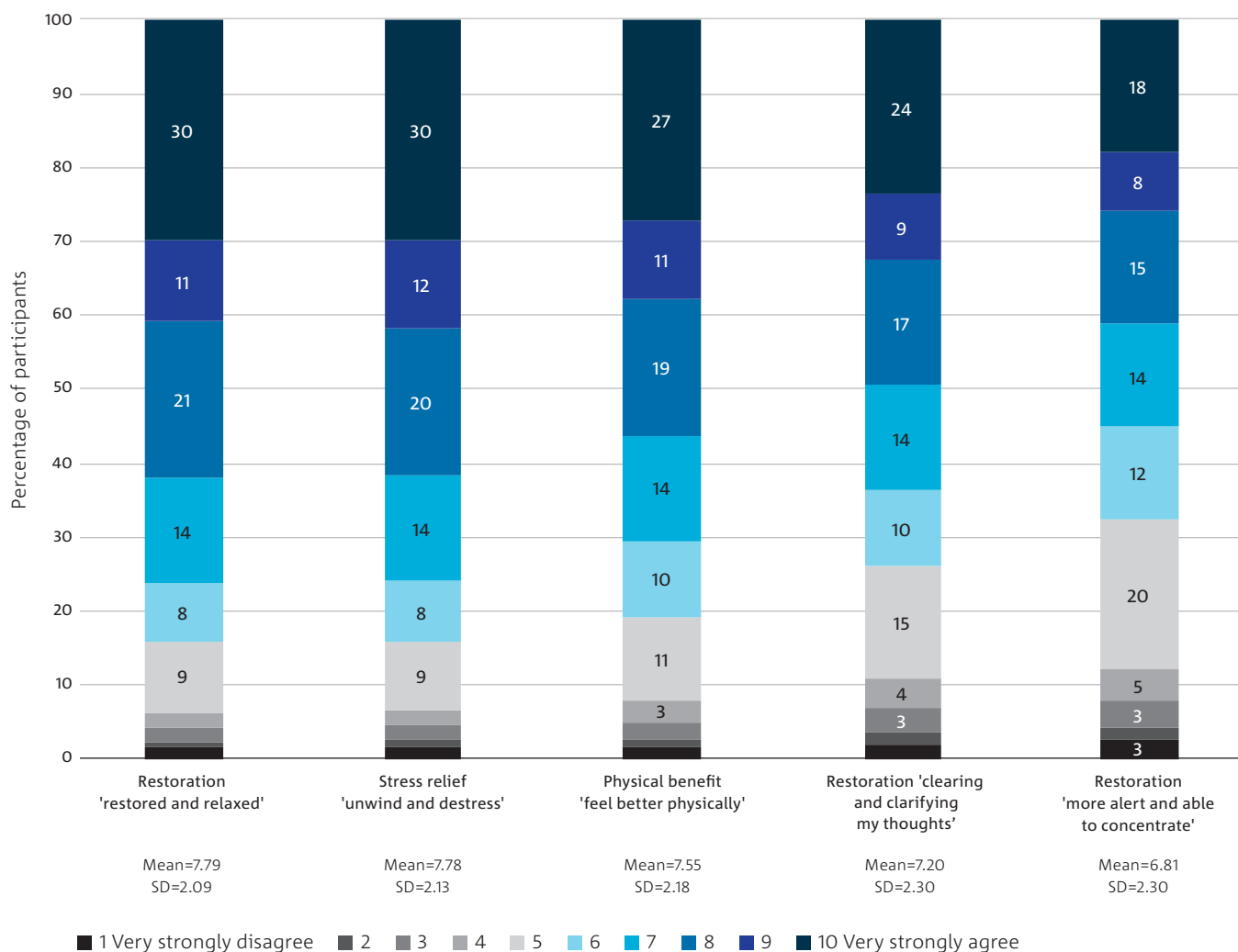


Figure 5 Participant ratings of individual benefits from visiting the GBR (restoration outcomes, stress relief, physical benefit), mean-ranked from highest to lowest agreement

Notes: $n=2,048$. These questions were only presented to 2,048 participants who had 'ever' visited the GBR. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

These results are consistent with a growing body of research suggesting that people experience improved physical health, mental health, and well-being when they can access and/or interact with nature and natural environments (Keniger et al., 2013; Maas et al., 2006; Wendelboe-Nelson et al., 2019). Research also suggests that individuals who live nearer the coast report better general health and mental health – with the proposed mechanism of action being that those living nearer the coast are more likely to visit the coast, which promotes physical activity, encourages positive social interaction, and aids stress reduction (White et al., 2013). Our results align with this proposition, by revealing that people do indeed perceive these types of physical and psychological benefits from visiting the GBR.

It is noted that there are likely to be a range of additional benefits that Reef recreational users derive from visiting the GBR beyond the ones presented in the survey. Prior research has identified a range of benefits that come from interacting with nature, including psychological well-being, cognitive function, physical health, social benefits, spiritual well-being, and tangible material benefits (e.g., food, money) (Keniger et al., 2013). In our survey, we only measured a small set of benefits including physical benefits, stress relief, and restoration outcomes (i.e., relaxation and calmness, attention restoration and clearing one's thoughts) that aligned with prior literature on the restorative benefits of interacting with nature (Hartig et al., 2003; Korpela et al., 2008). Future research may therefore wish to explore a broader range of individual benefits associated with visiting and 'using' the Reef.

Indicator: The adoption of environmental best practice for the Reef is increased by agriculture; Reef recreational users; industry and urban sector; and marine industries

To contribute to the assessment of this indicator, the following SELTMP constructs, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS
GBR visitor marine best practices	<p>List of best practices in the marine sphere</p> <ul style="list-style-type: none"> • ‘When you visit the GBR, how often do you engage in the following actions?’ (selected from the GBRMPA’s Responsible Reef Practices (Australian Government, 2022) (1=never, 2=rarely, 3=some of the time, 4=most of the time, 5=all the time, not applicable) <ul style="list-style-type: none"> - ‘practice responsible anchoring (e.g., anchoring in sandy areas away from corals)’ - ‘dispose of food scraps and rubbish appropriately (i.e., in a rubbish bin on shore, not overboard)’ - ‘report sighting of unusual or interesting marine life using the ‘Eye on the Reef’ sightings network app’ - ‘report suspicious activity to the authorities (e.g., fishing in no-take or ‘green’ zones, dumping rubbish)’ - ‘avoid touching corals and marine life (e.g., when snorkelling or diving)’ - ‘participate in GBR-related community activities or programs (e.g., monitoring surveys, clean-ups, habitat restoration)’
Resident perceptions of GBR interventions	<p>Importance of GBR interventions (1=not at all important to 10=extremely important)</p> <ul style="list-style-type: none"> • ‘In your opinion, how important are the following initiatives for managing the GBR?..’ <ul style="list-style-type: none"> - ‘marine park zoning to restrict certain activities (e.g., fishing, collecting) in some areas of the GBR’ - ‘culling crown of thorns starfish (a sea star that feeds on coral) to protect corals on reefs’ - ‘coral restoration’ (i.e., assisted propagation or ‘gardening’ of corals) to replenish damaged reefs’ - ‘community and citizen science programs that involve local people in reef monitoring, clean-ups, and coral restoration’ - ‘increased compliance to reduce illegal fishing (e.g., poaching in protected marine park zones)’ - ‘assisted coral ‘adaptation’ to increasing sea temperatures (e.g., through selective breeding and moving of heat-tolerant corals)’ - ‘improved land management to improve GBR water quality (i.e., efforts to reduce sediments, nutrients and pollution flowing into the sea)’ - ‘efforts to reduce rubbish and plastics from urban areas entering GBR waters’ - ‘improving Indigenous Traditional Owner co-management and custodianship of the GBR’ - ‘efforts to improve on-water practices by recreational users and tourists (e.g., reducing coral damage from anchors and human contact)’ - ‘Government and industry initiatives to reduce carbon emissions and tackle climate change’ <p>Need for additional GBR interventions</p> <ul style="list-style-type: none"> • ‘I think adopting additional interventions (such as the ones just described) to manage the GBR is... (1) not needed at all, (2) somewhat needed, (3) moderately needed, (4) greatly needed, (5) critically needed’
Participation in agricultural practice programs	<p>List of agricultural practice programs (presented only to participants who indicated that they mainly work in the agricultural sector (n=115))</p> <ul style="list-style-type: none"> • Have you participated in the following programs? (select all that apply) <ul style="list-style-type: none"> - Industry best management practice programs (e.g., Smartcane BMP, Banana BMP, Hort360 GBR BMP) - Nutrient management planning programs (e.g., RP161, Reef Trust Repeated Tenders, WTSIP nutrient management planning) - Sediment reduction or gully remediation programs (e.g., GRASS, Grassroots, Project Pioneer, Landholders Driving Change) - Pesticide improvement programs (e.g., Project Bluewater) - I don’t participate in organised programs but have improved my practices to reduce run-off - I haven’t done anything to reduce run-off from my farm

GBR visitor marine best practices

As shown in Figure 6, on average, people who had visited the GBR at least once in their lifetime, reported higher engagement with the following best practices (where applicable to them); these practices could be classified as relatively low-cost, simple actions: disposing of food scraps and rubbish appropriately (Mean=4.67, SD=0.96, 93% performed this practice most of, or all the time); avoiding touching corals and marine life (Mean=4.54, SD=0.90; 91% performed this practice most of, or all the time); and responsible anchoring (Mean=4.41, SD=1.13; 87% performed this practice most of, or all the time).

In comparison, they reported less engagement with the following best practices (where applicable to them), which could be considered as more effortful or requiring more 'action': reporting suspicious activity to the authorities (Mean=2.80, SD=1.63; 38% performed this practice most of, or all the time); using the 'Eye on the Reef' app (which is consistent with the low uptake across the community) (Mean=1.86, SD=1.27, 14% performed this practice most of, or all the time), and participating in GBR-related community activities (Mean=2.14, SD=1.18; 13% performed this practice most of, or all the time).

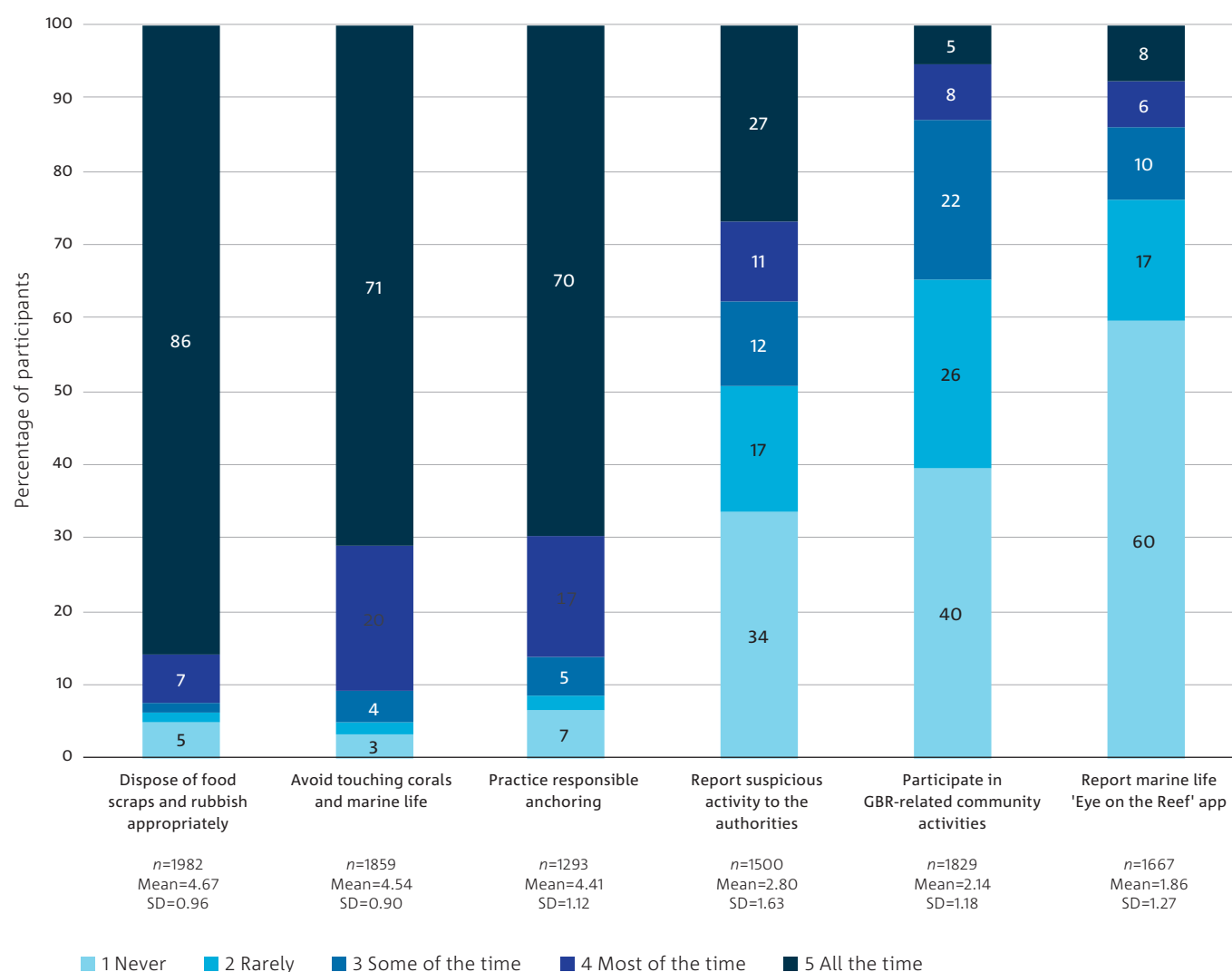


Figure 6 Participant ratings of engagement in/with GBR visitor marine best practices

Notes: Participants were asked: 'When you visit the GBR, how often do you engage in the following actions?'. This question was only presented to 2,048 participants who had 'ever' visited the GBR. The number of participants who answered the question using the 1 to 10 rating scale is denoted at the bottom of each bar. This number varied due to some participants selecting the 'not applicable' response option – these responses are not included in the presentation of results. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

When interpreting these results however, it is important to note that these data come from a self-report survey. Therefore, to further establish the veracity of, or validate, the results reported herein, it is recommended that additional methods also be used to accurately reflect the frequency of best practice behaviours carried out by visitors to the Reef. Ideally, such data should be collected using objective methods, rather than self-reports, which can be subject to social desirability bias (that is, the tendency to answer questions in a manner that will be viewed favourably by others). For example, observational data of Reef visitors could be collected by researchers in the field, usage of the 'Eye on the Reef' app could be already automatically collected by GBRMPA, and community participation rates in GBR-related community activities are likely to already be known. If data from these sources yields the same or similar results, then we can be more confident that the survey findings are a valid or accurate measure of best practices performed by Reef visitors.

As it stands, it is possible that the results for best practices are affected by social desirability bias, resulting in over-reporting of these best practices. We undertook the following steps to minimise socially desirable responding:

1. A behaviourally anchored scale was designed, which asked respondents to nominate the *frequency of engaging in such action* rather than simply rating their level of agreement with a statement.
2. A 'not applicable' response option was included to provide participants with the option to not respond at all, rather than to respond in a biased way.

The confidential nature of the survey also should have curbed the tendency to respond in a socially desirable way (when people are identifiable, socially desirable responding increases). Despite these steps, it is still possible that some people answered the questions in a socially desirable way. Thus, we would advise that the results for participation in best practices are interpreted with caution, viewing them as only gross approximations of actual behaviour.

It was also found that some of these best practices were not applicable to many survey respondents – for example, responsible anchoring was not applicable for 37% of respondents, the reporting of suspicious activity to the authorities was not applicable for 27% of respondents, and using the app was not applicable for 19% of respondents. Given that there are many best practices that can be undertaken in the GBR marine space, future research may consider measuring a broader spectrum of best practices, which may be more relevant to the general population of GBR visitors. Certain best practices may be more appropriate to measure with a defined segment of the visitor population and in a situationally specific way – for example, the measurement of anchoring practices among fishers and boat operators, and app usage behaviour among tourists visiting the Reef.

Resident perceptions of GBR interventions

Moving beyond GBR best practices, which are largely mitigative actions occurring at an individual level, we asked people for their views regarding broad-scale interventions that directly impact on Reef health. Such interventions included both current and future-focussed technological innovations, with either a mitigative (i.e., preventing threats to the Reef), restoration (i.e., repairing the Reef) or adaptation focus (i.e., increasing the resilience of the Reef).

The comparatively easier-to-action behaviour of reducing rubbish and plastics from urban areas entering GBR waters was cited as the most important GBR intervention, with almost two-thirds (64%) of the sample rating it as an extremely important intervention. In fact, compared to the remaining interventions – which were all rated as either of moderate, high, or very high importance overall – reducing rubbish and plastics was a clear forerunner. It is possible that efforts to reducing rubbish and plastics was viewed as an intervention that individuals in the community have more direct control over, compared to other suggested interventions such as increased compliance to reduce illegal fishing, Government and industry carbon emission initiatives and improved land management to improve water quality – actions that all require potentially complex and lengthy institutional-level and industry-wide changes.

Our results can be compared to an earlier 2018 survey of Australian residents ($n=2,743$) and residents of the Reef region ($n=1,293$) (Taylor et al., 2019) undertaken for the Reef Restoration and Adaptation Program (RRAP). In that study, respondents were moderately to strongly accepting of eight specific, targeted reef restoration and adaptation interventions, ranging from pest control to infrastructure solutions, the development of heat resistant coral, and the use of shading. Approximately half were generally accepting of the technologies presented, while another

one-quarter to one-third were undecided or unsure, and roughly 1 in 10 indicated strong or moderate opposition. A similar distributional spread of support ratings was observed in another 2018 Australian-based survey, which assessed public responses to the targeted application of synthetic biology for the development of heat-tolerant coral – in this study, a little over half supportive, around one-third hovering around the mid-point, and roughly 1 in 10 expressing less or no support (Hobman et al., 2022).

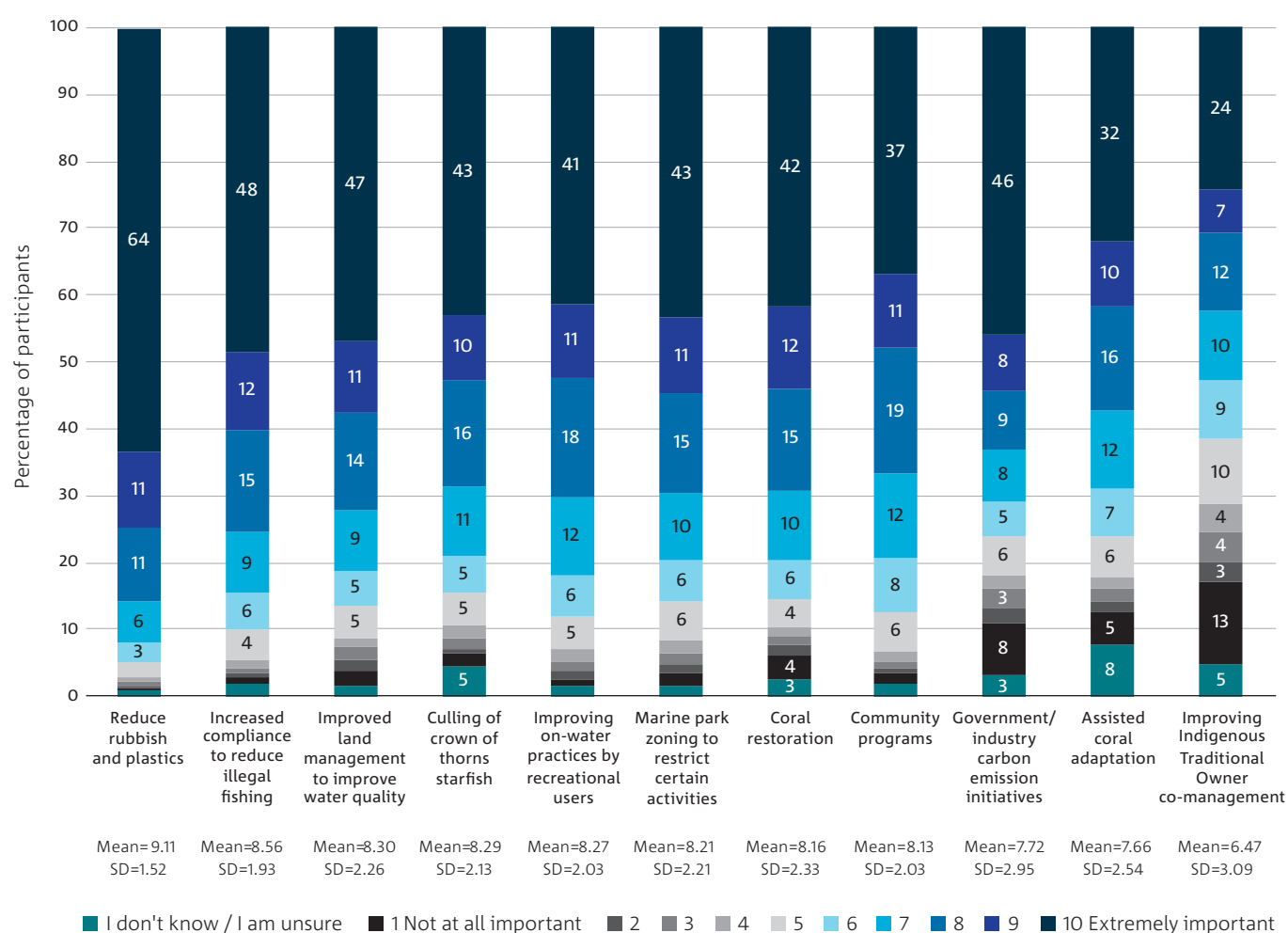


Figure 7 Participant ratings of importance of various GBR interventions

Notes: $n=2488$. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

A follow-up question about the need for such additional interventions, referring explicitly to the interventions just presented to them in the survey, revealed that most people felt that such interventions are needed (Mean=3.91, SD=1.11). As shown in Figure 8, 71% ($n=1,760$) reported that additional interventions were greatly or critically needed. Very few ($n=100$, 4%) felt that interventions were not needed at all. This finding that most participants recognised the need for additional interventions to manage the GBR is similar to the findings of the RRAP study, which found that most (i.e., between 71% and 79%) respondents believed that humans should intervene to prevent threats, repair the GBR, and increase its resilience to future threats (Taylor et al., 2019).

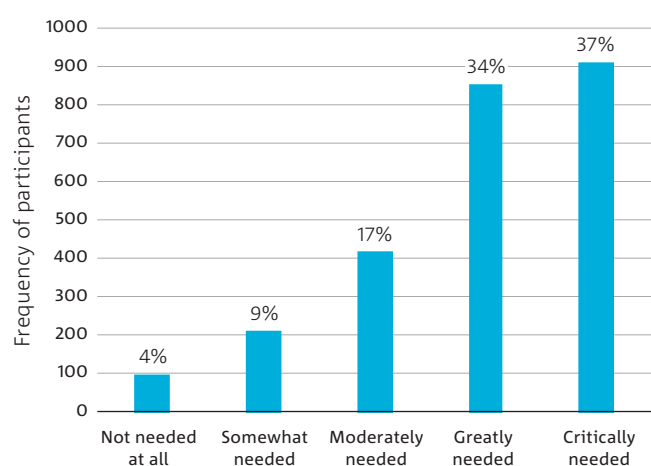


Figure 8 Participant ratings of the need for additional interventions to manage the GBR

Notes: $n=2,488$. Participants were presented with the statement: 'I think adopting additional interventions to manage the GBR is 1=not needed at all, 2=somewhat needed, 3=moderately needed, 4=greatly needed, 5=critically needed'. Percentages are calculated based on the number of people who selected that option divided by 2,448. Percentages are rounded to the nearest whole number. The total percentage does not sum to 100% due to rounding to the nearest whole number.

Participation in agricultural practice programs

As shown in Figure 9, results revealed that for a small percentage ($n=115$, 4.6%) who worked mainly in the agricultural sector, participation across agricultural practice programs varied from between 20% (for pesticide improvement programs) to 35% (for industry BMA programs). Around 35% indicated that they do not participate in organised programs, but they have improved their own practices to reduce run-off, and 17% indicated that they have not done anything to reduce run-off from their farm.

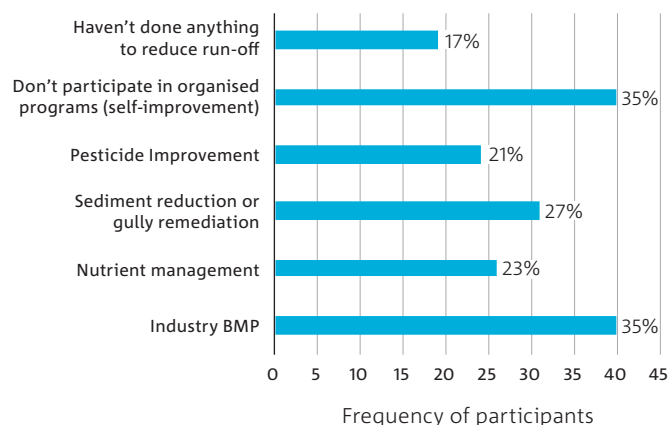


Figure 9 Frequency of participation in agricultural practice programs among agricultural workers

Notes: $n=115$. Participants could select as many options that applied to them. Percentages reflect the percentage of participants who selected that particular option. Percentages are rounded to the nearest whole number.

Almost half ($n=56$, 48.7%) had participated in more than one organised program (see Figure 10), with some ($n=13$, 11.3%) even participating in all four programs.

Please note that additional data is reported for this small subset of agricultural workers in Appendix G.

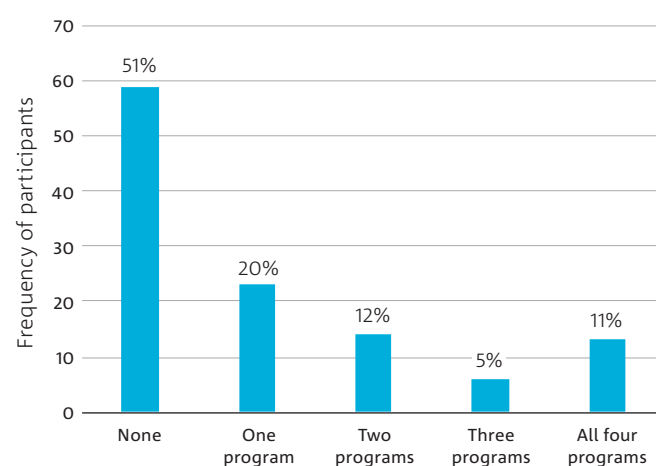


Figure 10 Number of participants who participated in a certain number of organised programs

Notes: $n=115$. Percentages reflect the percentage of participants who participated in that particular number of programs. Percentages are rounded to the nearest whole number. The total percentage does not sum to 100% due to rounding to the nearest whole number.

Indicator: Adaptive capacity of Reef users continues to improve

To contribute to the assessment of this indicator, the following SELTMP constructs, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS
Resident financial dependence on GBR	<p>Household income derived from GBR-related employment</p> <ul style="list-style-type: none"> • ‘What proportion of your household income is from GBR-related businesses or employment (e.g., tourism, restaurants, boating, retail)?’ (1=none, 2=a small amount, 3=a moderate amount, 4=a large amount, 5=all my income) <p>Sector of GBR-related business/employment</p> <ul style="list-style-type: none"> • ‘Which broad sector of GBR-related business or employment does this income come from?’ (1=tourism, 2=fishing, 3=government, 4=science and education, 5=other) <p>Personal employment is GBR-related</p> <ul style="list-style-type: none"> • ‘Is your personal employment associated with the GBR?’ (1=no, 2=yes)
Personal impacts of declining GBR health	<p>Personal impacts of declining GBR health</p> <ul style="list-style-type: none"> • ‘If the health of the GBR significantly declined...(1=very strongly disagree to 10=very strongly agree) <ul style="list-style-type: none"> - ...living in the GBR region would become undesirable to me’ - ...I would take steps to relocate out of the GBR region’ - ...my employment prospects would be reduced’ - ...my financial situation would be negatively affected’ - ...my lifestyle would be negatively affected’
Resident adaptive capacity	<p>Adaptive capacity (job flexibility) – for those whose personal income is derived from GBR-related employment (Barnes et al., 2020) (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> • ‘If my work associated with the GBR was no longer viable, I could shift into a different job or role easily’ • ‘If my work associated with the GBR was no longer viable, I would move out of the region’ • ‘I am already taking steps, or have taken steps, to change the work I do so that I am not as reliant on the GBR for income’

Resident financial dependence on GBR

19% reported that their household was financially dependent on the GBR ($n=481$, 19%) for at least a small amount of income, leaving the majority ($n=2,007$, 81%) not dependent on the GBR for household income (see Figure 11). Of this subsample of people (i.e., the 19%) who were dependent on the GBR for household income, a little under half ($n=212$, 44%) indicated that tourism (including hospitality) was the sector from which they derived this income (see Figure 12). Other represented sectors included the government ($n=75$, 16%), science and education ($n=52$, 11%), fishing ($n=52$, 11%) and 'other' ($n=90$, 19%).

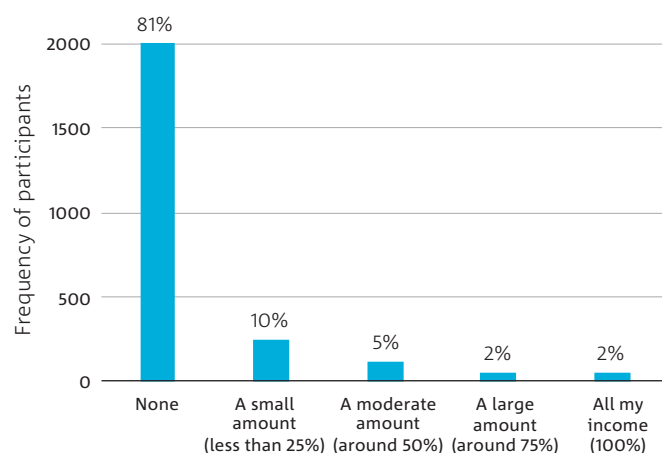


Figure 11 Number of participants deriving a proportion of their household income from GBR-related business or employment

Notes: $n=2,488$. Percentages reflect the percentage of participants who selected that particular option. Percentages are rounded to the nearest whole number.

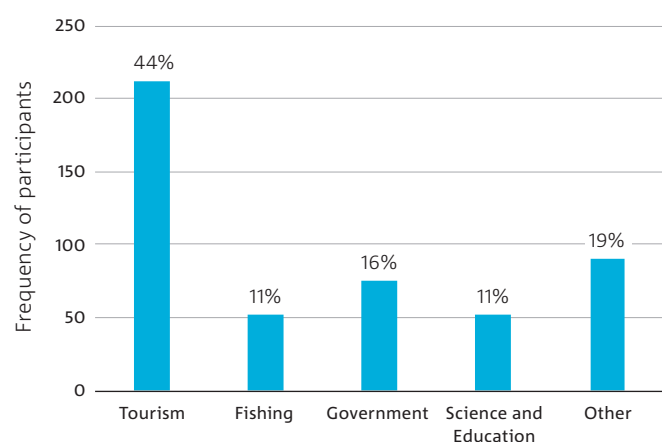


Figure 12 Number of participants working in a particular sector related to the GBR

Notes: $n=481$. This question was only presented to 481 participants who indicated that at least a small amount of their household income is from GBR-related business or employment. Percentages reflect the percentage of participants who selected that particular option. Percentages are rounded to the nearest whole number. The total percentage does not sum to 100% due to rounding to the nearest whole number.

Furthermore, a small number ($n=147$, 6% of entire sample) of participants also indicated that their personal income is derived from GBR-related employment.

Overall, the findings show that most respondents were not dependent on the GBR for household income. For the small proportion of participants who were dependent on the GBR, very few indicated that they were heavily dependent on the GBR for household income; most people indicated that they were moderately or only a little dependent on the GBR for household income. A little under half ($n=212$, 44%) indicated that their GBR-related business or employment lay within the tourism (including hospitality) sector.

Personal impacts of declining GBR health

Looking at the personal impacts of declining GBR health on the broader sample of participants overall, most did not feel that their financial situation or employment prospects would be negatively impacted if the health of the GBR significantly declined (see Figure 13). However, there was a roughly even split between those who thought their lifestyle would be negatively affected and those who did not hold this perception.

In follow up to the above, additional analyses was undertaken to explore personal impacts for (1) the subset of participants whose household income was derived from the GBR and (2) the subset of participants whose personal employment was associated with the GBR.

Those whose household income ($n=481$) was associated with the GBR (as compared to those whose household income was not derived from the GBR) reported significantly higher negative impacts on their lifestyle (Mean=6.78 versus Mean=4.81, $t(2475)=-12.43$, $p<0.001$, Cohen's $d=0.63$), financial situation (Mean=5.76 versus Mean=2.63, $t(2475)=25.23$, $p<0.001$, Cohen's $d=1.28$) and employment prospects (Mean=5.49 versus Mean=2.56, $t(2475)=22.92$, $p<0.001$, Cohen's $d=1.16$). Consistent with these negative impacts, more participants whose household income was derived from the GBR reported that living in the GBR region would become undesirable to them (Mean=5.34 versus Mean=3.91, $t(2475)=-9.95$, $p<0.001$, Cohen's $d=0.51$) and they would take steps to relocate out of the GBR region (Mean=4.81 versus Mean=3.11, $t(2475)=-12.76$, $p<0.001$, Cohen's $d=0.65$).

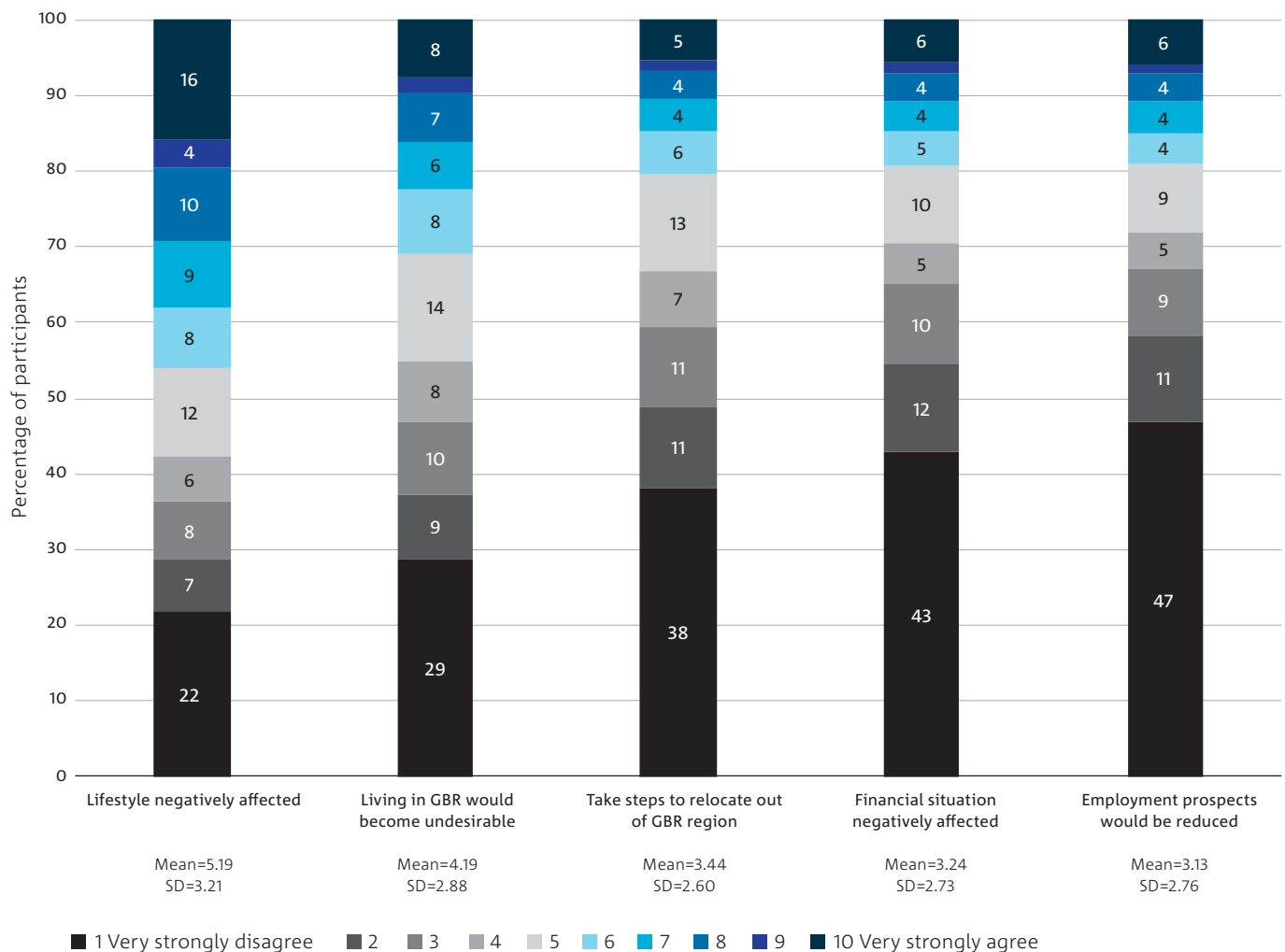


Figure 13 Participant ratings of personal impacts if the health of the GBR significantly declined

Notes: $n=2,475$; 13 missing cases. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

A similar pattern of results was observed for those whose personal employment ($n=147$) was associated with the GBR (as compared to those whose personal employment was not related to the GBR). They reported significantly higher negative impacts on their lifestyle (Mean=7.54 versus Mean=5.04, $t(2473)=9.30$, $p<0.001$, Cohen's $d=0.79$), financial situation (Mean=6.80 versus Mean=3.01, $t(2473)=17.28$, $p<0.001$, Cohen's $d=1.47$) and employment prospects (Mean=6.63 versus Mean=2.91, $t(2473)=16.69$, $p<0.001$, Cohen's $d=1.42$). Consistent with these negative impacts, more participants whose personal employment was associated with the GBR reported that living in the GBR region would become undesirable to them (Mean=5.62 versus Mean=4.10, $t(2473)=6.28$, $p<0.001$, Cohen's $d=0.53$) and they would take steps to relocate out of the GBR region (Mean=5.57 versus Mean=3.31, $t(2473)=10.11$, $p<0.001$, Cohen's $d=0.86$).

The above results suggest that most residents did not feel that their employment prospects or financial situation would be negatively affected if the health of the GBR significantly declined, and nor would they take steps to relocate out of the region. Participants also slightly disagreed that living in the GBR region would become undesirable, although there was a roughly even split between those who felt that their lifestyle would be negatively affected and those who did not feel this way. Unsurprisingly, all negative personal impacts were felt more so by individuals whose personal employment was associated with, or whose household income was derived from, the GBR. However, we remain cautious in generalising this particular result, given the very small sample of GBR-dependent participants in either of these categories. Further research should be performed with a larger group of residents who are dependent on the GBR for their personal and/or household income.

Adaptive capacity – flexibility

Whether and how people respond to environmental change, such as degradation of the GBR, is driven by their underlying adaptive capacity – which is defined broadly as the ‘conditions that underpin people’s ability to anticipate and respond to change; to recover from and minimise the consequences of change; and to take advantage of new opportunities’ (Barnes et al., 2020). Drawing on the literature of adaptive capacity in the context of responding to climate change (Barnes et al., 2020; Cinner & Barnes, 2019), we measured just one aspect (of the possible six broad domains) of adaptive capacity – Flexibility. Flexibility reflects the capacity of individuals who may be affected by change, to deal with change by being able to accommodate and use different coping strategies. Flexibility includes having a diversity of options to choose from, but also an innate willingness and ability to engage these options (Cinner & Barnes, 2019).

Thus, for the subset of residents likely to be affected by a changing GBR – that is, those whose personal income was associated with the GBR – we assessed three aspects of flexibility:

- Perceptions of job flexibility – that is, the ease of shifting into a different job or role.
- Adaptive behavioural intentions – whether they would move out of the region if their work associated with the GBR was no longer viable.
- Adaptive actions – whether they had already taken steps to change their work so that they are not as reliant on the GBR for income.

Figure 14 reports on the flexibility for the smaller number of people ($n=147$, 6%) whose personal employment was associated with the GBR. Overall, respondents slightly agreed that their jobs were flexible or that they would move out of the region if their work associated with the GBR was no longer viable. However, when it came to having already taken steps to change their work to reduce reliance on the GBR for income, respondents slightly disagreed that they had done so.

Based on these results, it appears that around half of GBR-reliant individuals felt reasonably capable of adapting (by changing jobs or moving out of the region) if their work was no longer viable, while around a third did not feel they would be able to adapt in these ways. However, these results should be interpreted cautiously given the very small sample size. Additional research is required to examine adaptive capacity more rigorously, which could involve both qualitative and quantitative targeted studies with people who are employed in GBR-related employment and business.

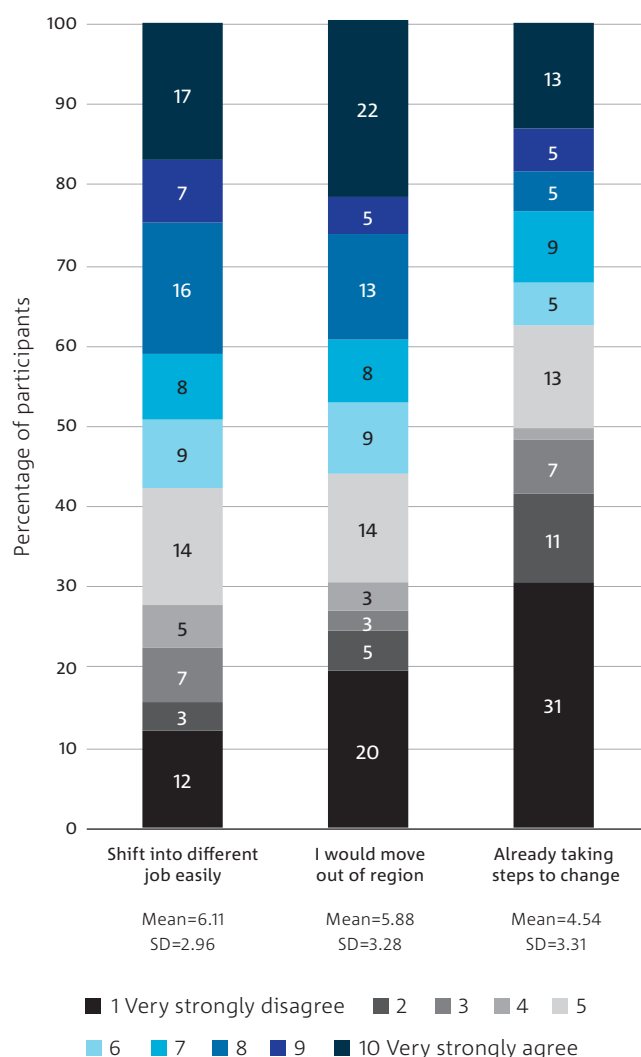


Figure 14 Participant ratings of job flexibility for participants whose personal income is associated with the GBR

Notes: $n=147$. Participants were asked ‘If my work associated with the GBR was no longer viable, I could shift into a different job or role easily’, ‘If my work associated with the GBR was no longer viable, I would move out of the region’, and ‘I am already taking steps, or have taken steps, to change the work I do so that I am not as reliant on the GBR for income’. The number of respondents is low because it was only asked to people who indicated that their personal income is derived from GBR-related employment. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

Objective 1: Uses of the Reef are ecologically sustainable as the system changes, in turn sustaining economic and social benefits

Overall, the following conclusions for this Reef 2050 Objective can be made based on our results:

GBR visitation

- While visitation to the GBR may have been low with only 50% visiting the GBR in the year prior to the survey, 66% of people still indicated that they choose to visit the GBR in their recreation time.
- Also, 82% reported that they had visited the GBR at least once in their lifetime.

Benefits from visiting GBR

- Two-thirds to three-quarters of those who have visited the GBR (at least once in their lifetime) recognised the benefits of interacting with the GBR – helping them to feel better in both a physical and psychological sense (e.g., stress relief and psychological restoration).

GBR visitor best practices and perceptions of GBR interventions

- Around 90% of participants reported frequently engaging in certain low-cost, simple best practices relevant to the Reef.
- People viewed a range of additional large-scale GBR-management interventions as highly to extremely important, with 70% reporting that such interventions were ‘greatly’ to ‘critically’ needed. Only 4% felt that such interventions were not needed at all.

Agricultural workers’ participation in agricultural practice programs

- By virtue of living in the GBR region, there was a small number ($n=115$) of agricultural farmers who completed the survey. Approximately 50% of this small sample of farmers reported that they had participated in at least one organised agricultural practice programs available to them.

Personal impacts and adaptive capacity

- 81% reported that they were not financially dependent on the GBR for household income.
- Unsurprisingly, 80% of participants did not feel that they personally would be financially impacted, or that their employment prospects would reduce if the health of the GBR declined. However, nearly 50% recognised that their lifestyle could be negatively affected.
- A small proportion who reported being dependent on the GBR for household (19% of sample) or personal income (6% of sample) did report more negative financial and employment impacts, and that living in the region would become undesirable to them and that they would take steps to move out of the region.
- For the small percentage (6%) whose personal income was derived from GBR-related employment, around half reported feeling as though their work was flexible (in terms of changing jobs) but fewer people had actually taken steps to change their work to reduce reliance on the GBR for income.

Objective 2

People maintain or grow their attachment to the Great Barrier Reef

Indicator: For Great Barrier Reef region residents: Wellbeing and satisfaction associated with the Great Barrier Reef is maintained or improved

To contribute to the assessment of this indicator, the following SELTMP constructs, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS
Resident perceptions of GBR health	<p>Perceived health of GBR</p> <ul style="list-style-type: none"> • 'Of the places you have visited in the GBR, how would you rate the health of the...(1=very poor, 2=poor, 3=fair, 4=good, 5=excellent, not applicable (have not visited), I don't know) - ...beaches' - ...creeks and rivers' - ...ocean and sea' - ...islands' - ...coral reefs' - ...mangroves' - ...seagrass' - ...fish and other marine life'
Resident emotions when hearing about GBR degradation	<p>Emotional response to GBR degradation</p> <ul style="list-style-type: none"> • 'When you hear about damage to the GBR (e.g., from cyclones, coral bleaching), to what extent does it make you feel...(1=not at all, 2=a little bit, 3=somewhat, 4=quite a bit, 5=a great deal) - ...sad' - ...angry' - ...afraid' - ...helpless' - ...disappointed'
Resident wellbeing from living in GBR region	<p>Wellbeing from living in GBR region (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> • 'Living in this region contributes positively to my overall wellbeing'

Resident perceptions of GBR health

People who had visited the GBR at least once in their lifetime, on average, tended to perceive different habitats of the GBR that they had visited as being in 'fair' to 'good' health (see Figure 15). Most responses fell in the fair, good and excellent health categories of the rating scale with very few people (4% to 14%) providing poor or very poor health ratings. Beaches, islands, ocean and sea, mangroves, creeks and rivers, and fish and other marine life tended to receive higher health ratings as compared to coral reefs and seagrass. For example, 76% thought the condition of beaches was good or excellent and 70%

thought the condition of islands was good or excellent, while only 46% thought the condition of coral reefs, and 38% thought the condition of seagrass was good or excellent. Given the recent natural disasters including significant coral bleaching events in 2016-2017, and 2020, it is perhaps not surprising to find that participants rated coral reefs in the GBR as relatively less healthy than other parts of the GBR. The same can be said for seagrass which is also negatively affected by cumulative pressures such as poor water quality and high sea surface temperatures, similar to coral (Commonwealth of Australia, 2011).

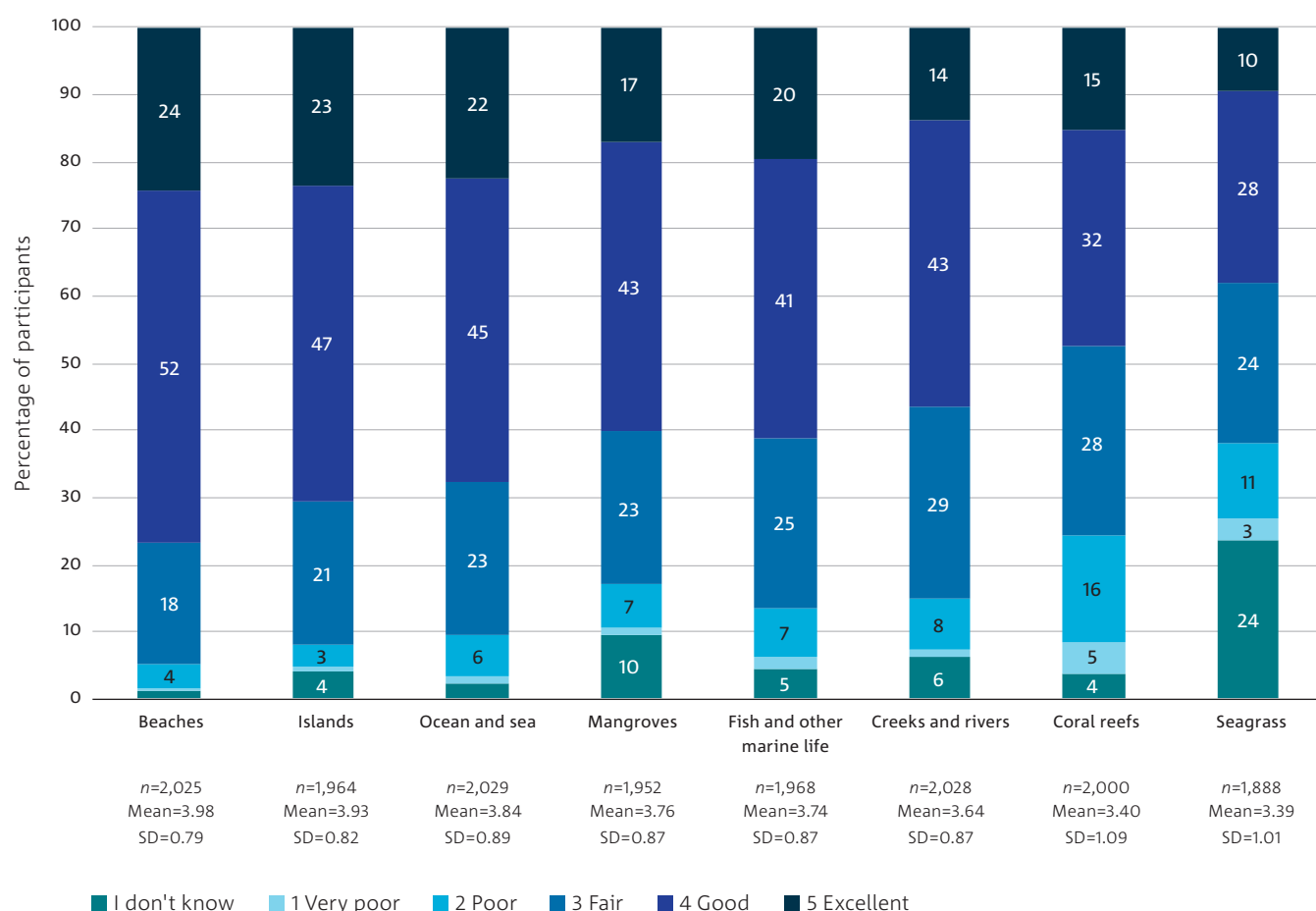


Figure 15 Participant ratings of perceived health of different parts of the GBR, mean-ranked from highest to lowest

Notes: These questions were only presented to 2,048 participants who had 'ever' visited the GBR. The number of participants who answered the question using the 1 to 5 and 'I don't know' options is denoted at the bottom of each bar. Another 'not applicable (have not visited)' was provided but these responses were not included in the presentation of results. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled. The mean scores are calculated based on the 1 to 5 responses only.

Resident emotions when hearing about GBR degradation

‘Ecological grief’ is a term used to describe the emotional suffering or pain that people experience when faced with losses or declines in the condition of the natural environment – for example, the loss of valued species of flora and fauna, ecosystems, and landscapes (Benham, 2016; Cunsolo & Ellis, 2018; Marshall et al., 2019). The presence of ecological grief among GBR residents, in the context of the GBR, was identified in the 2017 SELTMP survey

where around half the residents surveyed strongly agreed (scoring 8, 9, or 10 on a 10-point agreement scale) that they felt depressed when thinking about coral bleaching. The term ‘reef grief’ was coined to describe ecological grief in this context (Marshall et al., 2019). In the current survey, we measured a range of negative emotions that people may experience when faced with potential damage to the GBR (see Figure 16). On average, participants reported feeling sad and disappointed more than feeling helpless, angry, or afraid.

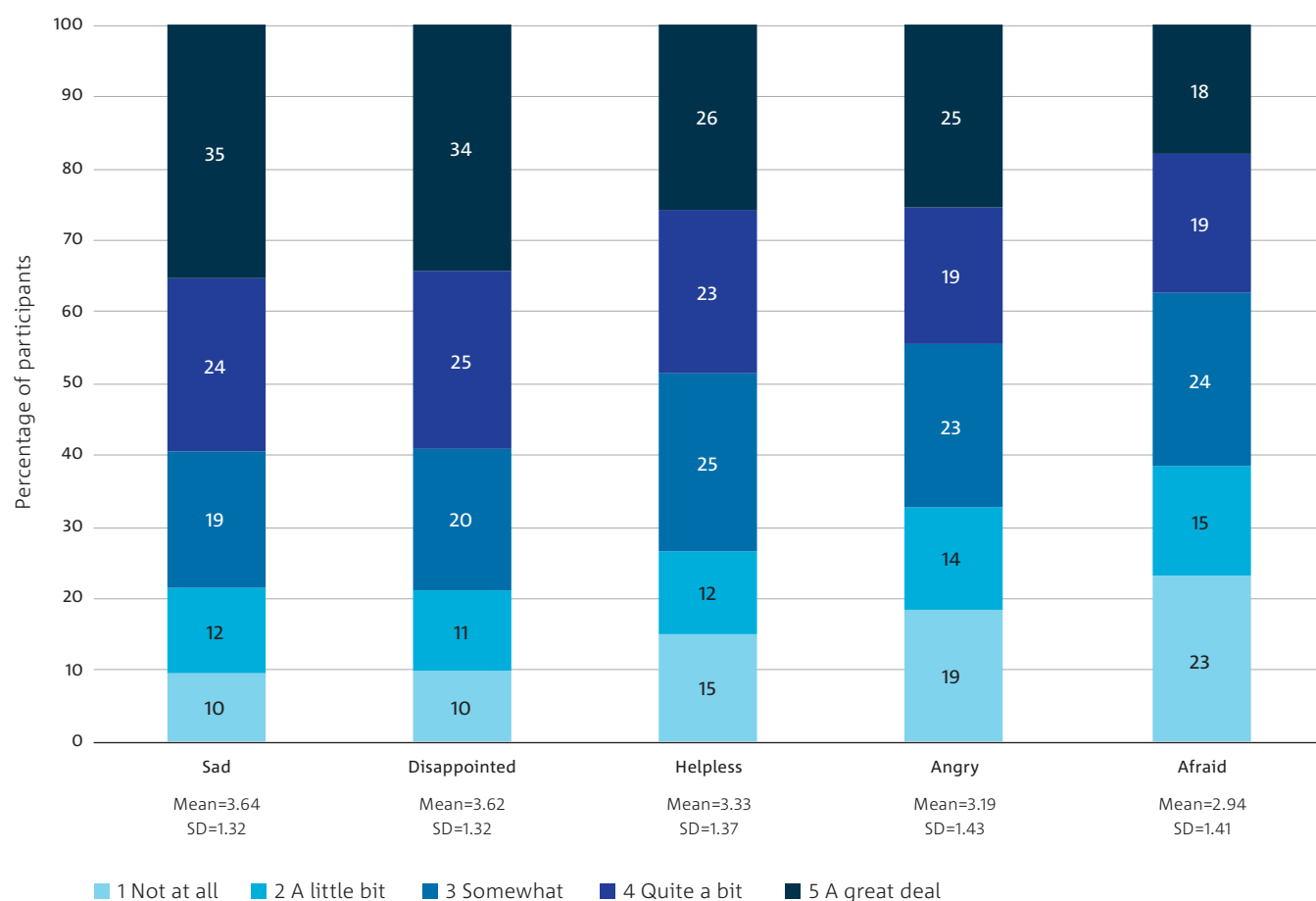


Figure 16 Participant ratings of emotions felt when hearing about damage to the GBR, mean-ranked from highest to lowest

Notes: $n=2,448$. Participants were presented with a generic statement: ‘When you hear about damage to the GBR (e.g., from cyclones, coral bleaching), to what extent does it make you feel...sad, disappointed, helpless, angry, and afraid’. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number.

Our finding, that over half, felt quite a bit to a great deal sad and disappointed suggests that over half may be experiencing grief-type emotions related to the Reef – like what was observed in 2017. In comparison to the other emotions (feeling angry, helpless, and afraid), people were more likely to experience feeling sad and disappointed. It is noted that there was a relatively small proportion who indicated that they did not feel any of the listed emotions. However, it remains an open question as to the types of emotions, if any, that these respondents experience when hearing about damage to the GBR – that is, if people do not report any negative feelings, does this mean they are indifferent or do not care? Future research is needed to further explore the range of responses to hearing about damage to the GBR.

In addition to our targeted evaluation of negative emotions, there also exists the opportunity to explore the emotions in general, by systematically analysing responses to the place-related meanings question asked elsewhere in the survey. This question has been asked in each of the SELTMP surveys: ‘What are the first words that come to mind when you think about the GBR?’ and the analysis has precedence in that it was used to explore differences in positive, negative, and neutral words between 2013 and 2017 among tourists of the GBR (Curnock et al., 2019). While we present the overall results of this place-related meanings question elsewhere in this report, a targeted assessment of emotions is something that could be potentially undertaken in the future, for publication in the scientific literature.

Resident wellbeing from living in GBR region

Participant’s assessment of how living in the region contributes positively to their own wellbeing was strong (Mean=7.81, SD=2.29) (see Figure 17). Most people agreed that living in the region contributes positively to their overall wellbeing, with 75% agreeing or strongly agreeing (scoring 7 or over on the 10-point agreement scale) and only 8% disagreeing or strongly disagreeing (scoring 4 or below on the 10-point agreement scale).

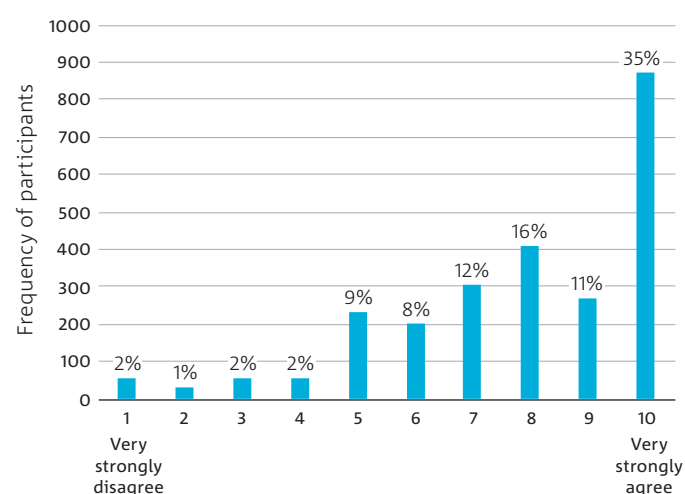


Figure 17 Participant ratings of wellbeing derived from living in the GBR region

Notes: $n=2,488$. Participants were presented with the statement: ‘Living in this region contributes positively to my overall wellbeing’. Numbers above the bars show the number of respondents. Percentages reflect the percentage of participants who selected that particular option. Percentages are rounded to the nearest whole number. The total percentage does not sum to 100% due to rounding to the nearest whole number.

Indicator: For Great Barrier Reef region residents: attachment and identity associated with the Reef is maintained or improved; pride in the Reef is maintained or improved; non-use values for the Reef are maintained or improved

To contribute to the assessment of this indicator, the following SELTMP constructs, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS	SELTMP METRICS RETAINED FROM SELTMP 2013/ SELTMP 2017
Resident place attachment	Place attachment (Song et al., 2019) (1=very strongly disagree to 10=very strongly agree) <ul style="list-style-type: none"> Place affect: 'I feel a strong sense of belonging to where I live' Place dependence: 'Living close to the GBR is important to me because of my lifestyle' Place social bonding: 'I live in this region because those closest to me (family, friends) live here too' 	Place-related meanings (GBR word association task) <ul style="list-style-type: none"> 'What are the first words that come to mind when you think of the Great Barrier Reef?' (Devine-Wright & Howes, 2010). Space for three entries was provided. A sentiment analysis was conducted on participant responses to this question (see Appendix E for further detail).
Resident place identity	<i>Not applicable</i>	Place identity (1=very strongly disagree to 10=very strongly agree) <ul style="list-style-type: none"> 'The GBR is part of my identity'
Resident pride in GBR	<i>Not applicable</i>	Pride in GBR (1=very strongly disagree to 10=very strongly agree) <ul style="list-style-type: none"> 'I feel proud that the GBR is a World Heritage Area'
Resident perceptions of services and benefits associated with GBR	GBR services and benefits (additional services and benefits) <ul style="list-style-type: none"> 'How much do you value the following aspects of the GBR?' (1=I don't value this at all to 10=I value this extremely highly, not applicable) <ul style="list-style-type: none"> Local economy: 'The GBR supports the local economy' Individual's livelihood: 'The GBR supports my livelihood' Individual's lifestyle: 'The GBR supports my lifestyle and recreational interests' Individual's socialising: 'The GBR provides a place for me to spend time with my family and friends' Maritime heritage: 'The GBR has historic maritime heritage' 	GBR services and benefits (selected and modified wording and response scale) (López-Hoffman et al., 2010; van Riper et al., 2012) (1=I don't value this at all to 10=I value this extremely highly, not applicable) <ul style="list-style-type: none"> 'How much do you value the following aspects of the GBR?' <ul style="list-style-type: none"> Biodiversity: 'The GBR supports a variety of marine life, such as fish and corals' Existence: 'The fact that the GBR exists, even if I don't use or benefit from it' Individual's culture: 'The GBR is an important part of my culture' Bequest culture: 'The GBR provides a place where people can continue to pass down wisdom, traditions, and a way of life' International icon: 'The GBR attracts people from all over the world' Food provisioning: 'The GBR provides fresh seafood' Scientific heritage: 'People can learn about the environment through scientific discoveries made on the GBR' Indigenous heritage: 'The GBR has rich Traditional Owner heritage'

Resident place attachment, place identity and pride in GBR

It is well known that people can develop an emotional attachment, bond, connection, or ‘sense of place’ with the places in which they live and work (Lewicka, 2011; Song et al., 2019). In our survey, we measured four dimensions of place attachment to the GBR¹ (Song et al., 2019):

- Place identity – the symbolic or ideological connection between an individual and a setting.
- Place affect – emotive attachment, and captures an individual’s sentiments about a place.
- Place dependence – attachment based on whether the place meets a person’s functional needs.
- Place social bonding – feelings of membership to a group of close others such as family and friends.

We also assessed constructs thought to align with place attachment and as articulated in the Reef 2050 Plan, including pride in the GBR (that it is a World Heritage Area) and place identity. Furthermore, a place-related meanings task (Devine-Wright & Howes, 2010) was included to explore sentiment towards the GBR in a more qualitative manner. As shown in Figure 18, our results demonstrate the strong pride that participants have regarding the GBR being a World Heritage Area. In comparison to pride, feelings of place attachment and place identity were slightly lower yet still positive overall. These results illustrate that pride in the GBR seems to be acknowledged more strongly than all aspects of place attachment (place affect, place dependence, place social bonding) and place identity.

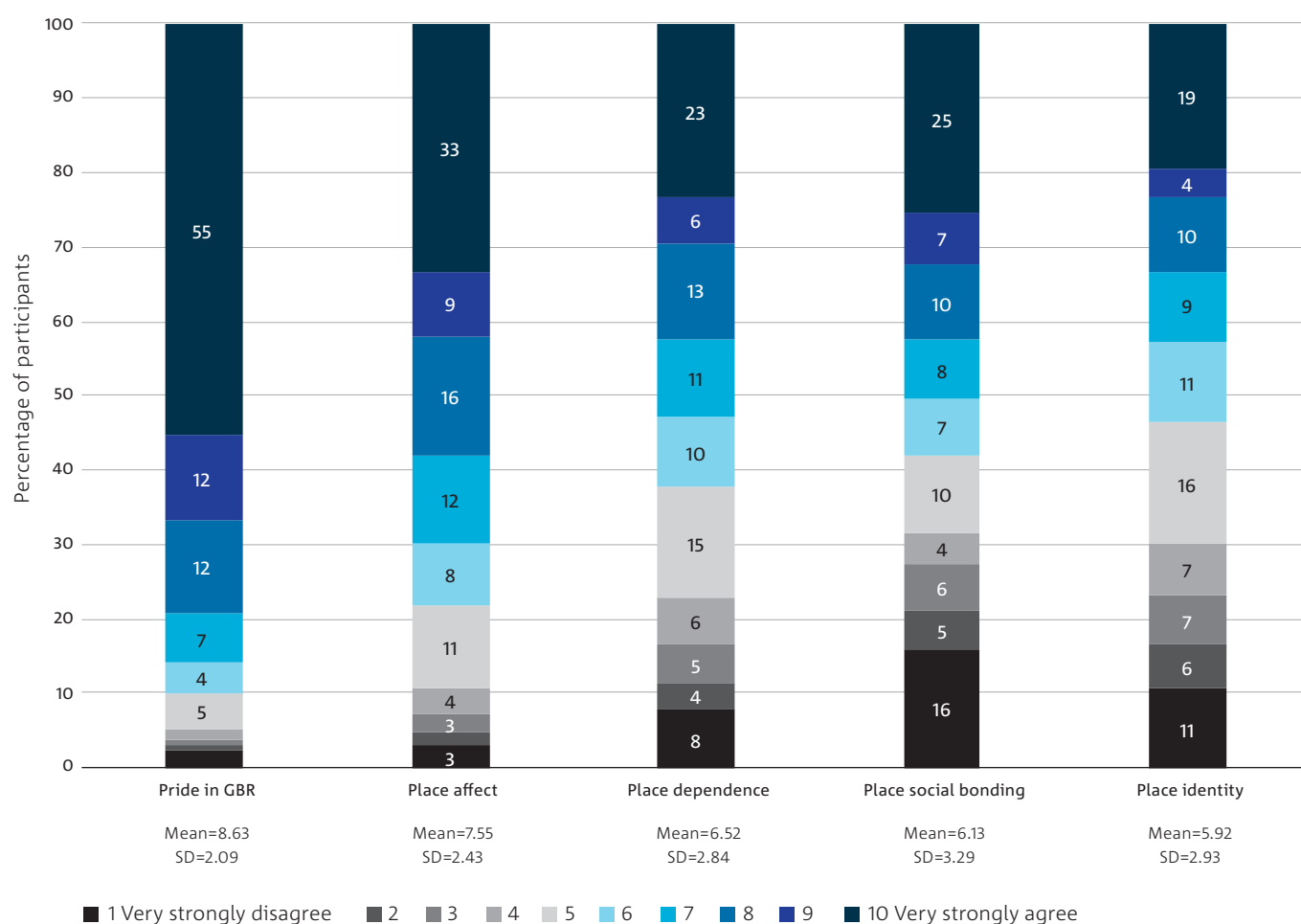


Figure 18 Participant ratings of pride in GBR, place attachment (affect, dependence, social bonding) and place identity

Notes: $n=2,448$. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

1 Noting that other quantitative measures of place attachment exist (see Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology*, 31(3), 207-230. <https://doi.org/10.1016/j.jenvp.2010.10.001> .

The fact that place dependence, place social bonding and place identity were only ‘slightly felt’ could be explained by the fact that there may be several reasons why people live in the GBR region, besides the fact that it supports their lifestyle (place dependence) or that other family and friends live in the GBR region too (place social bonding). Similarly, an individual’s personal identity is influenced by many other factors besides the place where one resides. Future research may wish to explore residents’ attachment to the GBR, and qualitative studies may be well suited to this endeavour. Future research may also explore the associations between emotions (as previously discussed) and feelings of place attachment, pride, and identity as it has been proposed that place attachment, pride, and identity are complementary to the expression of ecological grief, and in fact, represent ‘ecological empathy’ (Curnock et al., 2019).

The results of the sentiment analysis conducted on the place-related meanings task ‘What are the first words that come to mind when you think about the GBR’ revealed that the words ‘beautiful’, ‘coral’ and ‘fish’ are common (see Figure 19 for a visual depiction or illustration of the words, in word cloud format). It was also apparent that more words were classified as either neutral (55.4% of all words) or positive (35.5% of all words), than negative (9.1% of all words). As this question has been repeated across the years, future analysis may be performed on the sub-sample of participants who have visited in the past 12 months, to explore any changes in sentiment over time. This could be accomplished by quantifying differences in the frequency of positive versus negative versus neutral words across the years.



Figure 19 Word cloud from the place-related meanings task

Notes: The word clouds show the results from a sentiment analysis conducted on the place-related meanings task ‘What are the first words that come to mind when you think about the GBR’. Negatively-valenced words are coloured red, positively-valenced words are coloured blue; and neutrally-valenced words are coloured grey. The size of words indicates the relative frequency of their occurrence (i.e., larger words were mentioned more). Words occurring fewer than three times are omitted from the figure.

Resident perceptions of services and benefits associated with the GBR

As per the Reef 2050 indicator, to measure non-use values, participants were asked to rate the value that they place in a range of services and benefits associated with the GBR. Figure 20 displays these value ratings. All services and benefits associated with the GBR were

rated strongly (all above 7 on a 10-point scale), except for 'supporting' one's livelihood, which may be explained by the fact that only a small number of residents are financially dependent on the GBR². In this regard, respondents still recognised the ability of the GBR in helping support the local economy – as evidenced by the high value placed on the 'local economy' benefit.

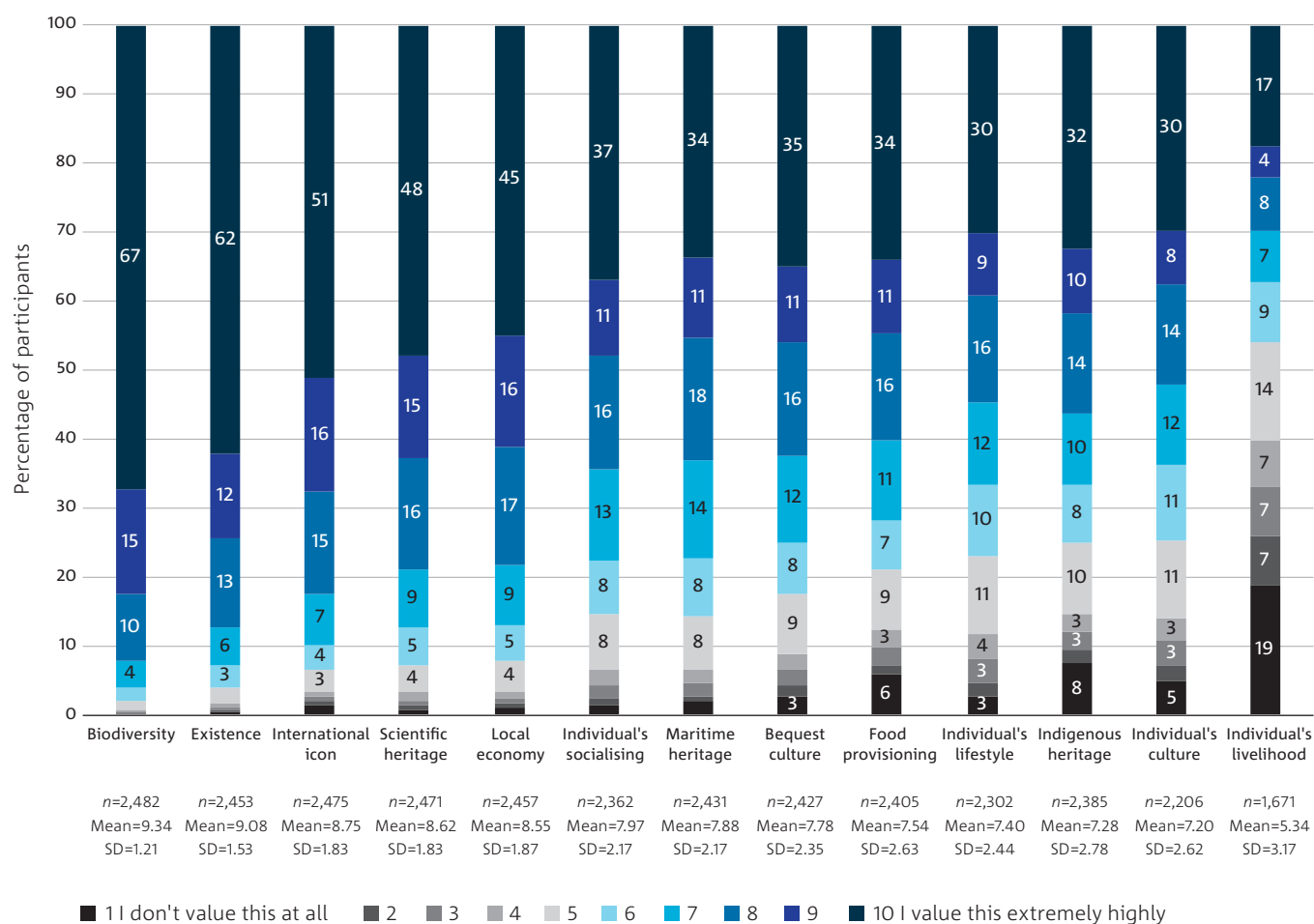


Figure 20 Participant value ratings for various services and benefits associated with the GBR, mean-ranked from highest to lowest value

Notes: $n=2,488$. The number of participants who answered the question using the 1 to 10 rating scale is denoted at the bottom of each bar. This number varied due to some participants selecting the 'not applicable' response option – these responses are not included in the presentation of results. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

2 Follow-up analysis has revealed that the value placed on this GBR benefit of individual livelihood was significantly higher (Mean=7.41, SD=2.68) for those residents who were financially dependent on the GBR, as compared to those who were not (Mean=4.62, SD=3.01) ($t(1669)=17.06$, $p=0.000$, Cohen's $d=0.95$).

Objective 2: People maintain or grow their attachment to the Great Barrier Reef

Overall, the following conclusions for this Reef 2050 Objective can be made based on our results:

Perceived health of the GBR

- Those who have visited the GBR (at least once in their lifetime) (82% of sample) tended to rate different parts of the GBR in 'fair' to 'good' health. Beaches and islands received the highest health ratings (averaging 'good' health), while coral reefs and seagrass received the lowest health ratings (average just above 'fair' health). Few people (<14%) viewed the GBR in poor or very poor health.

Emotional response to GBR degradation

- When asked to think about how they feel when they hear about damage to the GBR, 59% reported feeling 'quite a bit' to 'a great deal' sad and disappointed.
- Other feelings – such as feeling helpless, angry and afraid – were still reported by many people but were not as frequently reported as were the emotions of sad and disappointed.

Wellbeing from living in GBR region

- 83% agreed that living in the GBR region contributes positively to their overall wellbeing.

Place attachment, pride in GBR, place identity and place-related meanings

- 90% indicated that they felt proud that the GBR is a World Heritage Area.
- In terms of attachment to the GBR region, 78% agreed that they feel a strong sense of belonging to where they live. However, feelings of attachment due to specific reasons such as one's lifestyle or family/friend bonds, and a sense that the GBR is 'part of their identity' were not quite as strongly or commonly experienced by people.
- The words that people associate with the GBR tended to hold meanings that were more positive (35.5% of all words were positive) or neutral (55.4% of all words were neutral), than negative (9.1% of all words were negative).

GBR services and benefits

- People placed high to very high value on a range of services and benefits that the GBR provides. The mere existence of the GBR, and the fact that the GBR supports biodiversity were the top-rated services and benefits with over 90% placing a high to very high value on these.

Objective 3

People and communities take individual and collective action to maintain Reef resilience

Indicator: Levels of community awareness and education about the Great Barrier Reef is maintained or improved

To contribute to the assessment of this indicator, the following SELTMP constructs, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS	SELTMP METRICS RETAINED FROM SELTMP 2013/ SELTMP 2017
Resident perceptions of GBR threats	<p>Threat susceptibility</p> <ul style="list-style-type: none"> • ‘For the following list of issues, please rate the extent to which you think they represent a threat to the GBR’ (1=does not represent a threat at all, 2=a minor threat, 3=a moderately serious threat, 4=a serious threat, 5=represents an extremely serious threat, 9=I don’t know) - ‘crown of thorns starfish’ - ‘illegal fishing practices (e.g., poaching in no-take areas)’ - ‘land-based runoff (containing sediment, fertiliser, pesticides etc.)’ - ‘climate change’ - ‘tourism’ - ‘coastal development and land clearing’ - ‘ports and shipping’ - ‘mining’ - ‘population growth’ - ‘governance (i.e., management of the GBR)’ <p>Threat severity</p> <ul style="list-style-type: none"> • ‘In your opinion, how problematic are each of the following issues in the GBR?...’ (1=not a problem at all, 2=a small problem, 3=a moderate problem, 4=a big problem, 5=a very big problem, 9=I don’t know) - ‘loss of coral cover’ - ‘loss of mangroves’ - ‘loss of seagrass’ - ‘poor coastal water quality’ - ‘low abundance of fish’ - ‘loss of access to parts of the Reef (e.g., for fishing, recreation, or cultural practices)’ 	<p>Threat susceptibility (open-ended):</p> <ul style="list-style-type: none"> • ‘What do you think are the three (3) most serious threats to the GBR?’ Thematic coding was performed on participant responses to this question (see Appendix F for further detail).

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS	SELTMP METRICS RETAINED FROM SELTMP 2013/ SELTMP 2017
Resident climate change beliefs	<i>Not applicable</i>	<p>Climate change beliefs</p> <ul style="list-style-type: none"> • ‘Which of the following statements best describes your beliefs about climate change and the GBR?...’ - ‘Climate change is a threat to the GBR, requiring immediate action’ (in previous years, worded: Climate change is an immediate threat requiring action) - ‘Climate change is a threat to the GBR, but does not require immediate action’ (in previous years, worded: Climate change is a serious threat, but the impacts are too distant for immediate concern) - ‘I need more evidence to form an opinion about climate change and how it may threaten the GBR’ (in previous years, worded: I need more evidence to be convinced of the problem) - ‘Climate change is not a threat to the GBR’ (in previous years, worded: I believe that climate change is not a threat at all) - ‘I do not have a view on climate change and how it relates to the GBR’ (in previous years, worded: I do not have a view on climate change) - ‘I do not believe in climate change’ (not included as an option in previous years)

Resident perceptions of threats

To contribute to an assessment of community awareness of the GBR, we first asked participants to nominate in an open-text field what they think are the top 3 most serious threats to the GBR. As shown in Figure 21,

climate change and pollution were the most common threats mentioned – almost half the sample referred to climate change (mentioned by 46%) and pollution (mentioned by 45%). Other common threats mentioned included fishing (mentioned by 29%), humans (mentioned by 23%), and water quality (mentioned by 21%).

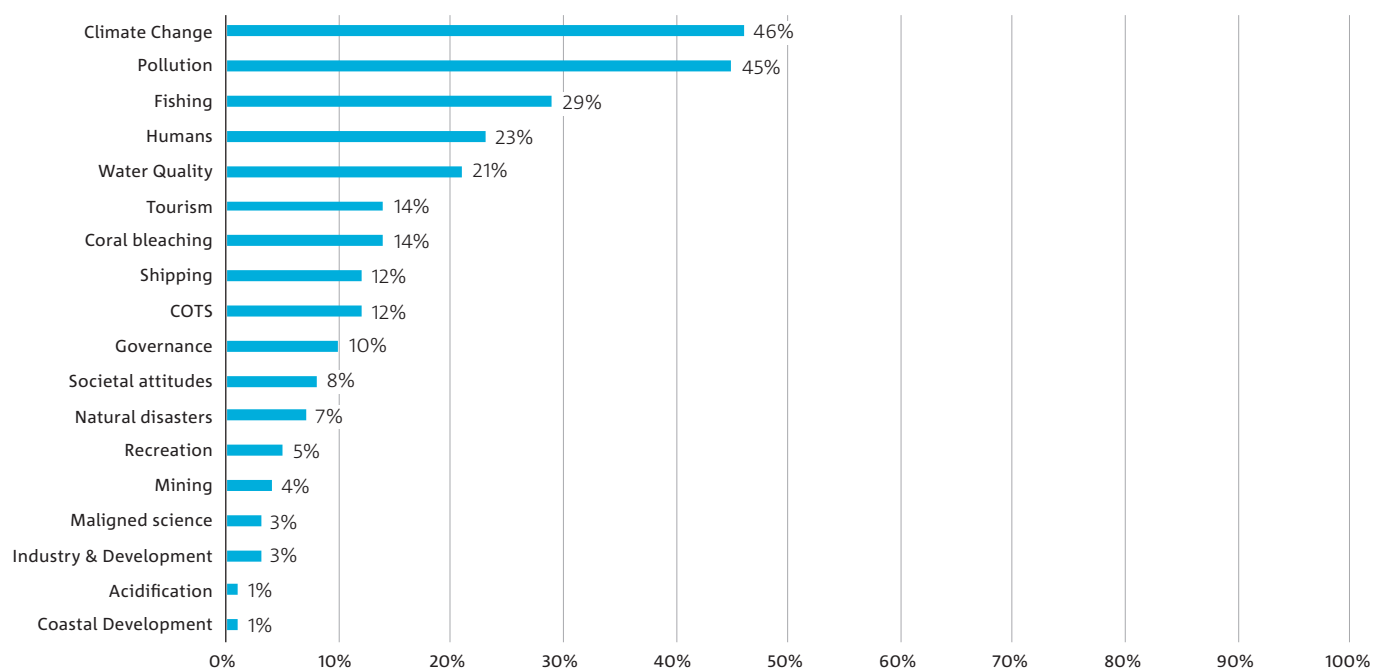


Figure 21 Most common threats mentioned in the open-ended question: ‘What do you think are the three (3) most serious threats to the GBR?’, ranked from most mentioned to least mentioned threat

Notes: Percentages are rounded to the nearest whole number. Percentages are based on the number of people who mentioned this threat divided by 2,488. COTS = Crown of thorns starfish.

In a second threat perceptions measure we presented participants with a selection of potential threats. Results showed that, on average, participants tended to perceive all listed threats as moderate to serious (see Figure 22).

Finally, when we asked participants to rate the severity of certain problems facing the GBR, participants generally rated them as moderate to big problems (see Figure 23).

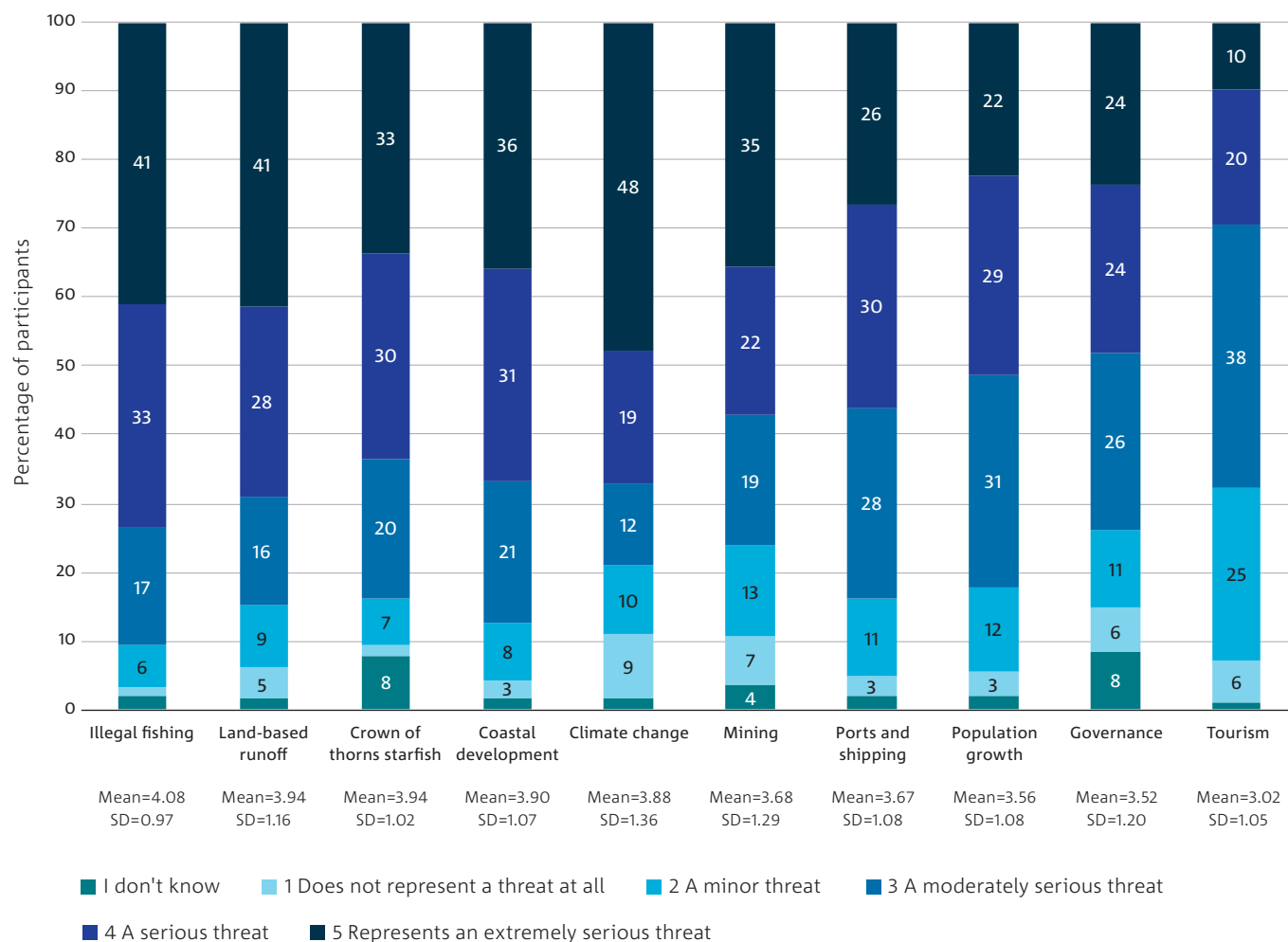


Figure 22 Participant ratings of various threats to the GBR, mean-ranked from highest to lowest perceived threat

Notes: $n=2,488$. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

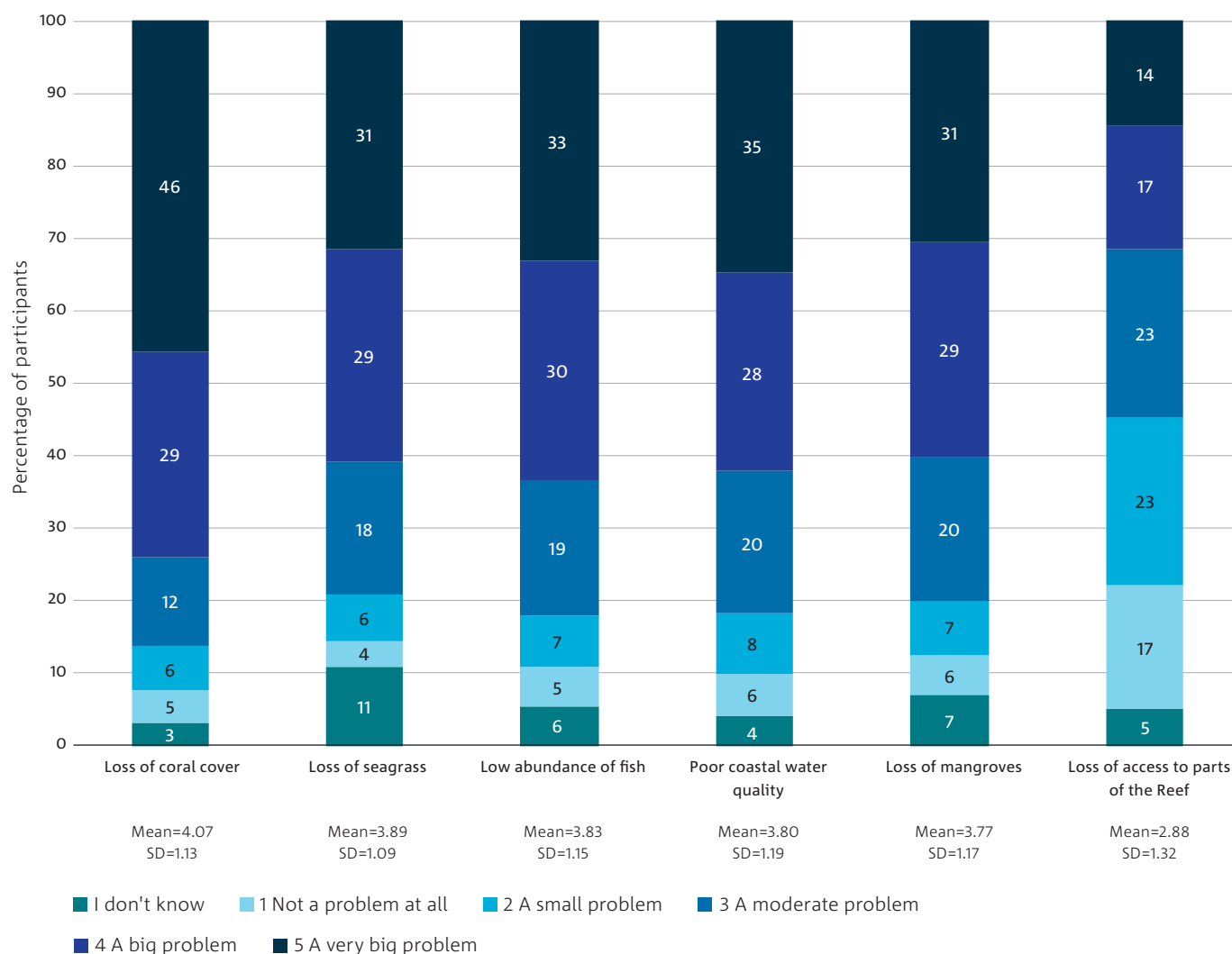


Figure 23 Participant ratings of various GBR-related problems, mean-ranked from the most to least problematic

Notes: $n=2,488$. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

Overall, the results for our set of threat perceptions questions suggest that people are very much aware of the threats facing the GBR, and of the problems that the GBR is currently experiencing. In particular, participants were highly cognisant that climate change is a critical threat, which concurs with the scientific literature positioning climate change as the most significant threat to the future of coral reefs worldwide (National Ocean Service, 2021). Roughly half of our sample nominated climate change (and pollution) as a serious threat to the GBR. Furthermore, in our analysis of responses to the threat rating question, of all the threats listed, climate change received the largest portion (48%) of people rating it as an extremely serious threat (Mean=3.88, SD=1.36).

Interestingly, there was another ~20% who rated climate change as a minor threat, or no threat at all. This pattern of contrasting results was only observed for climate change which suggests the presence of diverging perspectives regarding whether climate change is a significant threat to the GBR. Our findings for climate change beliefs, presented in the next section, provides some supporting evidence in this respect – answers to the climate change beliefs question revealed that while most believe climate change is a threat to the GBR (65%), there was a sizeable proportion (in aggregate) who either do not believe in climate change (5%), do not have a view on climate change and how it relates to the GBR (3%), do not believe climate change is a threat to the GBR (7%), or need more evidence to form an opinion about climate change and how it may threaten the GBR (21%).

The resultant changes brought about by climate change were also consistently rated by participants as problematic, particularly loss of coral cover, seagrass and mangroves, the low abundance of fish, and poor coastal water quality. With reference to the problem of coral reef loss, our results are similar to those of a 2018 survey of the broader Australian public ($n=1,148$) which explored attitudes towards synthetic biology and the development of heat-tolerant coral (Mankad et al., 2021). In that study, 94% of respondents rated loss of coral cover as a moderate-to-very big problem, which is consistent with our finding of 87% rating loss of coral cover as a moderate-to-very big problem.

Resident climate change beliefs

Figure 24 presents the results for the climate change beliefs question. As shown, more than half believed that climate change is a threat to the GBR requiring immediate action. 21% needed more evidence to form an opinion about climate change and how it may threaten the GBR. The remaining small percentages (3% to 6%) were distributed across the remaining options.

The results for climate change beliefs are consistent with the results for perceived threats. Across all questions, climate change was consistently recognised by many people as a threat to the Reef. In our sample, over half believed that climate change is a threat to the GBR. However, there was also a smaller, yet sizeable (~24%) percentage who did not currently hold an opinion about climate change and how it relates to the GBR, with most of these people reporting that they need more evidence or information to form a view. While the remaining 12% did not believe – either in climate change, or that climate change poses a threat to the GBR.

The need for ‘more evidence’ was also present in some participants’ open-ended responses to the perceived threats question, where a small but visible proportion of respondents indicated some apprehension and mistrust in the GBR/climate science that is publicly communicated. Further, more in-depth analyses would need to be conducted to establish the nature of apprehension and mistrust experienced by this small group, and whether there are other related factors contributing to these feelings. To this end, we intend to further explore the attitudes and beliefs of this small subset of participants (e.g., What sources of information are trusted by people who require more evidence/do not believe in climate change?). While this topic remains a focus for future exploration, we suggest that there are several external factors that may be contributing to a more general, public need for ‘evidence’ that is emerging worldwide, arguably borne out of international political events giving rise to ‘fake news’ suspicions and the ongoing COVID-19 pandemic where reliable scientific information is difficult to find (Dube et al., 2021; Germani & Biller-Andorno, 2021; Schernhammer et al., 2022). It is possible that these parallel global events, both with strong social media influences, have led to more general scepticism about the communication of science and an exaggerated sense of science literacy in the ‘lay expert’ (Hornsey et al., 2018; Prior, 2003). These issues, while presented in a more general sense, may certainly apply when considering climate change beliefs in the present context.

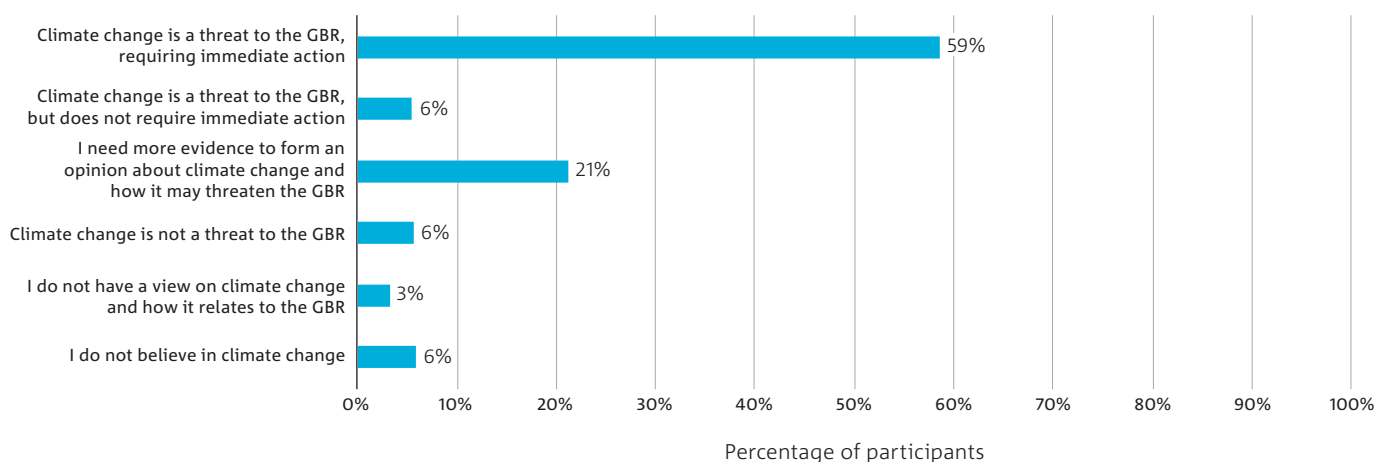


Figure 24 Climate change beliefs

Notes: $n=2,488$. Participants were asked: ‘Which of the following statements best describes your beliefs about climate change and the GBR?’ Percentages are rounded to the nearest whole number.

Indicator: Opportunities for community leadership and stewardship are increased and supported

To contribute to the assessment of this indicator, the following SELTMP constructs, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS	SELTMP METRICS RETAINED FROM SELTMP 2013/ SELTMP 2017
Resident attitudes and beliefs towards GBR stewardship	<p>Ascription of shared responsibility (local) (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> • 'I believe it is the responsibility of everyone in my local area to reduce their impacts on the GBR'. <p>Moral obligation (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> • 'I feel morally obligated to reduce any impacts I might personally have on the GBR' (van der Werff et al., 2013) <p>Social norms (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> • 'I think that most people in my local area try to reduce any impacts they might have on the GBR' (Bissing-Olson et al., 2016) <p>Outcome expectancy (Bradley et al., 2020) (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> • Waste reduction: 'Reducing my household waste helps reduce impacts on the GBR' • Electricity consumption reduction: 'Reducing my electricity consumption helps reduce impacts on the GBR' 	<p>Personal agency (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> • 'I feel that I cannot make a personal difference in improving the health of the GBR' (in previous years, worded: 'I cannot make a personal difference in improving the health of the GBR')

Resident attitudes and beliefs towards GBR stewardship

As shown in Figure 25, we found that participants on average, reported strong belief that it is their personal responsibility, as well as the responsibility of everyone in their local area, to reduce their individual impacts on the GBR. They also generally agreed that reducing one's waste would help reduce impacts on the GBR. Participants on average slightly agreed that people in their local area were trying to reduce any impacts they might have on the GBR, that reducing electricity consumption would help reduce impacts on the GBR, and that they themselves could make a personal difference in improving the health of the GBR.

Overall, these results suggest that while many people may feel personally responsible for taking steps to minimise impacts on the GBR and believe that everyone in their local area shares this responsibility and that some are doing their part; there are slightly less people who feel that such individual efforts will lead to significant or tangible improvements for the Reef. This slightly reduced sense of personal agency or confidence in the impact of one's actions may be partly explained by the fact that some people may not necessarily be aware of how their private climate-related actions (e.g., reducing electricity consumption, as we measured; and perhaps other climate-related actions) affect the Reef. Indeed, in a 2019 national survey of 4,385 Australians, when asked the following open-ended question: 'Say you were asked to do something to help the Great Barrier Reef. What types of actions do you think people like you could do that would be helpful for the Reef?', only 4.1% identified at least one specific action that related to climate change – the vast majority (34.8%) listed pollution-related action instead (Dean et al., 2020). These results in combination with ours, suggest that people may not necessarily be aware of the everyday household practices that may contribute to Reef conservation.

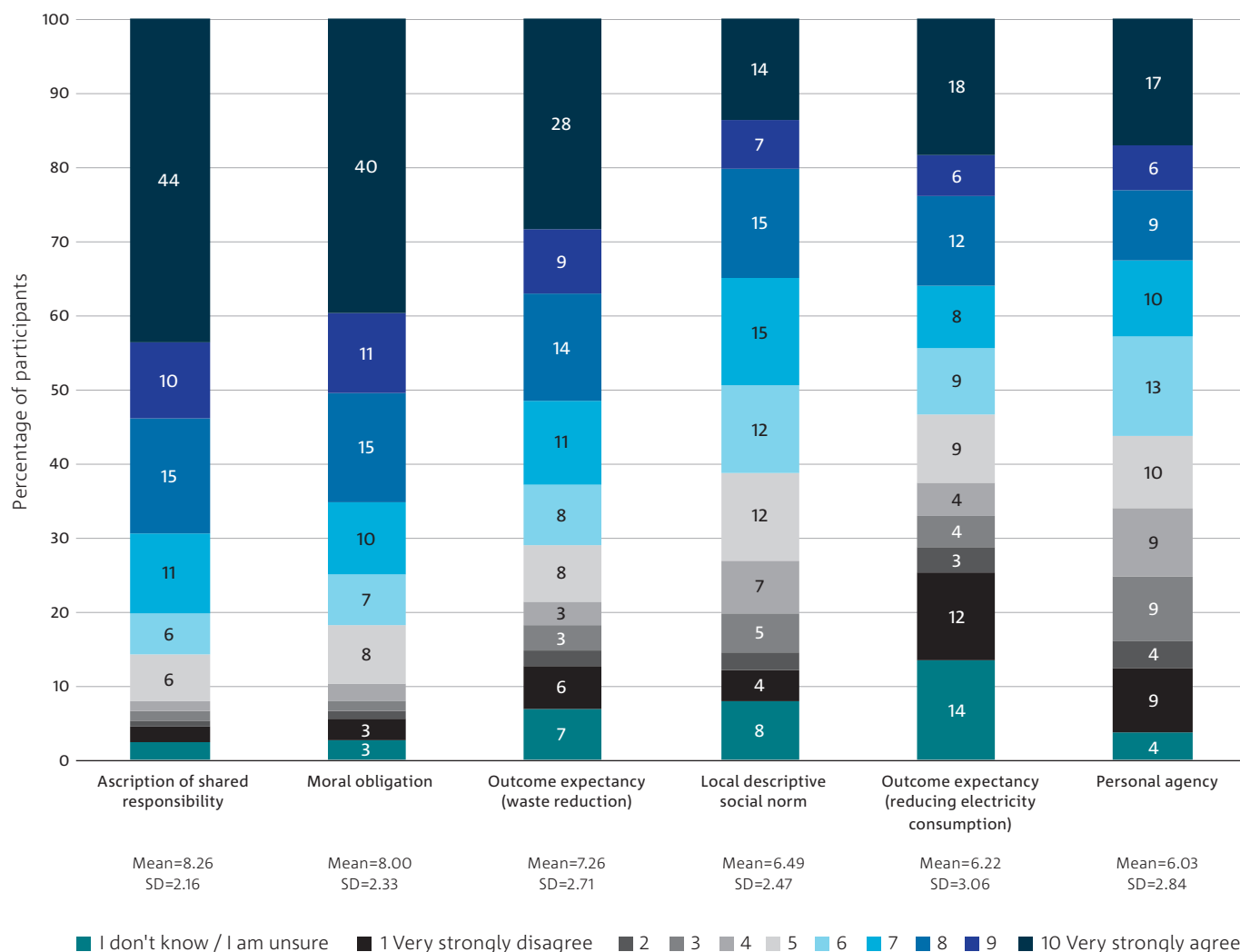


Figure 25 Participant ratings of attitudes and beliefs towards GBR stewardship, mean-ranked from highest to lowest

Notes: $n=2,488$. Personal agency was reverse scored prior to analysis, such that higher scores reflect higher levels of personal agency (the original question: 'I feel I cannot make a personal difference in improving the health of the GBR'). Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

Objective 3: People and communities take individual and collective action to maintain Reef resilience

Overall, the following conclusions for this Reef 2050 Objective can be made based on our results:

Resident perceptions of GBR threats

- Climate change and pollution were the most mentioned threats to the GBR, mentioned by 46% and 45% of people mentioning these two threats, respectively.
- When presented a list of potential threats, between approximately 75% and 90% of participants viewed all threats (except for tourism) as ‘moderate’ to ‘serious’.
- Similarly, approximately 80% to 90% of participants rated the following as ‘moderate’ to ‘big’ problems for the GBR – loss of coral cover, seagrass and mangroves, low abundance of fish, and poor coastal water quality.

Resident climate change beliefs

- When asked about their beliefs regarding climate change and the GBR, more than half (65%) believed that climate change is a threat to the GBR – with most of these people saying that it requires immediate action.
- A smaller yet sizeable proportion (24%) did not have a view on climate change and how it may threaten the GBR – with most of these people saying they need more evidence to form an opinion.
- The remaining people (12%) did not believe – either in climate change, or that climate change is a threat to the GBR.

Resident attitudes and beliefs towards GBR stewardship

- When it came to stewardship, 86% agreed that it is the responsibility of everyone in their local area to reduce their impacts on the GBR. However, only 63% agreed that people in their local area were trying to do so.
- Participants also felt a strong moral obligation to reduce their impacts on the GBR with 83% agreeing that they were morally obligated. However, only 55% felt that they could make a personal difference in improving the health of the GBR.
- Reflecting understanding of how one’s actions impact on the GBR, 70% agreed that reducing waste would contribute to reduced impacts, whereas only 53% thought that reducing electricity consumption would also lead to this outcome.

Objective 4

Intangible and tangible historic heritage and cultural heritage and contemporary cultural values remain intact

Indicator: Aesthetic values scores are maintained or improved

To contribute to the assessment of this indicator, the following SELTMP construct, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP METRICS RETAINED FROM SELTMP 2013/SELTMP 2017
Resident aesthetic perceptions of the GBR	Aesthetic perceptions (1=very strongly disagree to 10=very strongly agree) <ul style="list-style-type: none">• ‘The aesthetic beauty of the GBR is outstanding’ (López-Hoffman et al., 2010; van Riper et al., 2012)

Resident aesthetic perceptions of the GBR

The extent to which residents appreciate and/or recognise the aesthetic beauty of the GBR has been suggested as a key factor that underpins whether people will engage in nature-based recreation and tourism (Marshall et al., 2019). Our results revealed that, on average, people recognised the GBR for its aesthetic value as reflected by strong agreement with the statement that the aesthetic beauty of the GBR is outstanding (Mean=8.88, SD=1.71) (see Figure 26). 90% agreed or strongly agreed, 4% slightly agreed, 3% slightly disagreed and 2% disagreed or strongly disagreed.

Prior research has revealed that aesthetic ratings are related to people’s sense of place, whereby greater familiarity with a place can contribute to a more positive aesthetic judgment about that place (i.e., the place is perceived as more beautiful) (Marshall et al. 2019). While out of scope for the current report, we intend to extend on this prior literature by exploring the relationships between aesthetic perceptions and a range of other variables including, but not limited to place attachment, pride, and identity. Such analysis will reveal whether people who feel more attached to the GBR region, greater pride in the GBR being a World Heritage area, and/or stronger identification with the GBR, also perceive that the aesthetic beauty of the GBR is more outstanding – compared to their counterparts who are not as attached, proud or strongly identified.

Pert et al. (2020) also recommends to further contextualise the aesthetic response scores, knowing more about an individual respondents’ background (i.e., their age, interest level and previous coral reef experience) can be useful and that reef managers should consider long term monitoring of aesthetic values to better understand the state and trend of associated environmental attributes, to better manage and protect those attributes and preserve aesthetic values.

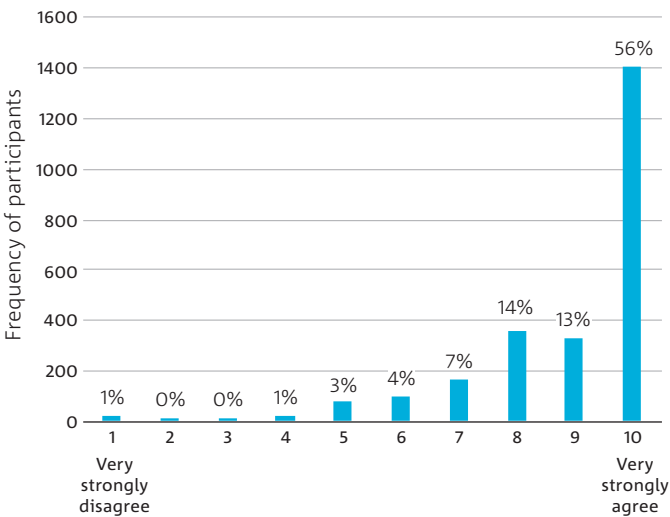


Figure 26 Participant ratings of aesthetic beauty of the GBR

Notes: n=2,488. Participants were presented with the statement: ‘The aesthetic beauty of the GBR is outstanding’. Numbers above the bars show the number of respondents. Percentages on the x-axis reflect the percentage of participants who selected that particular option. Percentages are rounded to the nearest whole number. The total percentage does not sum to 100% due to rounding to the nearest whole number.

Objective 4: Intangible and tangible historic heritage and cultural heritage and contemporary cultural values remain intact

Overall, the following conclusions for this Reef 2050 Objective can be made based on our results:

Resident aesthetic perceptions of the GBR

- 94% agreed that the aesthetic beauty of the GBR is outstanding.

Objective 5

Governance systems are inclusive, coherent and adaptive

Indicator: Planning, management and decision making is more inclusive of rights and interests of stakeholders, Traditional Owners and communities

To contribute to the assessment of this indicator, the following SELTMP construct, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS
Resident perceptions of decision-making processes and outcomes related to GBR management	<p>Perceived fairness (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> Procedural justice: 'I think that decisions about managing the GBR are made in a fair way' (Cotton & Devine-Wright, 2011; Devine-Wright, 2012; Lacey & Lamont, 2014; Moffat & Zhang, 2014; Witt et al., 2018) Distributive justice: 'I think that the benefits and costs of managing the GBR are distributed fairly across different groups of people (e.g., GBR residents, tourist operators, fishers)' (Lacey & Lamont, 2014; Moffat & Zhang, 2014; Witt et al., 2018) <p>Voice (1=very strongly disagree to 10=very strongly agree)</p> <ul style="list-style-type: none"> Opportunities for participation in decision-making: 'There are opportunities available to me to have a say in how the GBR is managed' (Cotton & Devine-Wright, 2011; Devine-Wright, 2012) Influence: 'I feel I personally have some influence over how the GBR is managed' (Barnes et al., 2020)

Resident perceptions of decision-making processes and outcomes related to GBR management

Because conservation practices may impose disproportionately high costs at the local level, achieving distributional fairness – that is, a fair distribution of benefits and costs across relevant stakeholders and end users – is considered a critical component of effective environmental management (Ohl et al., 2008). Thus, we sought to measure residents' perceptions of distributional fairness when it comes to managing the GBR. To accompany this assessment of decision-making outcomes, we also measured residents' perceptions of procedural fairness – that is, the fairness of decision-making processes.

And in addition to assessing residents' general perceptions of decision-making regarding GBR management, we measured their own personal involvement in decision making (both in terms of opportunity and influence) because community participation in decision-making is thought to support the effectiveness of policy-making processes (Irvin & Stansbury, 2004).

As shown in Figure 27, there was a sizeable percentage (18% to 25%) who did not know or were unsure about whether decisions were made in a fair way, or whether the outcomes (benefits and costs) are distributed fairly. For those who did respond to the questions, views diverged resulting in a roughly even split across the agreement and disagreement ranges.

Also shown in Figure 27 are the results for personal involvement in decision-making. Interestingly, there was still a small percentage who did not know whether there were opportunities (15%) or whether they have a personal influence over how the GBR is managed (8%). For those who did respond to the questions, more people seemed to disagree that there were opportunities for them to have a say in how the GBR is managed, and that they have an influence over how the GBR is managed.

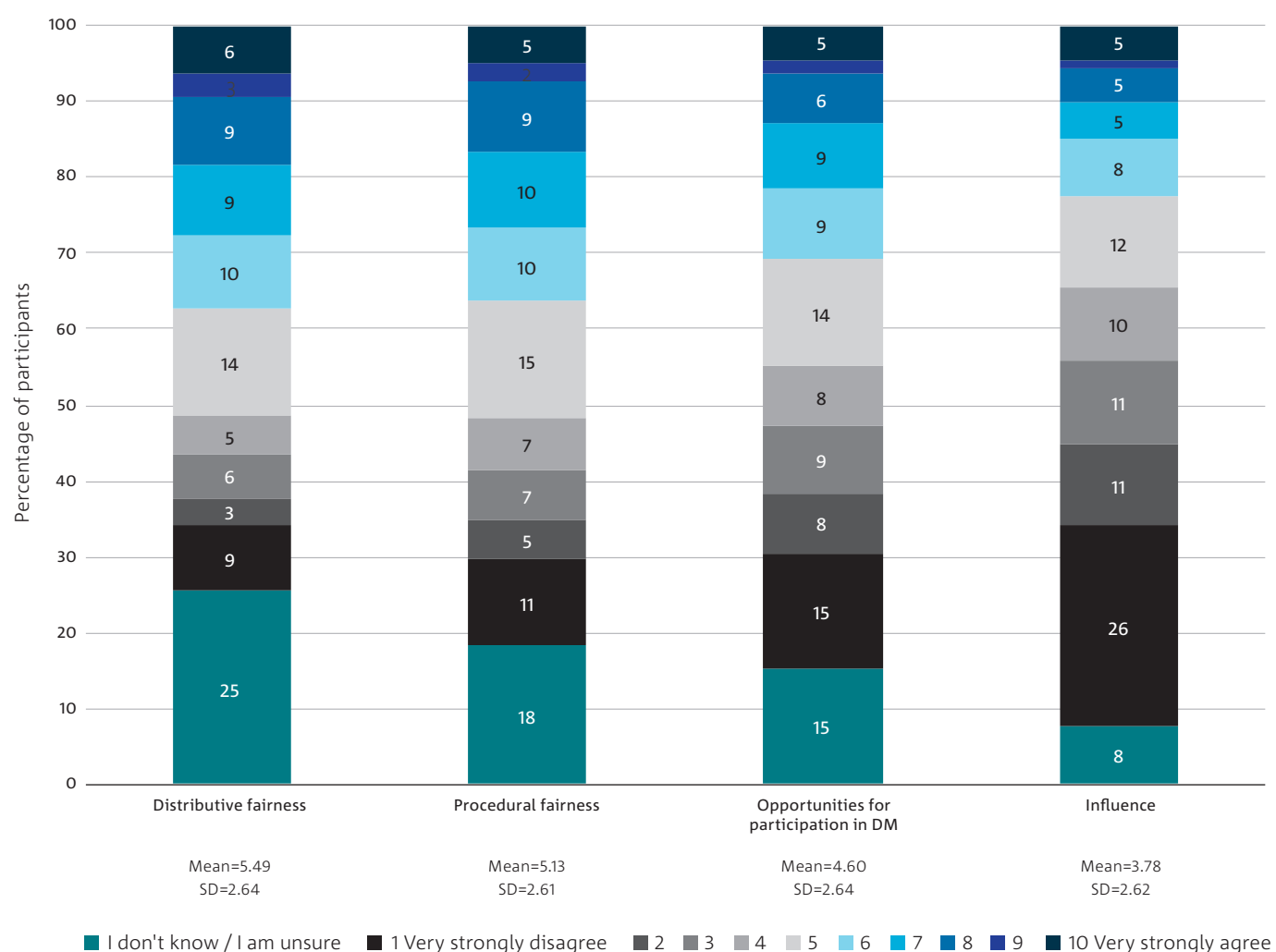


Figure 27 Participant ratings of decision-making processes and outcomes related to GBR management, mean-ranked from highest to lowest

Notes: n=2,488. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number.

Indicator: Satisfaction with governance and management

To contribute to the assessment of this indicator, the following SELTMP constructs, and associated metrics were used (NB. Our metrics only assess part of the indicator):

SELTMP CONSTRUCTS	SELTMP 2021 NEWLY DESIGNED METRICS AND QUESTIONS	SELTMP METRICS RETAINED FROM SELTMP 2013/ SELTMP 2017
Resident satisfaction with GBR management	Satisfaction with GBR management (1=very strongly disagree to 10=very strongly agree) <ul style="list-style-type: none"> • ‘Overall, I feel satisfied with how the GBR is managed’ 	<i>Not available</i>
Resident trust in sources of information about GBR	Trust in information sources (additional sources) (1=do not trust at all to 10=trust very strongly) <ul style="list-style-type: none"> • ‘Thinking about the information you receive about the GBR, how much do you trust information about the GBR that comes from the following groups?...’ <ul style="list-style-type: none"> - ‘My local council’ - ‘My close friends & family’ - ‘My work colleagues’ - ‘Local environmental groups (e.g., North Queensland Conservation Council, Cairns and Far North Environment Centre)’ - ‘Newspapers’ - ‘Television news’ - ‘Citizen science and community groups in the GBR (e.g., Reef Check, Coral Watch)’ 	Trust in information sources (selected and modified wording) <ul style="list-style-type: none"> • ‘Thinking about the information you receive about the GBR, how much do you trust information about the GBR that comes from the following groups?...’ <ul style="list-style-type: none"> - ‘The Australian Government’ - ‘The Queensland Government’ - ‘The Great Barrier Reef Marine Park Authority’ - ‘Scientists from research institutions (e.g., CSIRO, Universities)’ - ‘Australian-based environmental non-governmental organisations (e.g., Natural Resource Management groups, the Australian Conservation Foundation)’ - ‘International environmental non-governmental organisations (e.g., GreenPeace, World Wildlife Fund)’ - ‘Social media (e.g., Facebook, Twitter, blogs etc.)’

Satisfaction with GBR management

Figure 28 shows the distribution of responses to the statement: ‘Overall, I feel satisfied with how the GBR is managed’. As can be seen, responses varied considerably and averaged just below the mid-point of the scale signifying slight disagreement (Mean=5.08, SD=2.53). While most responses tended to hover around the mid-point to above the mid-point, there was a spike of responses at the bottom end of the scale reflecting very strong disagreement. It is also notable that an additional 8% indicated that they did not know/were unsure how to answer the question.

Overall, the responses to this question suggest that there was slight dissatisfaction in how the GBR is managed. However, the wide distribution of responses suggests there is much diversity across the community. Further research would be required to explore residents’ perceptions of, and experiences with, GBR management to gain more insights into why satisfaction may be so varied.

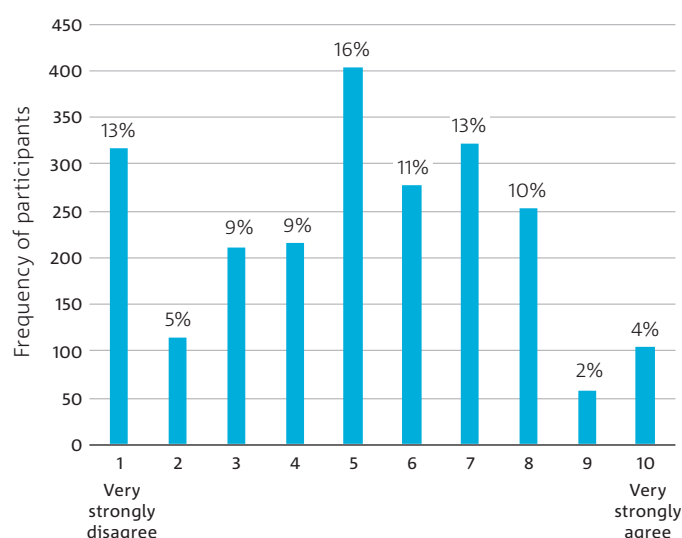


Figure 28 Participant ratings for satisfaction with GBR management

Notes: $n=2,279$. An additional 209 participants selected the ‘I don’t know/I am unsure’ option. Numbers above the bars show the number of respondents. Percentages on the x-axis reflect the percentage of participants who selected that particular option. Percentages are rounded to the nearest whole number. The total percentage does not sum to 100% due to rounding to the nearest whole number.

Trust in information sources

In conservation science, especially science that is in the public eye, the relationship between trust and credibility is an important one. Trust can influence risk-related perceptions as well as perceived efficacy of conservation-related initiatives (Cook et al., 2013; Horton et al., 2016). We therefore continued to assess residents' perceptions of trust in various information sources. Figure 35 displays the trust ratings for these sources.

- Sources that were highly trusted included scientists (Mean=7.55, SD=2.56) and The Great Barrier Reef Marine Park Authority (Mean=7.14, SD=2.53).
- Sources that were moderately-to-highly trusted included citizen science and community groups (Mean=6.82, SD=2.47), local environmental groups (Mean=6.53, SD=2.67) and Australian-based environmental NGOs (Mean=6.51, SD=2.71).
- Sources that were moderately trusted included family and friends (Mean=6.11, SD=2.29), international environmental NGOs (Mean=5.74, SD=3.03), Queensland Government (Mean=5.24, SD=2.74), work colleagues (Mean=5.16, SD=2.47), local council (Mean=5.15, SD=2.51), and the Australian Government (Mean=4.98, SD=2.74).
- Sources that were less-to-moderately trusted included television news (Mean=4.35, SD=2.48).
- Sources that were less trusted included newspapers (Mean=4.11, SD=2.41) and social media (Mean=3.62, SD=2.42).

Overall, our results demonstrate that in the GBR context, scientists and government authorities may be viewed as key sources of specialised knowledge about the GBR. Trust was especially strong for scientists from research institutions, suggesting that science is a highly trusted, primary source of knowledge about the GBR. In contrast, knowledge gained via social media did not have the same level of high trust observed between the general public and scientists/GBRMPA, with the average score falling well below the mid-point of the scale. Literature examining trust in social media, particularly social media that attempts to convey scientific information, suggests that a primary issue is the presentation of scientific information without appropriate context (Ophir & Jamieson, 2021). That is, the brevity of social media is such that there is little room to include important trust-building information such as how the science was conducted, or indeed why. The absence or limited presence of these crucial, context-setting pieces of information can reduce trust. Another reason could be the types of interactions that are commonplace on social media with respect to statements of fact or information, and we see higher rates of 'incivility' (e.g., incensed discussion and rude critiques) in these types of platforms, which can lead to reduced trust (Antoci et al., 2019). The presence of negative commentary in social media is problematic because as Huber et al. (2019) report, people are increasingly relying on social media for the news and cite the Internet as a primary source of science and technology information (Fitzpatrick et al., 2020; Roy Morgan Research, 2020). In recognition that social media is increasingly being accessed as a source for scientific information, it may be important for scientific and government agencies to ensure that any GBR information they communicate via social media can be identified as originating from a credible source and is not overly simplified. It may be prudent to link social media posts with published and/or peer reviewed literature to add a layer of integrity and context, to try and build trust in GBR social media sources.

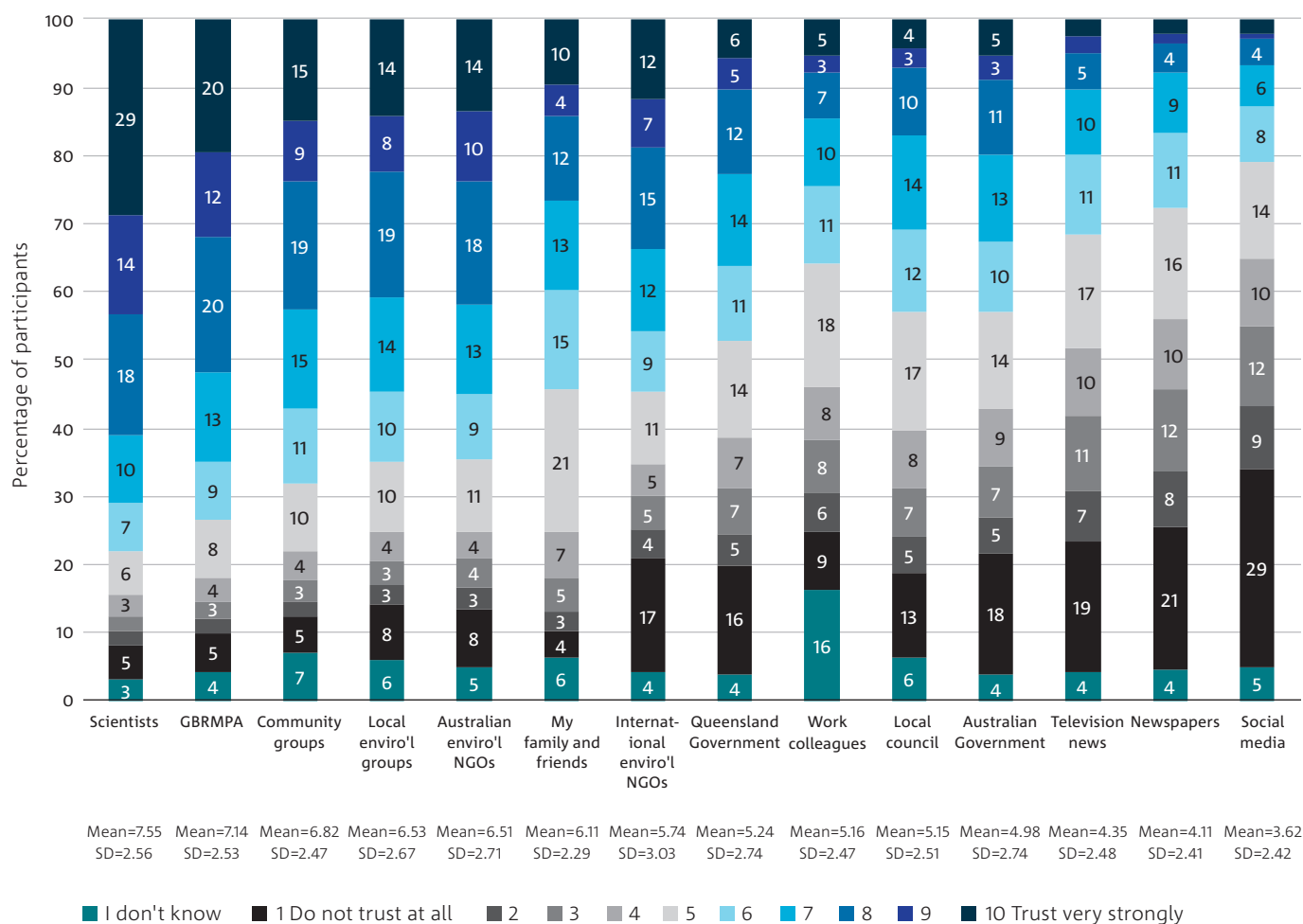


Figure 29 Participant ratings of trust in information about the GBR from various sources

Notes: $n=2,488$. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled. There were differences in trust across the three different sub-samples (panel, social media and CATI). See Appendix D for a presentation of these results.

Objective 5: Governance systems are inclusive, coherent and adaptive

Overall, the following conclusions for this Reef 2050 Objective can be made based on our results:

Resident perceptions of decision-making processes and outcomes related to GBR management

- Around one-fifth to a quarter of participants, respectively, did not know or were unsure about whether decisions regarding GBR management are made in a fair way, or whether the outcomes of such decisions are distributed fairly.
- For those participants who did respond to the questions, there was a roughly even split between those who agreed (36% and 37%, respectively) that decisions were made fairly and resulted in fair outcomes versus those who disagreed (37% and 45%, respectively).
- In terms of personal involvement in decision-making, 54% did not think there were opportunities available for them to have a say in how the GBR is managed and 70% did not think that they had an influence over how the GBR is managed.

Resident satisfaction with GBR management

- Overall, there was slight dissatisfaction with how the GBR is managed, yet responses were highly variable suggesting that presence of diverse views in the community. 51% indicated that they were not satisfied, 41% reported satisfaction, while 8% were unsure.

Trust in sources of information about the GBR

- Overall, scientists and the Great Barrier Reef Marine Park Authority were viewed as the most trusted sources of information about the GBR, both averaging 'high' trust.
- On the converse, social media and more traditional forms of media (television and newspapers) received lower trust ratings.

Changes over time for people who visited the GBR in the last 12 months (prior to survey)

As discussed in the methods section, due to systematic differences in the overall sample of participants, analysis of changes over time were only performed for a subset of respondents who had visited the GBR in the past 12 months, and only on a small set of variables that were measured at least in one prior survey (i.e., either 2013 or 2017) but ideally in both the 2013 and 2017 surveys.

The variables included:

- Place identity
- Place-related meanings (word cloud from sentiment analysis)
- Pride in the GBR
- Aesthetic perceptions
- Personal agency
- Climate change beliefs
- Trust in selected sources
- Threats (open-ended)

Place identity

An analysis of variance was performed to explore differences in place identity across the time-series. This analysis revealed a statistically significant yet small amount of variance explained (by survey year) in place identity ($R^2=0.001$, $F(2, 5259)=3.61$, $p=0.027$).

- Follow-up pairwise comparisons (adjusting for multiple comparisons with Bonferroni's method) revealed that the only statistically significant difference was between 2013 (Mean=6.54, SD=2.73) and 2017 (Mean=6.77, SD=2.77) ($t=2.59$, $p=0.029$), with place identity being higher in 2017. However, the effect size was small (Cohen's $d=0.08$).
- Place identity was similar between 2017 (Mean=6.77, SD=2.77) and 2021 (Mean=6.70, SD=2.81) ($t=-0.70$, $p=1.000$).

We can conclude from this analysis that:

- Among respondents who had visited the GBR at least once in the past year, place identity (or the feeling that the GBR is part of one's identity) has been maintained on the level observed in 2017.



Figure 30 Comparison of scores for place identity among those who have visited the GBR in the past 12 months, across 2013 ($n=2,609$), 2017 ($n=1,649$) and 2021 ($n=1,236$) SELTMP surveys

Notes: The number who answered the question using the 1 to 10 rating scale is denoted at the bottom of each bar. This number was different to the sample size due to missing responses. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

Pride

An analysis of variance was performed to explore differences in pride across the time-series. This analysis revealed a statistically significant yet small amount of variance explained (by survey year) in pride ($R^2=0.01$, $F(2, 5365)=37.02$, $p<0.001$). Follow-up pairwise comparisons (adjusting for multiple comparisons with Bonferroni's method) revealed statistically significant differences between all the years:

- Pride was lower in 2013 (Mean=9.02, SD=1.71) compared to 2017 (Mean=9.24, SD=1.57) ($t=3.92$, $p<0.001$). However, the effect size was small (Cohen's $d=0.13$).
- Pride was higher in 2013 (Mean=9.02, SD=1.71) compared to 2021 (Mean=8.67, SD=2.14) ($t=-5.73$, $p<0.001$). However, the effect size was small (Cohen's $d=0.19$).
- Pride was higher in 2017 (Mean=9.24, SD=1.57) compared to 2021 (Mean=8.67, SD=2.14) ($t=-8.59$, $p<0.001$). However, the effect size was small-to-moderate (Cohen's $d=0.31$).

We can conclude from this analysis that:

- While pride in the GBR is strongly felt among residents who have visited the GBR in the past year, there has been a small reduction in these feelings since 2017.

It is difficult to hypothesise what may be causing this fall in pride. To better understand what may be contributing to reduced pride, further analysis may be undertaken to explore relationships between pride and other survey variables. However, qualitative research is possibly the only way to truly understand what may be contributing to a reduced sense of pride in the GBR.

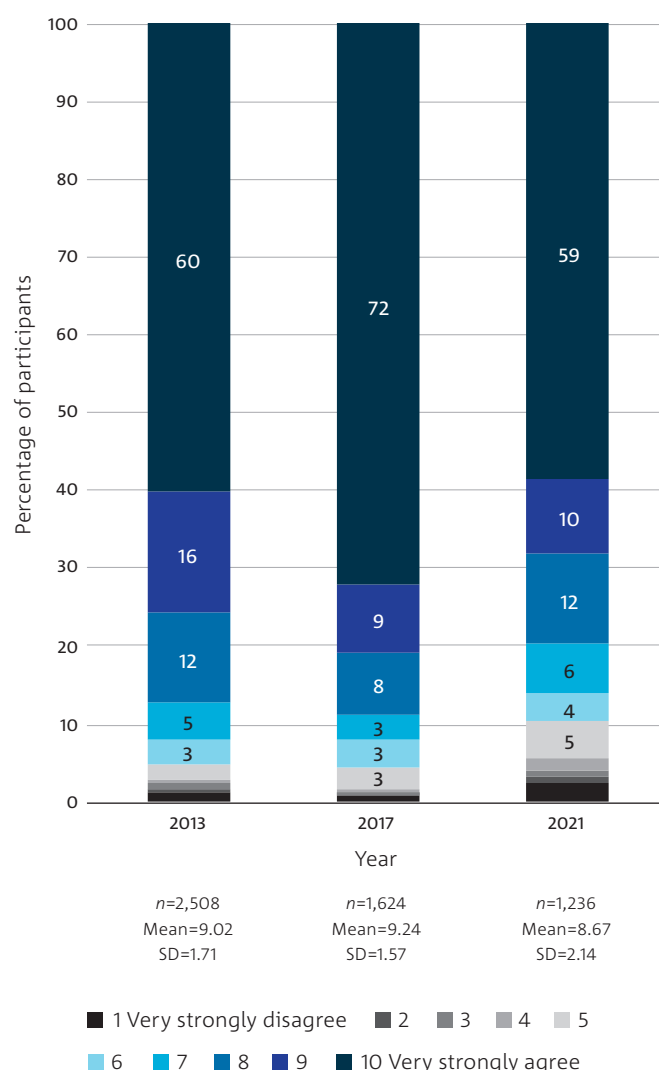


Figure 31 Comparison of scores for pride in GBR among those who have visited the GBR in the past 12 months, across 2013 ($n=2,609$), 2017 ($n=1,649$) and 2021 ($n=1,236$) SELTMP surveys

Notes: The number who answered the question using the 1 to 10 rating scale is denoted at the bottom of each bar. This number was different to the sample size due to missing responses. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

Aesthetic perceptions

An analysis of variance was performed to explore differences in aesthetic perceptions of the GBR across the time-series. This analysis revealed a statistically non-significant amount of variance explained (by survey year) in aesthetic perceptions ($R^2=0.0004$, $F(2, 5402)=2.19$, $p=0.112$). Thus, there were no differences between any of the years in aesthetic perceptions.

We can conclude from this analysis that:

- Perceptions that the aesthetic beauty of the GBR is outstanding is strongly felt among residents who have visited the GBR in the past year, and this feeling has been maintained across the years.

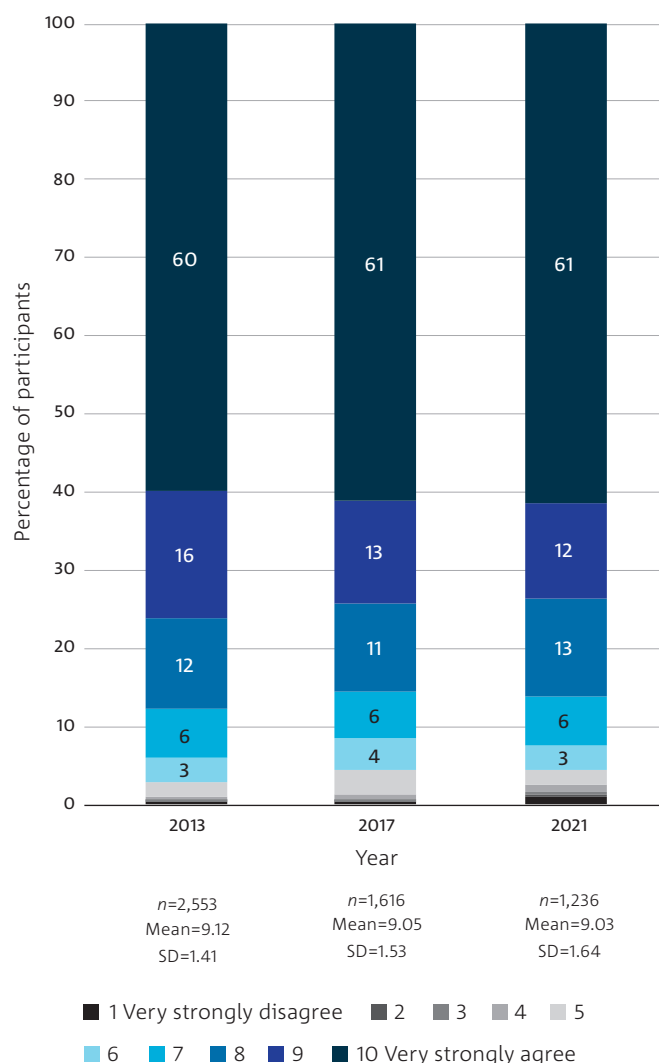


Figure 32 Comparison of scores for agreement with the statement that 'The aesthetic beauty of the GBR is outstanding' among those who have visited the GBR in the past 12 months, across the 2013 ($n=2,609$), 2017 ($n=1,649$) and 2021 ($n=1,236$) SELTMP surveys

Notes: The number who answered the question using the 1 to 10 rating scale is denoted at the bottom of each bar. This number can be different to the sample size due to missing responses being removed. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

Personal agency

An analysis of variance was performed to explore differences in personal agency – that is, whether people felt as though they could make a personal difference in improving the health of the GBR – across the time-series. This analysis revealed a small, statistically significant amount of variance explained (by survey year) in personal agency ($R^2=0.01$, $F(2, 5337)=33.02$, $p<0.001$). Follow-up pairwise comparisons (adjusting for multiple comparisons with Bonferroni's method) revealed statistically significant differences between 2013 and 2017, and between 2013 and 2021:

- Personal agency was significantly higher in 2013 (Mean=7.28, SD=2.62) compared to 2017 (Mean=6.80, SD=2.69) ($t=-5.60$, $p<0.001$). However, the effect size was small (Cohen's $d=0.18$).
- Personal agency was significantly higher in 2013 (Mean=7.28, SD=2.62) compared to 2021 (Mean=6.58, SD=2.84) ($t=-7.49$, $p<0.001$). However, the effect size was small-to-moderate (Cohen's $d=0.26$).
- Personal agency was similar between 2017 (Mean=6.80, SD=2.69) and 2021 (Mean=6.58, SD=2.84) ($t=-2.17$, $p=0.091$) (Cohen's $d=0.03$).

We can conclude from this analysis that:

- Among residents who have visited the GBR in the past year, there is slight agreement that they can make a personal difference in improving the health of the GBR and this sentiment has been maintained since 2017.

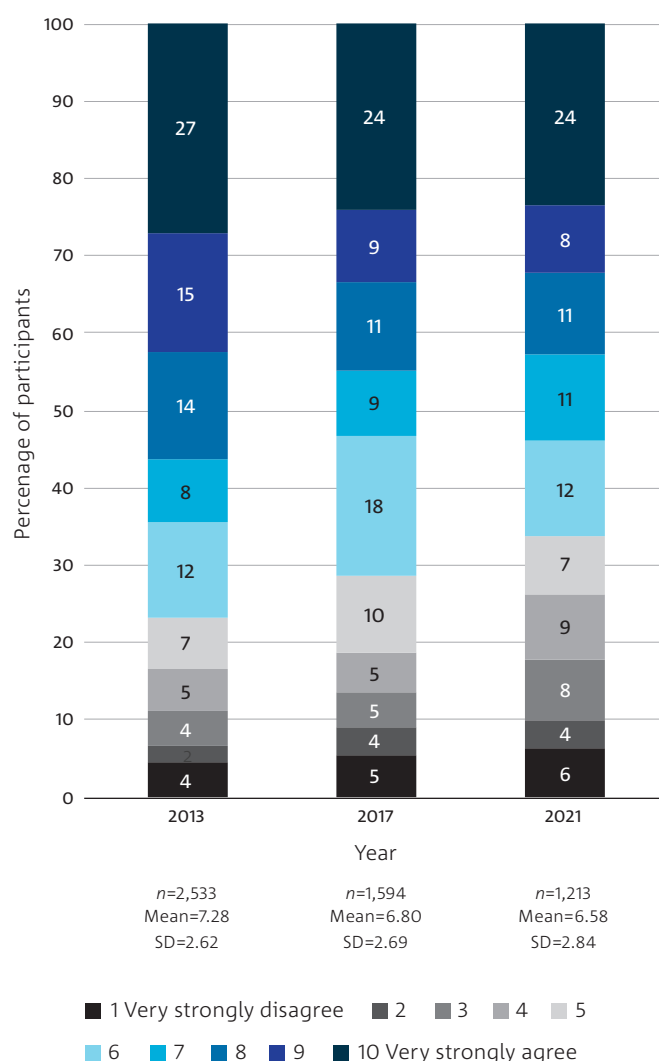


Figure 33 Comparison of scores for personal agency among those who have visited the GBR in the past 12 months, across the 2013 ($n=2,609$), 2017 ($n=1,649$) and 2021 ($n=1,236$) SELTMP surveys

Notes: Personal agency was reverse scored prior to analysis, such that higher scores reflect higher levels of personal agency (the original question was: 'I feel I cannot make a personal difference in improving the health of the GBR'). The number who answered the question using the 1 to 10 rating scale is denoted at the bottom of each bar. This number was different to the sample size due to missing responses. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (2% and below) are not labelled.

Threats

In our analysis of open-ended responses to the question ‘What do you think are the three (3) most serious threats to the GBR’, we observed a marked shift from previous years in the mention of climate change. In fact, climate change mentions have been steadily increasing across the years – there was an 18 percentage-point increase on 2013 levels (where 29% mentioned it as a threat) and a 5 percentage-point increase on 2017 levels (where 42% mentioned it as a threat). Pollution still featured as a prominent threat, like what was observed in 2017. Fishing and water quality also were mentioned by a good proportion of respondents.

We can conclude from this analysis that:

- Among residents who have visited the GBR in the past year, a greater proportion of people are viewing climate change as a serious threat to the GBR with almost half now mentioning it. Pollution also is perceived as a serious threat by a similar proportion of people, which is similar to what was observed in 2017. Fishing and water quality also are commonly mentioned – roughly at the same level as previous years.

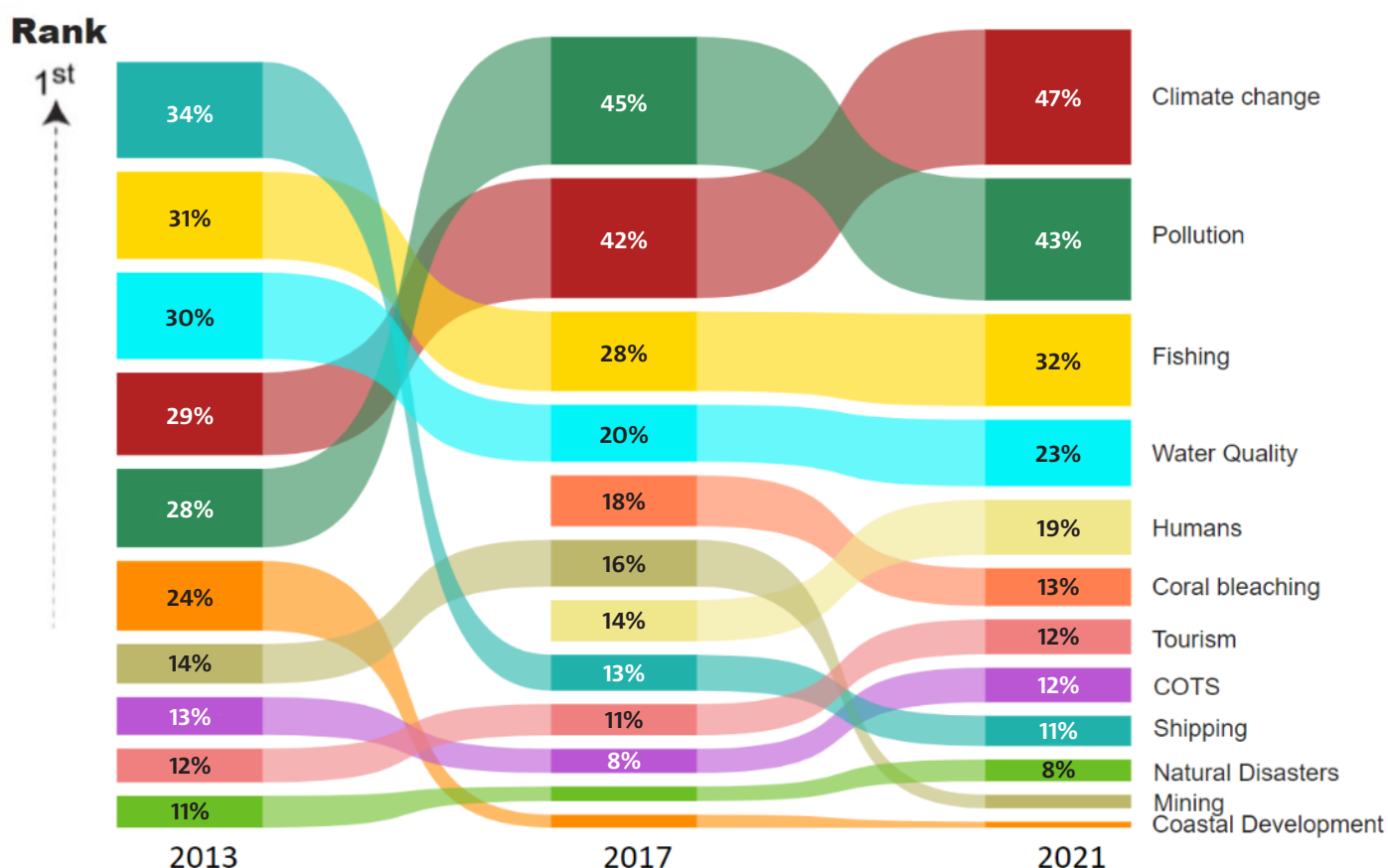


Figure 34 Most common threats mentioned in the open-ended question: ‘What do you think are the three (3) most serious threats to the GBR?’ among those who have visited the GBR in the past 12 months, across the 2013 (n=2,609), 2017 (n=1,649) and 2021 (n=1,236) SELTMP surveys, ranked from most mentioned to least mentioned threat

Notes: Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. Low percentages (7% and below) are not labelled.

Climate change beliefs

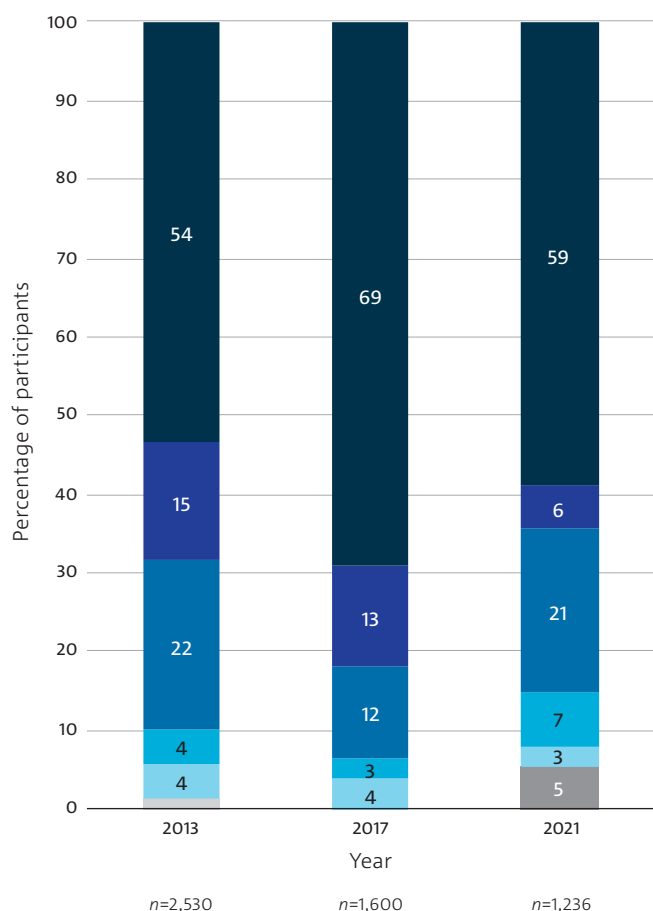
A formal statistical analysis of changes over time could not be performed on the climate change beliefs question due to changes in the wording of questions and response options, as shown in Table 3. Precise comparisons of percentages were also precluded due to the presence of unique response options in 2013 and 2017. Thus, the results in Figure 35 should be interpreted with caution and the following observations must be considered as preliminary and requiring continued investigation.

Overall, the pattern of results suggests that climate change beliefs may be within range of earlier years. For instance, across all years:

- Most respondents (> 50%) thought that climate change is a threat, requiring immediate action.
- There were smaller proportions who either indicated that climate change is a threat but does not require immediate action (6% to 15%), or that they need more evidence to form an opinion about climate change (12% to 22%).
- The smallest percentages of respondents either thought that climate change is not a threat (3% to 7%), or that they do not hold a view about climate change (3% to 4%).

Table 3 Question and response options for climate change beliefs across the 2013, 2017 and 2021 surveys

2013	2017	2021
Which of the following statements best describes your beliefs about climate change?	Which of the following statements best describes your beliefs about climate change?	Which of the following statements best describes your beliefs about climate change and the GBR?
• Climate change is an immediate threat requiring action	• Climate change is an immediate threat requiring action	• Climate change is a threat to the GBR, requiring immediate action
• Climate change is a serious threat, but the impacts are too distant for immediate concern	• Climate change is a serious threat, but the impacts are too distant for immediate concern	• Climate change is a threat to the GBR, but does not require immediate action
• I need more evidence to be convinced of the problem	• I need more evidence to be convinced of the problem	• I need more evidence to form an opinion about climate change and how it may threaten the GBR
• I believe that climate change is not a threat at all	• I believe that climate change is not a threat at all	• Climate change is not a threat to the GBR
• I do not have a view on climate change	• I do not have a view on climate change	• I do not have a view on climate change and how it relates to the GBR
• Climate change is a natural phenomenon (Note: While this was not provided as an option to respondents in the survey, certain responses were coded to this category, by interviewers in the field)	<i>Not available</i>	<i>Not available</i>
<i>Not available</i>	<i>Not available</i>	• I do not believe in climate change



We can conclude from this analysis that:

- Among residents who have visited the GBR in the past 12 months, the pattern of their beliefs about climate change seems to be similar to that of previous years with over half believing that climate change is a threat requiring immediate action; some feeling that it is a threat but does not require immediate action; some feeling they need more evidence to form an opinion; and a small number thinking climate change is not a threat, not believing in climate change, or not holding a view about climate change at all.

- 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 climate change and how it may threaten the GBR
- Climate change is not a threat to the GBR
- I do not have a view on climate change and how it relates to the GBR
- Climate change is a natural phenomenon (2013 only)
- I do not believe in climate change (2021 only)

Figure 35 Climate change beliefs among those who have visited the GBR in the past 12 months, across the 2013 (n=2,609), 2017 (n=1,649) and 2021 (n=1,236) SELTMP surveys

Notes: The number who answered the question is denoted at the bottom of each bar. This number was different to the sample size due to missing responses. Numbers within bars show percentages of respondents in each respective score. Percentages are rounded to the nearest whole number. The legend provides the wording of response options for the 2021 survey (except for 'climate change is a natural phenomenon', which was only relevant to 2013). In other years, response options were worded slightly differently. The 'I do not believe in climate change' option was not included in 2013 or 2017.

Trust

An analysis of variance was performed to explore differences in trust in information sources across the time-series. The analysis could not be conducted on all sources, due some response options not being presented in earlier years, as denoted by 'not available' in Table 4.

Table 4 Question and response options for trust across the 2013, 2017 and 2021 surveys

2013	2017	2021
How much do you trust the information you receive about the GBR from the following groups?	How much do you trust the information you receive about the GBR from the following groups?	How much do you trust information about the GBR that comes from the following groups?
<i>Not available</i>	<ul style="list-style-type: none"> The Australian Government 	<ul style="list-style-type: none"> The Australian Government
<i>Not available</i>	<ul style="list-style-type: none"> The Queensland Government 	<ul style="list-style-type: none"> The Queensland Government
<ul style="list-style-type: none"> Government managers (e.g., GBRMPA, Fisheries Qld) 	<ul style="list-style-type: none"> The Great Barrier Reef Marine Park Authority (GBRMPA) 	<ul style="list-style-type: none"> The Great Barrier Reef Marine Park Authority
<ul style="list-style-type: none"> Research institutions (e.g., CSIRO, Universities) 	<ul style="list-style-type: none"> Scientists from research institutions (e.g., CSIRO, Universities) 	<ul style="list-style-type: none"> Scientists from research institutions (e.g., CSIRO, Universities)
<ul style="list-style-type: none"> Non-Governmental Organisations/ other community groups (e.g., NRM regional bodies) 	<ul style="list-style-type: none"> Australian-based conservation NGOs (including NRM groups) 	<ul style="list-style-type: none"> Australian-based environmental non-governmental organisations (e.g., Natural Resource Management groups, the Australian Conservation Foundation)
<i>Not available</i>	<ul style="list-style-type: none"> International conservation NGOs (e.g., GreenPeace, WWF) 	<ul style="list-style-type: none"> International environmental non-governmental organisations (e.g., GreenPeace, World Wildlife Fund)
<ul style="list-style-type: none"> Friends, and family, and/or work colleagues 	<ul style="list-style-type: none"> Friends, and family, and/or work colleagues 	<ul style="list-style-type: none"> Close friends and family Work colleagues <p>(composite-scale)</p>
<ul style="list-style-type: none"> Media (i.e., radio, newspapers, TV) 	<ul style="list-style-type: none"> News media journalists 	<ul style="list-style-type: none"> Television news Newspapers <p>(composite-scale)</p>
<ul style="list-style-type: none"> Social media (e.g., FaceBook, Twitter) 	<ul style="list-style-type: none"> Social media commentators/ bloggers 	<ul style="list-style-type: none"> Social media (e.g., Facebook, Twitter, blogs etc.)
<i>Not available</i>	<i>Not available</i>	<ul style="list-style-type: none"> Local council
<i>Not available</i>	<i>Not available</i>	<ul style="list-style-type: none"> Local environmental groups (e.g., North Queensland Conservation Council, Cairns and Far North Environment Centre)
<i>Not available</i>	<i>Not available</i>	<ul style="list-style-type: none"> Citizen science and community groups in the GBR (e.g., Reef Check, Coral Watch)

This analysis revealed statistically significant differences between the years, for several of the information sources:

- Scientists in research institutions – a small yet significant amount of variance in trust in scientists was explained by survey year ($R^2=0.01$, $F(2, 5,296)=14.60$, $p<0.001$). Follow-up pairwise comparisons (adjusting for multiple comparisons with Bonferroni's method) revealed statistically significant differences between 2021 and the previous years:
 - Trust was significantly higher in 2017 (Mean=7.90, SD=2.09, $n=1,590$) compared to 2021 (Mean=7.50, SD=2.69, $n=1,221$) ($t=-4.74$, $p<0.001$) yet the effect size was small (Cohen's $d=0.17$).
 - Trust was also significantly higher in 2013 (Mean=7.88, SD=1.97, $n=2,488$) compared to 2021 (Mean=7.50, SD=2.69, $n=1,221$) ($t=-4.96$, $p<0.001$) yet the effect size was small (Cohen's $d=0.17$).
 - Trust was similar between 2013 (Mean=7.88, SD=1.97, $n=2,488$) and 2017 (Mean=7.90, SD=2.09, $n=1,590$) ($t=0.22$, $p=1.000$).
 - We can conclude from this analysis that: While trust in scientists is very strong among residents who have visited the GBR in the past year, the level of trust is lower in 2021 compared to previous years.
- The Great Barrier Reef Marine Park Authority – a small yet significant amount of variance in trust in GBRMPA was explained by survey year ($R^2=0.01$, $F(2, 5,284)=148.87$, $p<0.001$). Follow-up pairwise comparisons (adjusting for multiple comparisons with Bonferroni's method) revealed statistically significant differences between 2013 and the later years (2017 and 2021), but there was no significant difference between 2017 and 2021:
 - Trust was significantly higher in 2017 (Mean=7.18, SD=2.14, $n=1,587$) compared to 2013 (Mean=5.93, SD=2.57, $n=2,492$) ($t=15.65$, $p<0.001$). The effect size was moderate (Cohen's $d=0.51$).
 - Trust was also significantly higher in 2021 (Mean=7.01, SD=2.67, $n=1,208$) compared to 2013 (Mean=5.93, SD=2.57, $n=2,492$) ($t=12.37$, $p<0.001$). The effect size was moderate (Cohen's $d=0.41$).
 - Trust was similar between 2021 (Mean=7.01, SD=2.67, $n=1,208$) and 2017 (Mean=7.18, SD=2.14, $n=1,587$) ($t=-1.80$, $p=0.216$).
 - We can conclude from this analysis that: Trust in GBRMPA is quite strong among residents who have visited the GBR in the past year, and the level of trust is higher in 2021 compared to 2013, and is similar to that observed in 2017.
- Australian NGOs – a non-significant amount of variance in trust in Australian NGOs was explained by survey year ($R^2=0.0009$, $F(2, 5,218)=2.39$, $p=0.092$). Thus, there were no differences between any of the years in trust in Australian NGOs.
 - We can conclude from this analysis that: Trust in Australian NGOs is quite strong among residents who have visited the GBR in the past year, and the level of trust has been maintained across the years.

- International NGOs (for 2017 and 2021 only)
 - a two-sample t-test revealed a statistically significant difference between 2017 and 2021:
 - Trust was significantly higher in 2017 (Mean=6.35, SD=2.52, $n=1,568$) compared to 2021 (Mean=5.62, SD=3.11, $n=1,211$) ($t=6.85$, $p<0.001$). The effect size was small (Cohen's $d=0.26$).
 - We can conclude from this analysis that: Trust in international NGOs is moderate among residents who have visited the GBR in the past year, however the level of trust in 2021 is lower than 2017.
- Friends, family and work colleagues – a small yet significant amount of variance in trust in family, friends and work colleagues was explained by survey year ($R^2=0.02$, $F(2, 5142)=46.46$, $p<0.001$). Follow-up pairwise comparisons (adjusting for multiple comparisons with Bonferroni's method) revealed statistically significant differences between all years:
 - Trust was significantly higher in 2017 (Mean=6.54, SD=2.17, $n=1,587$) compared to 2013 (Mean=6.36, SD=2.26, $n=2,470$) ($t=2.60$, $p=0.028$). However, the effect size was small (Cohen's $d=0.08$).
 - Trust was significantly higher in 2017 (Mean=6.54, SD=2.17, $n=1,587$) compared to 2021 (Mean=5.74, SD=2.02, $n=1,088$) ($t=-9.34$, $p<0.001$). The effect size was moderate (Cohen's $d=0.38$).
 - Trust was also significantly higher in 2013 (Mean=6.36, SD=2.26, $n=2,470$) compared to 2021 (Mean=5.74, SD=2.02, $n=1,088$) ($t=-7.81$, $p<0.001$). However, the effect size was small-to-moderate (Cohen's $d=0.28$).
 - We can conclude from this analysis that: Trust in friends, family, and work colleagues is moderate among residents who have visited the GBR in the past year, and it appears to be lower in 2021 compared to previous years.
- Queensland Government (for 2017 and 2021 only)
 - a two-sample t-test revealed no significant difference between 2017 and 2021:
 - Trust was similar between 2021 (Mean=4.99, SD=2.77, $n=1,205$) compared to 2017 (Mean=4.83, SD=2.42, $n=1,597$) ($t=-1.62$, $p=0.104$) (Cohen's $d=0.06$).
 - We can conclude from this analysis that: Trust in the Queensland Government is moderate among residents who have visited the GBR in the past year, and comparable with the level observed in 2017.
- Australian Government (for 2017 and 2021 only)
 - a two-sample t-test revealed no significant difference between 2017 and 2021:
 - Trust was similar between 2021 (Mean=4.74, SD=2.75, $n=1,210$) compared to 2017 (Mean=4.63, SD=2.42, $n=1,599$) ($t=-1.16$, $p=0.248$) (Cohen's $d=0.04$).
 - We can conclude from this analysis that: Trust in the Australian Government is low to moderate among residents who have visited the GBR in the past year, and comparable with the level observed in 2017.

- Television and newspaper media – a small yet significant amount of variance in trust in television and newspaper media was explained by survey year ($R^2=0.01$, $F(2, 5,286)=23.50$, $p<0.001$). Follow-up pairwise comparisons (adjusting for multiple comparisons with Bonferroni's method) revealed statistically significant differences between all years:
 - Trust was significantly higher in 2013 (Mean=4.20, SD=2.29, $n=2,504$) compared to 2017 (Mean=3.72, SD=2.14, $n=1,589$) ($t=-6.79$, $p<0.001$). The effect size was small (Cohen's $d=0.22$).
 - Trust was significantly higher in 2013 (Mean=4.20, SD=2.29, $n=2,504$) compared to 2021 (Mean=3.94, SD=2.26, $n=1,196$) ($t=-3.32$, $p=0.003$). The effect size was small (Cohen's $d=0.11$).
 - Trust was also significantly higher in 2021 (Mean=3.94, SD=2.26, $n=1,196$) compared to 2017 (Mean=3.72, SD=2.14, $n=1,589$) ($t=2.64$, $p=0.025$). The effect size was small (Cohen's $d=0.10$).
 - We can conclude from this analysis that: Trust in television and newspaper media is relatively low among residents who have visited the GBR in the past year, and while the level of trust is higher in 2021 compared to 2017, it is lower than that observed in 2013.
- Social media – a small yet significant amount of variance in trust in social media was explained by survey year ($R^2=0.002$, $F(2, 4,996)=5.63$, $p=0.004$). Follow-up pairwise comparisons (adjusting for multiple comparisons with Bonferroni's method) revealed statistically significant differences between 2021 and the previous years:
 - Trust was significantly higher in 2013 (Mean=3.76, SD=2.33, $n=2,219$) compared to 2021 (Mean=3.53, SD=2.33, $n=1,201$) ($t=2.89$, $p=0.012$). The effect size was small (Cohen's $d=0.10$).
 - Trust was significantly higher in 2017 (Mean=3.80, SD=2.13, $n=1,579$) compared to 2021 (Mean=3.53, SD=2.33, $n=1,201$) ($t=3.11$, $p=0.006$). The effect size was moderate (Cohen's $d=0.41$).
 - Trust was similar between 2013 (Mean=3.76, SD=2.33, $n=2,219$) and 2017 (Mean=3.80, SD=2.13, $n=1,579$) ($t=0.47$, $p=1.00$) (Cohen's $d=0.01$).
 - We can conclude from this analysis that: Trust in social media is relatively low among residents who have visited the GBR in the past year, and the level of trust is lower in 2021 than in previous years.

Overall, we can conclude from the analysis on trust that:

- Among residents who have visited the GBR in the past 12 months, the pattern of trust across various sources is largely the same as previous years – people tend to place strong trust in scientists and the GBRMPA; moderate trust in Australian and International NGOs, family, friends, and work colleagues; and the Australian and Queensland Governments; and lower trust in news media and social media.

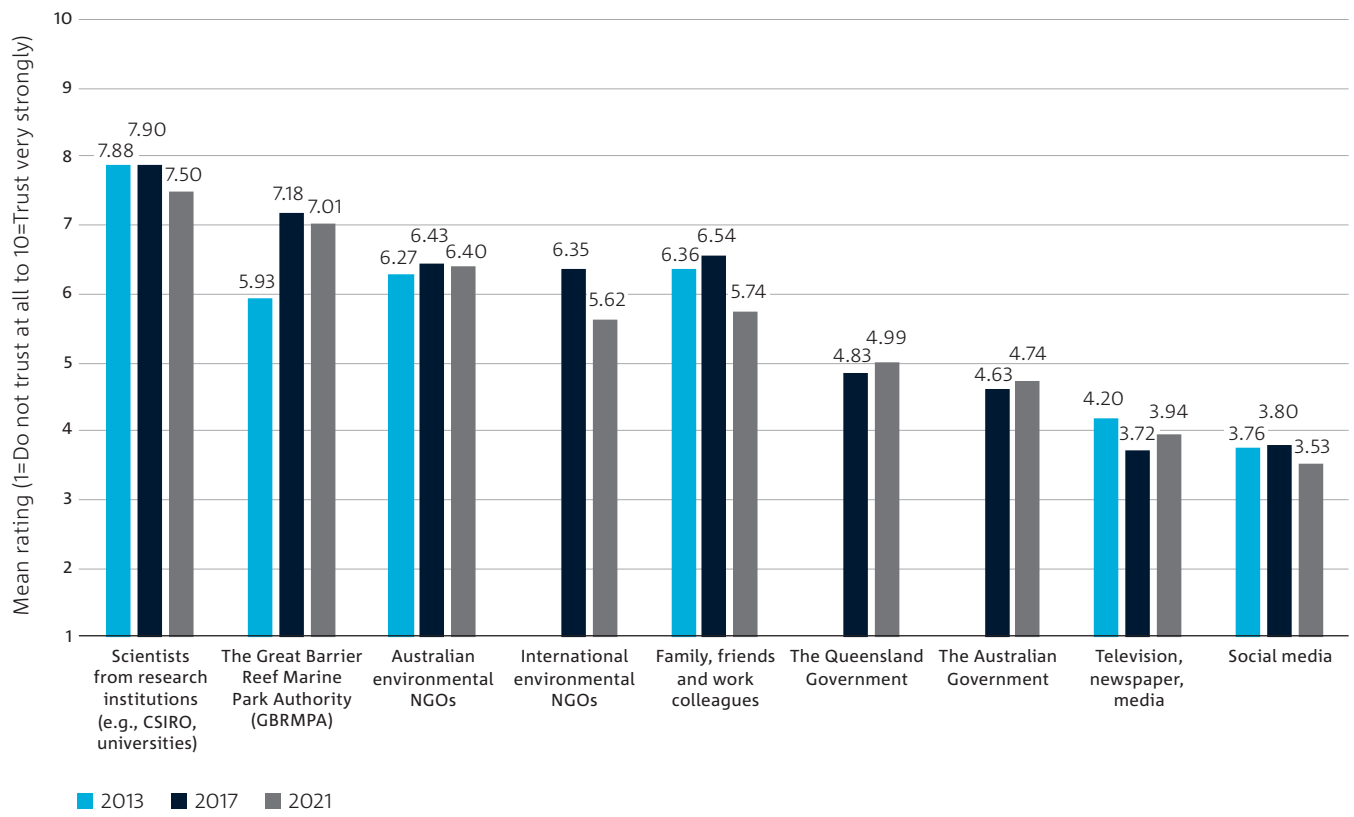


Figure 36 Comparison of mean scores for trust in selected sources among those who have visited the GBR in the past 12 months, across the 2013 ($n=2,609$), 2017 ($n=1,649$) and 2021 ($n=1,236$) SELTMP surveys

Notes: The number of participants varied across sources due to missing responses. Trust in international NGOs, the Queensland Government, and the Australian Government were not measured in the 2013 survey.

Part 4 Conclusion



The aim of SELTMP 2021 was to collect primary data on a selection of social metrics relevant to human dimension objectives and indicators included in the Reef 2050 Plan, as well as SELTMP's broad objectives. A refocus of SELTMP's aims to address the updated Reef 2050 Plan, and recent changes observed in the GBR social-ecological system (e.g., multiple mass coral bleaching events, the COVID-19 pandemic), required a significant redesign of the SELTMP survey metrics in 2021 (compared with previous iterations in 2013 and 2017), as well as new data collection methods. Due to these changes, many of the results presented in this report represent a new baseline, and comparisons with previous SELTMP iterations are limited to a small number of core metrics, using subsamples of respondents who had visited the GBR in the previous 12 months (who cannot be considered representative of the broad populace of residents living in the GBR region). Another significant change to SELTMP is the sampling frequency, now reduced from four years between iterations to two years. This improvement in temporal resolution is anticipated to enable greater responsiveness of the metrics to changes in the GBR social-ecological system, and the new, focussed metrics will allow more alignment of, and effective evaluation of, progress towards Reef 2050 Plan objectives into the future.

In closing, we return to the broad objectives of SELTMP and provide some concluding remarks. Note that we do not make any claims regarding 'monitoring changes' or 'predicting attitudinal and behavioural responses' as referenced in all SELTMP objectives, and nor do we comment on the relationships among the many variables surveyed. Investigations along these lines are forthcoming and may be accomplished through formal statistical analysis and/or additional SELTMP surveying.

1.

Monitor changes in community attitudes towards the GBR, its values and management, and the perceived threats to those values.

Overall, our results show that residents living in the GBR region hold the GBR in high regard, perceive it as a place of significant value and beauty, and are proud of its World Heritage Area status. However, when it came to assessing how the GBR is managed and one's personal involvement in decision-making surrounding such, perceptions varied significantly – suggesting the presence of diverse views in the community as well as an element of low awareness. Our finding that scientists and the Great Barrier Reef Marine Park Authority (GBRMPA) were the most trusted sources of information about the GBR, suggests that these sources may be the most effective when informing and engaging residents on topics related to the GBR.

3.

Monitor changes in social and economic well-being of Reef-dependent communities, and the benefits they derive from the GBR.

From an economic point of view, most people could not be classified as being directly 'Reef-dependent' with only 19% ($n=481$) reporting that they were dependent on the GBR for household income, and only 6% ($n=147$) reporting that their personal income is derived from GBR employment. Yet on a social-psychological level, residents showed moderate to high place attachment to the GBR region, reporting a strong sense of belonging to where they live, and indicating that living in the region contributes positively to their overall wellbeing. While visitation to the GBR may have been lower in the year prior to the survey, most people tended to view the GBR as a 'choice' place for recreation and many recognised the physical and psychological benefits of interacting with the GBR.

2.

Predict attitudinal and behavioural responses to future management interventions in the Reef, and changes in Reef health.

Overall, our results show that most GBR residents are aware that the GBR is under threat and vulnerable, and that steps need to be undertaken urgently to care for the GBR. Residents were highly cognisant of the range of threats and problems the GBR is facing, viewed the GBR as only being in 'fair' to 'good' health overall, and were highly supportive of individual, community, and broader-scale actions and interventions to help the GBR. Most people are doing what they can to reduce their impacts on the GBR and generally believe that others in their local area are doing the same, though slightly fewer feel that their actions will truly make a difference.

4.

Assess and monitor social and economic vulnerability, and adaptive capacity of GBR communities to changes in Reef condition & the wider system.

Overall, GBR residents appeared to be financially resilient to the prospect of significant decline in the health of the GBR, though around half anticipated that this scenario could affect their lifestyle negatively. The perception of relatively low economic impact may be primarily due to the fact that most people in our sample did not rely on the GBR for household or personal income. Indeed, all negative personal impacts were felt more so by the small number of individuals who either personally depended on the GBR for income, ($n=147$, 6%) or whose household did ($n=481$, 19%). Further to this, we found that adaptive capacity in terms of job flexibility (e.g., changing jobs) was not especially strong among those whose personal employment was associated with the GBR.

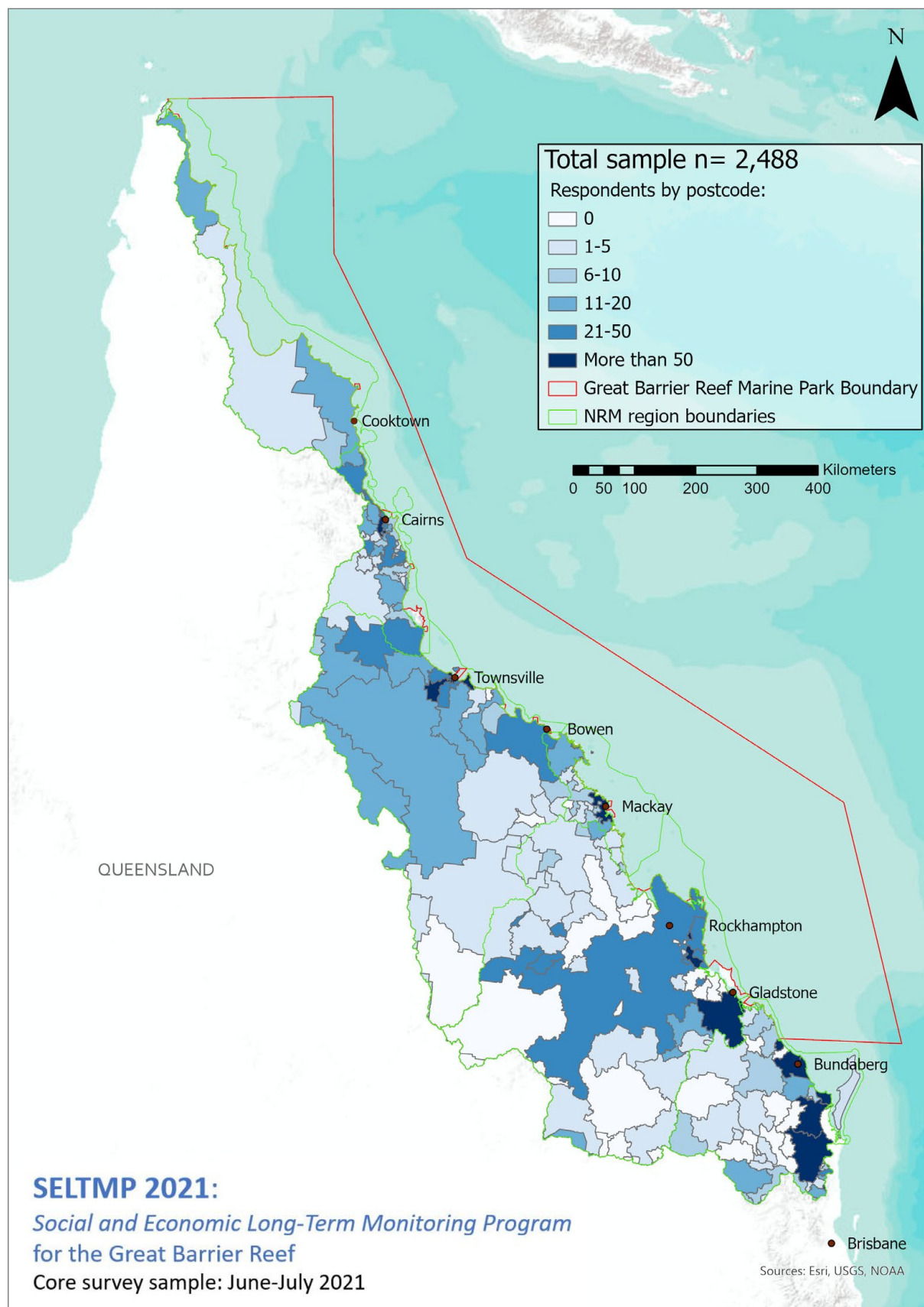
Next steps

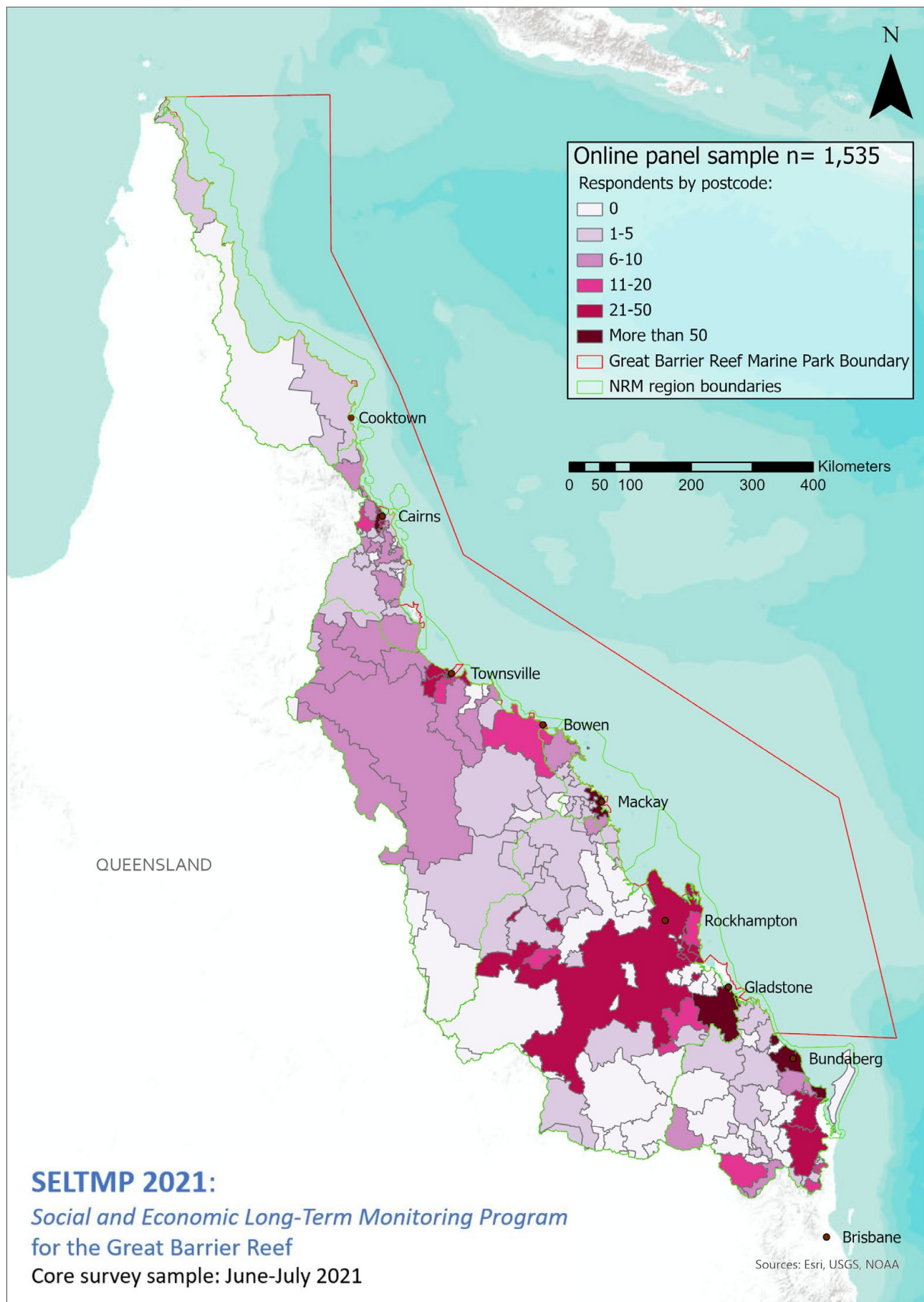
Forthcoming outputs drawing on SELTMP data include an interactive, online visualisation tool ('dashboard'), along with a brochure-style publication, to facilitate wider engagement with a broad range of end-users. The information contained in this report is primarily intended to inform both the Australian and Queensland Government's evaluation of how Reef 2050 Plan objectives are tracking; however, potential applications and uses of these data are far more diverse, and as previously demonstrated, these data can make a valuable contribution towards a broad range of scientific questions and outputs.

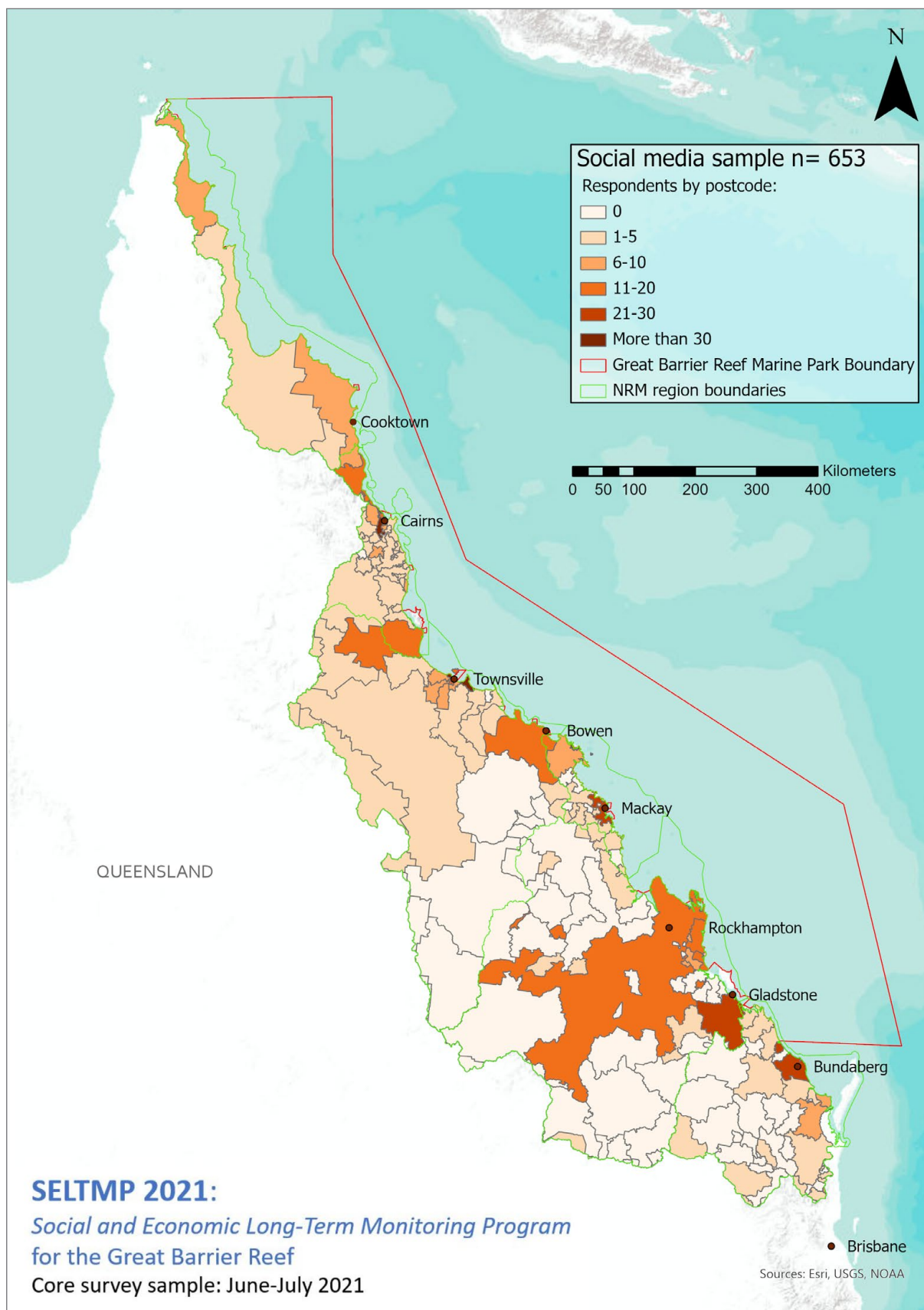
As per previous SELTMP iterations, the data will be made publicly available in a secure, persistent online repository, via the CSIRO Data Access Portal (DAP), and the authors welcome and encourage collaboration with other scientists. Forthcoming SELTMP surveys will continue to measure a core set of questions that map to the Reef 2050 Plan, with the next data collection scheduled to occur in June 2023, and an intent to sample biennially thereafter.

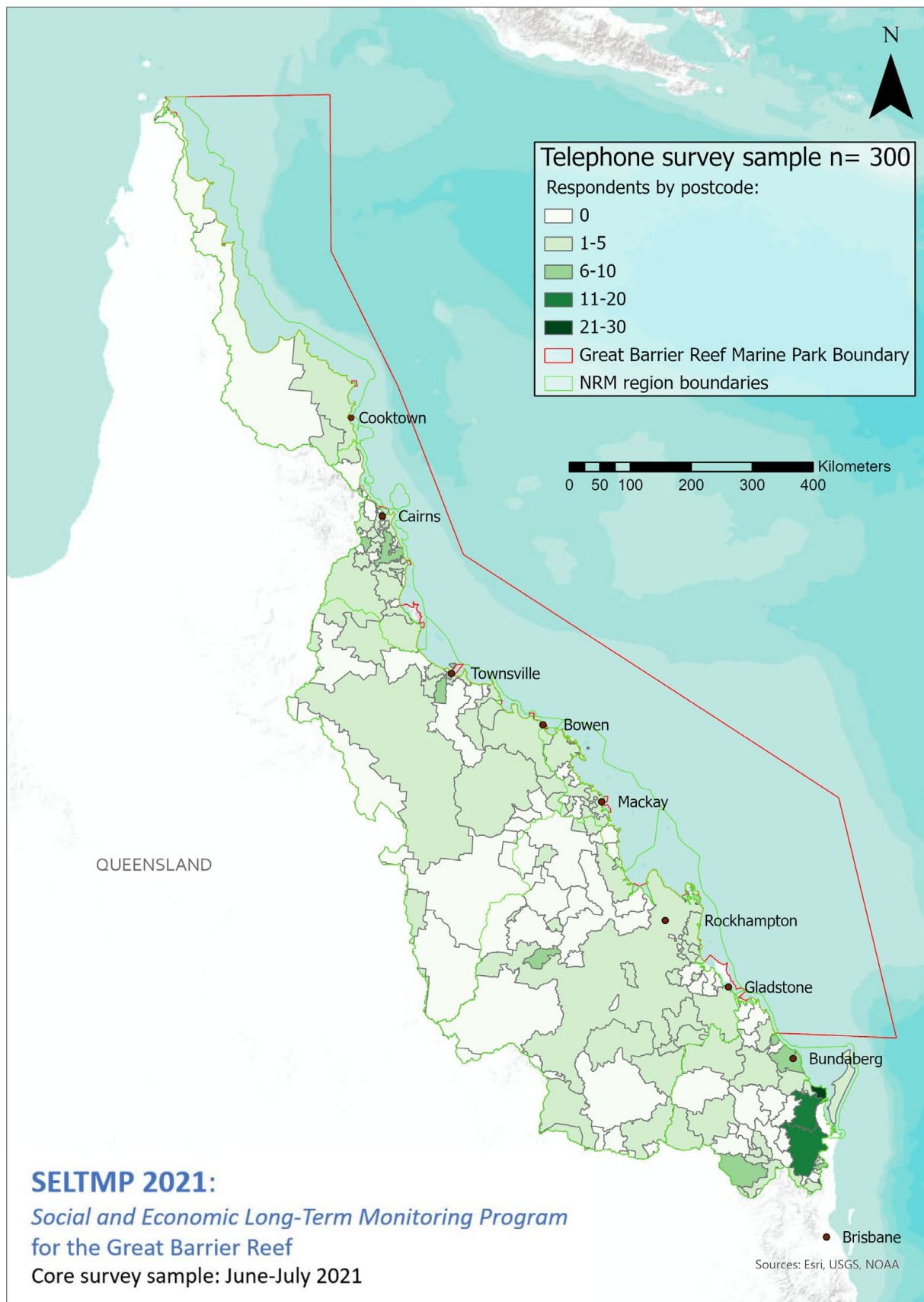
Appendix A:

Geographical distribution of survey participants









Appendix B:

Description and comparison of participants across SELTMP 2013, 2017 and 2021

Appendix Table B 1 Demographic breakdown of participants in the SELTMP 2013, 2017 and 2021 surveys

GBR CATCHMENT RESIDENTS	2013 <i>n</i> =3,181	2017 <i>n</i> =1,934	2021 <i>n</i> =2,488
Gender	%	%	%
Male	49	45	43
Female	51	54	56
Other		0.4	1
Age³	%	%	%
18-24	15.0	25.3	6.2
25-29	9.7	14.2	5.7
30-34	9.6	13.3	7.4
35-39	7.8	8.4	7.9
40-44	9.7	5.1	8.2
45-49	8.7	7.0	7.5
50-54	9.2	6.2	9.6
55-59	8.5	7.0	9.5
60-64	7.9	5.6	12.3
65-69	6.9	3.8	10.5
70-74	3.6	1.8	9.0
75-79	1.6	1.0	4.3
80-84	0.7	0.5	1.2
85-89	0.3	0.3	0.7
90 and over	0.8	0.5	0.1
Aboriginal or Torres Strait Islander origin	3.3% ATSI origin	4.8% ATSI origin	3.80% ATSI origin

³ In contrast to previous SELTMP surveys that used a continuous measure of age, a categorical question was included in the 2021 survey. This change was requested by CSIRO's Data Privacy Team to adhere to the new data privacy regulations introduced in 2020.

GBR CATCHMENT RESIDENTS	2013 n=3,181	2017 n=1,934	2021 n=2,488
Education	Not available	Not available	%
School education (Year 10 or below)			13.0
School education (Year 12)			16.8
Certificate			17.1
Advanced diploma/diploma			16.7
Bachelor degree			19.4
Graduate diploma/Graduate certificate			5.6
Postgraduate degree			11.3
Years living in GBR region	20.70 years (SE=0.323) (range 0 to 85 years)	17.20 years (SE=0.38) (range 1 month to 90 years)	27.17 years (SD=18.29, SE=0.37) (range 0 to 80 years)
Visited the GBR in previous 12 months (for recreation)	95%	91%	50%
Household income (per year)	%	%	%
\$1 to \$20,000	10.8	17.7	4.7
\$20,001 to \$40,000	26.8	32.0	14.5
\$40,001 to \$60,000	(\$20,001 to \$60,000)	(\$20,001 to \$60,000)	12.8
\$60,001 to \$80,000	28.6	4.8	11.0
\$80,001 to \$100,000	(\$60,001 to \$100,000)	(\$60,001 to \$100,000)	13.1
\$100,001 to \$200,000	27.4	24.6	22.6
\$200,001 to \$300,000	5.0	19.5	4.3
More than \$300,000	1.5	1.4	1.5
Prefer not to say	Not available	Not available	15.4
Missing	21.6	18.8	0.0

GBR CATCHMENT RESIDENTS	2013 n=3,181	2017 n=1,934	2021 n=2,488
Employment sector ⁴	%	%	%
Agricultural	5.0	2.2	4.6
Forestry	(agricultural, forestry and fishing combined)	(agricultural and forestry combined)	0.4
Fishing		0.3	1.0
Mining	12.0	4.6	4.0
Manufacturing	0.6	Not available	2.2
Electricity, gas, water, and waste	0.9	Not available	1.3
Construction	3.8	Not available	3.6
Wholesale trade	0.1	Not available	0.9
Retail trade	5.8	5.5	6.8
Accommodation and food	4.7	0.6	3.7
Transport, postal and warehousing	2.8	Not available	2.8
Information media and telecommunication	1.1	0.7	1.7
Financial and insurance services	1.3	1.1	2.4
Rental, hiring and real estate	0.8	Not available	0.3
Professional, scientific, and technical	3.3	Not available	5.8
Administrative and support	1.6	1.2	4.0
Public administration and safety	0.7	Not available	2.9
Education and training	0.8	Not available	10.3
Health care and social assistance	0.8	Not available	11.0
Arts and recreation services	0.6	Not available	2.4
Other services	Not available	Not available	24.9
Defence	0.9	Not available	Not available
Pension	0.8	Not available	Not available
Religious services	0.1	Not available	Not available
Trades (electrician, carpenter)	9.0	7.6	Not available
Government, health & education	19.0	19.8	Not available
Hospitality	Not available	6.3	Not available
Ports	Not available	0.3	Not available
Shipping	Not available	0.3	Not available
Research	Not available	1.2	Not available
Tourism land	2.0	2.0	Not available
Tourism marine	2.3	Not available	Not available
Retired	11.9	6.0	Not available
Student	2.3	6.4	Not available
Not working	2.8	1.1	2.9
Missing	7.4	28.3	Not available

⁴ Different categories were used to measure employment sector across the years. In 2021, the ABS ANZSCO employment categories were used.

GBR CATCHMENT RESIDENTS	2013 <i>n</i> =3,181	2017 <i>n</i> =1,934	2021 <i>n</i> =2,488
Agricultural commodity (<i>n</i>=115)	Not available	Not available	%
Grazing (cattle, sheep)			38.3 (<i>n</i> =44)
Sugar Cane			23.5 (<i>n</i> =27)
Bananas			7.0 (<i>n</i> =8)
Horticulture			20.0 (<i>n</i> =23)
Grains			5.2 (<i>n</i> =6)
Other			18.3 (<i>n</i> =21)
Participation in agricultural programs (<i>n</i>=115)	Not available	Not available	%
Industry best management practice programs			34.8
Nutrient management planning programs			22.6
Sediment reduction or gully remediation programs			27.0
Pesticide Improvement programs			20.9
I don't participate in organised programs but have improved my practices to reduce run-off			34.8
I haven't done anything to reduce run-off from my farm			16.5

Appendix C:

Survey questions and associated descriptives, tabulated against Reef 2050 Plan Indicators

Appendix Table C 1 Survey questions and descriptives, tabulated against Reef 2050 Plan indicators

CONSTRUCT	SURVEY QUESTIONS	MEAN (± SE) (SD)
INDICATOR: Recreational and tourism visitor benefits are sustained and maintained within ecologically sustainable limits		
Individual visitor benefits 1=very strongly disagree 10=very strongly agree	I choose to visit the GBR over other places in my recreation time	6.71 (SE=0.053) (SD=2.41)
	Visiting the GBR makes me feel better physically	7.55 (SE=0.048) (SD=2.18)
	Visiting the GBR helps me unwind and destress	7.78 (SE=0.047) (SD=2.13)
	After visiting the GBR, I feel restored and relaxed	7.79 (SE=0.046) (SD=2.09)
	I feel more alert and able to concentrate when I visit the GBR	6.81 (SE=0.051) (SD=2.30)
	Visiting the GBR is a way of clearing and clarifying my thoughts	7.20 (SE=0.051) (SD=2.31)
INDICATOR: The adoption of best practice by agricultural, reef recreational users, industry and urban sector and marine industries is increased		
Best practices 1=never 2=rarely 3=some of the time 4=most of the time 5=all the time Not applicable	How often do you practice responsible anchoring (e.g., anchoring in sandy areas away from corals)	4.41 (SE=0.031) (SD=1.12)
	How often do you dispose of food scraps and rubbish appropriately (i.e., in a rubbish bin on shore, not overboard)	4.67 (SE=0.021) (SD=0.96)
	How often do you report sightings of unusual or interesting marine life using the 'Eye on the Reef' sightings network app	1.86 (SE=0.031) (SD=1.27)
	How often do you report suspicious activity to the authorities (e.g., fishing in no-take or 'green' zones, dumping rubbish)	2.80 (SE=0.042) (SD=1.63)
	How often do you avoid touching corals and marine life (e.g., when snorkelling or diving)	4.54 (SE=0.021) (SD=0.90)
	How often do you participate in GBR-related community activities or programs (e.g., monitoring surveys, clean-ups, habitat restoration)	2.14 (SE=0.028) (SD=1.18)

CONSTRUCT	SURVEY QUESTIONS	MEAN (\pm SE) (SD)
Importance of GBR interventions 1=not important at all 10=extremely important I don't know/I am unsure	Marine Park zoning to restrict certain activities (e.g., fishing, collecting) in some areas of the GBR	8.21 (SE=0.044) (SD=2.21)
	Culling Crown of Thorns Starfish (a sea star that feeds on coral) to protect corals on reefs	8.28 (SE=0.044) (SD=2.13)
	'Coral restoration' (i.e., assisted propagation or 'gardening' of corals) to replenish damaged reefs	8.16 (SE=0.047) (SD=2.33)
	Community and citizen science programs that involve local people in reef monitoring, clean-ups, and coral restoration	8.129 (SE=0.041) (SD=2.02)
	Increased compliance to reduce illegal fishing (e.g., poaching in protected Marine Park zones)	8.56 (SE=0.039) (SD=1.93)
	Assisted coral 'adaptation' to increasing sea temperatures (e.g., through selective breeding and moving of heat-tolerant corals)	7.66 (SE=0.053) (SD=2.54)
	Improved land management to improve GBR water quality (i.e., efforts to reduce sediments, nutrients and pollution flowing into the sea)	8.30 (SE=0.046) (SD=2.26)
	Efforts to reduce rubbish and plastics from urban areas entering GBR waters	9.11 (SE=0.031) (SD=1.52)
	Improving Indigenous Traditional Owner co-management and custodianship of the GBR	6.47 (SE=0.063) (SD=3.09)
	Efforts to improve on-water practices by recreational users and tourists (e.g., reducing coral damage from anchors and human contact)	8.27 (SE=0.041) (SD=2.02)
	Government and industry initiatives to reduce carbon emissions and tackle climate change	7.72 (SE=0.060) (SD=2.95)
Perceived need for intervention 1=not needed at all 2=somewhat needed 3=moderately needed 4=greatly needed 5=critically needed	I think adopting additional interventions (such as the ones just described) to manage the GBR is (1=not needed at all, 2=somewhat needed, 3=moderately needed, 4=greatly needed, 5=critically needed)	3.91 (SE=0.022) (SD=1.11)

CONSTRUCT	SURVEY QUESTIONS	MEAN (± SE) (SD)
INDICATOR: Adaptive capacity of Reef users continues to improve		
Financial dependency on the GBR 1=none 2=a small amount (less than 25%) 3=a moderate amount (around 50%) 4=a large amount (around 75%) 5=all my income (100%) In 2013 the options were: 1=Not at all 2=Contributes a little 3=Contributes a lot 4=Contributes all my income	What proportion of your household income is from GBR-related businesses or employment (e.g., tourism, restaurants, boating, retail)?	None <i>n</i> =2,007 (81%) A small amount <i>n</i> =251 (10%) A moderate amount <i>n</i> =119 (5%) A large amount <i>n</i> =53 (2%)
Sector of GBR-related business 1=tourism (including hospitality) 2=fishing 3=government 4=science and education 5=other	Which broad sector of GBR-related business or employment does this income come from?	Tourism <i>n</i> =212 (44%) Fishing <i>n</i> =52 (11%) Government <i>n</i> =75 (16%) Science and education <i>n</i> =52 (11%) Other <i>n</i> =90 (19%)
GBR personal employment 1=no 2=yes	Is your personal employment associated with the GBR?	yes <i>n</i> =147 (6%)
Job flexibility 1=very strongly disagree 10=very strongly agree	If my work associated with the GBR was no longer viable, I could shift into a different job or role easily	6.11 (SE=0.244) (SD=2.96)
	If my work associated with the GBR was no longer viable, I would move out of the region	5.88 (SE=0.271) (SD=3.28)
	I am already taking steps, or have taken steps, to change the work I do so that I am not as reliant on the GBR for income	4.54 (SE=0.273) (SD=3.31)
Perceived personal impacts of GBR degradation 1=very strongly disagree 10=very strongly agree	If the health of the GBR significantly declined living in the GBR region would become undesirable to me	4.19 (SE=0.058) (SD=2.88)
	If the health of the GBR significantly declined I would take steps to relocate out of the GBR region	3.44 (SE=0.054) (SD=2.69)
	If the health of the GBR significantly declined my employment prospects would be reduced	3.13 (SE=0.056) (SD=2.76)
	If the health of the GBR significantly declined my financial situation would be negatively affected	3.24 (SE=0.055) (SD=2.73)
	If the health of the GBR significantly declined my lifestyle would be negatively affected	5.19 (SE=0.065) (SD=3.21)

CONSTRUCT	SURVEY QUESTIONS	MEAN (± SE) (SD)
INDICATOR: Community health, wellbeing, satisfaction with the GBR is maintained or improved		
Wellbeing 1=very strongly disagree 10=very strongly agree	Living in this region contributes positively to my overall wellbeing (previously: The GBR contributes positively to my quality of life and wellbeing)	7.81 (SE=0.049) (SD=2.29)
Perceived health of GBR 1=very poor 2=poor 3=fair 4=good 5=excellent Not applicable I don't know	How would you rate the health of the beaches	3.98 (SE=0.018) (SD=0.79)
	How would you rate the health of the creeks and rivers	3.64 (SE=0.020) (SD=0.87)
	How would you rate the health of the ocean and sea	3.84 (SE=0.020) (SD=0.89)
	How would you rate the health of the islands	3.93 (SE=0.019) (SD=0.82)
	How would you rate the health of the coral reefs	3.40 (SE=0.025) (SD=1.09)
	How would you rate the health of the mangroves	3.76 (SE=0.021) (SD=0.87)
	How would you rate the health of the seagrass	3.39 (SE=0.027) (SD=1.01)
	How would you rate the health of the fish and other marine life	3.74 (SE=0.021) (SD=0.93)
Emotional response to GBR degradation 1=not at all 2=a little bit 3=somewhat 4=quite a bit 5=a great deal	When you hear about damage to the GBR, to what extent does it make you feel sad	3.64 (SE=0.027) (SD=1.32)
	When you hear about damage to the GBR, to what extent does it make you feel angry	3.19 (SE=0.029) (SD=1.43)
	When you hear about damage to the GBR, to what extent does it make you feel afraid	2.94 (SE=0.028) (SD=1.41)
	When you hear about damage to the GBR, to what extent does it make you feel helpless	3.33 (SE=0.027) (SD=1.37)
	When you hear about damage to the GBR, to what extent does it make you feel disappointed	3.62 (SE=0.026) (SD=1.32)

CONSTRUCT	SURVEY QUESTIONS	MEAN (± SE) (SD)
INDICATOR: For (i) Great Barrier Reef region residents, (ii) the Australian public, and (iii) international community, scores of the below are maintained or improved: <ul style="list-style-type: none"> • place attachment • identity associated with the Reef • pride in the Reef • personal connections to the Reef • non-use values for Reef protection are maintained or improved 		
Place attachment 1=very strongly disagree 10=very strongly agree	I feel a strong sense of belonging to where I live	7.56 (SE=0.049) (SD=2.44)
	Living close to the GBR is important to me because of my lifestyle	6.52 (SE=0.057) (SD=2.84)
	I live in this region because those closest to me (family, friends) live here too	6.13 (SE=0.066) (SD=3.29)
Place meaning task (open-ended space for 3 words)	What are the first words that come to mind when you think of the GBR?	Qualitative
Place identity 1=very strongly disagree 10=very strongly agree	The GBR is part of my identity	5.92 (SE=0.059) (SD=2.93)
Pride in GBR 1=very strongly disagree 10=very strongly agree	I feel proud that the GBR is a World Heritage Area	8.63 (SE=0.042) (SD=2.09)

CONSTRUCT	SURVEY QUESTIONS	MEAN (± SE) (SD)
GBR services and benefits 1=I don't value this at all 10=I value this extremely highly Not applicable	The GBR supports a variety of marine life, such as fish and corals (previously: I value the GBR because it supports a variety of life such as fish and corals)	9.34 (SE=0.024) (SD=1.21)
	The GBR supports my lifestyle and recreational interests	7.40 (SE=0.051) (SD=2.44)
	The fact that the GBR exists, even if I don't use or benefit from it (previously: I value the GBR because it exists, even I don't use or benefit from it)	9.08 (SE=0.031) (SD=1.53)
	The GBR is an important part of my culture (previously: I value the GBR because it is an important part of my culture)	7.20 (SE=0.056) (SD=2.62)
	The GBR provides a place where people can continue to pass down wisdom, traditions, and a way of life (previously: I value the GBR because it provides a place where people can continue to pass down wisdom, traditions, and a way of life)	7.78 (SE=0.048) (SD=2.35)
	The GBR provides a place for me to spend time with family and friends	7.97 (SE=0.045) (SD=2.17)
	The GBR attracts people from all over the world (previously: I value the GBR because it attracts people from all over the world)	8.75 (SE=0.037) (SD=1.83)
	The GBR provides fresh seafood (previously: I value the GBR for the fresh seafood it provides)	7.54 (SE=0.054) (SD=2.63)
	People can learn about the environment through scientific discoveries made on the GBR (previously: I value the GBR because we can learn about the environment through scientific discoveries)	8.62 (SE=0.037) (SD=1.83)
	The GBR has rich Traditional Owner Heritage (previously: I value the GBR because of its rich Traditional Owner Heritage)	7.28 (SE=0.057) (SD=2.78)
	The GBR has historic maritime heritage (e.g., shipwrecks)	7.88 (SE=0.044) (SD=2.17)
	The GBR supports my livelihood (e.g., employment, income)	5.34 (SE=0.078) (SD=3.17)
	The GBR supports the local economy	8.55 (SE=0.038) (SD=1.87)

CONSTRUCT	SURVEY QUESTIONS	MEAN (± SE) (SD)
INDICATOR: Levels of community awareness and education about the GBR is maintained or improved		
Threat susceptibility	Crown of thorns starfish	3.94 (SE=0.021) (SD=1.02)
1=does not represent a threat at all	Illegal fishing practices (e.g., poaching in no-take zones)	4.08 (SE=0.020) (SD=0.97)
2=a minor threat	Land-based runoff (containing sediment, fertiliser, pesticides, etc.)	3.94 (SE=0.024) (SD=1.16)
3=a moderately serious threat	Climate change	3.94 (SE=0.024) (SD=1.36)
4=a serious threat	Tourism	3.02 (SE=0.021) (SD=1.05)
5=represents an extremely serious threat	Coastal development and land clearing	3.90 (SE=0.022) (SD=1.07)
I don't know	Ports and shipping	3.67 (SE=0.022) (SD=1.08)
	Mining	3.68 (SE=0.026) (SD=1.29)
	Population growth	3.56 (SE=0.022) (SD=1.08)
	Governance (i.e., management of the GBR)	3.52 (SE=0.025) (SD=1.20)
Perceived threats to the GBR (open-ended)	What do you think are the three (3) most serious threats to the GBR?	Qualitative
Threat severity	Loss of coral cover	4.07 (SE=0.023) (SD=1.13)
1=not a problem at all	Loss of mangroves	3.77 (SE=0.024) (SD=1.17)
2=a small problem	Loss of seagrass	3.89 (SE=0.023) (SD=1.09)
3=a moderate problem	Poor coastal water quality	3.80 (SE=0.024) (SD=1.19)
4=a big problem	Low abundance of fish	3.83 (SE=0.024) (SD=1.15)
5=a very big problem	Loss of access to parts of the Reef (e.g., for fishing, recreation, or cultural practices)	2.88 (SE=0.027) (SD=1.32)
I don't know		
Climate change beliefs	Which of the following statements best describes your beliefs about climate change and the GBR?	
	1=Climate change is a threat to the GBR, requiring immediate action	
	2=Climate change is a threat to the GBR, but does not require immediate action	
	3=I need more evidence to form an opinion about climate change and how it may threaten the GBR	see Figure 24
	4=Climate change is not a threat to the GBR	
	5=I do not have a view on climate change and how it relates to the GBR	
	6=I do not believe in climate change	

CONSTRUCT	SURVEY QUESTIONS	MEAN (± SE) (SD)
INDICATOR: Multiple dimensions of community capacity for stewardship are maintained or improved		
Social norms 1=very strongly disagree 10=very strongly agree	I think that most people in my local area try to reduce any impacts they might have on the GBR	6.49 (SE=0.052) (SD=2.47)
Ascription of shared responsibility 1=very strongly disagree 10=very strongly agree	I believe it is the responsibility of everyone in my local area to reduce their impacts on the GBR (previously: It is the responsibility of all Australians to protect the GBR)	8.26 (SE=0.044) (SD=2.16)
Moral obligation 1=very strongly disagree 10=very strongly agree	I feel morally obligated to reduce any impacts I might personally have on the GBR	8.00 (SE=0.047) (SD=2.33)
Personal agency 1=very strongly disagree 10=very strongly agree	I feel that I cannot make a personal difference in improving the health of the GBR	4.97 (SE=0.058) (SD=2.84)
Outcome expectancy 1=very strongly disagree 10=very strongly agree	Reducing my household waste helps reduce impacts on the GBR	7.26 (SE=0.056) (SD=2.71)
	Reducing my electricity consumption helps reduce impacts on the GBR	6.22 (SE=0.066) (SD=3.06)
INDICATOR: Aesthetic values scores are maintained or improved		
Aesthetic perception 1=very strongly disagree 10=very strongly agree	The aesthetic beauty of the GBR is outstanding	8.88 (SE=0.034) (SD=1.71)
INDICATOR: Decision-making and planning processes improve over time to be more inclusive and recognise the rights and interests of stakeholders, Traditional Owners and communities		
Opportunities for participation in decision-making 1=very strongly disagree 10=very strongly agree I don't know/I am unsure	There are opportunities available to me to have a say in how the GBR is managed	4.60 (SE=0.057) (SD=2.64)
Influence 1=very strongly disagree 10=very strongly agree I don't know/I am unsure	I feel I personally have some influence over how the GBR is managed	3.78 (SE=0.055) (SD=2.62)
Procedural fairness 1=very strongly disagree 10=very strongly agree I don't know/I am unsure	I think that decisions about managing the GBR are made in a fair way	5.13 (SE=0.058) (SD=2.61)
Distributive fairness 1=very strongly disagree 10=very strongly agree I don't know/I am unsure	I think that the benefits and costs of managing the GBR are distributed fairly across different groups of people (e.g., GBR residents, tourist operators, fishers)	5.49 (SE=0.061) (SD=2.64)

CONSTRUCT	SURVEY QUESTIONS	MEAN (± SE) (SD)
INDICATOR: Community satisfaction with governance and management is maintained or improved		
Satisfaction with GBR management 1=very strongly disagree 10=very strongly agree I don't know/I am unsure	Overall, I feel satisfied with how the GBR is managed	5.08 (SE=0.053) (SD=2.64)
Trust in information sources 1=do not trust at all 10=trust very strongly I don't know/I am unsure	The Australian Government	4.98 (SE=0.056) (SD=2.74)
	The Queensland Government	5.24 (SE=0.056) (SD=2.74)
	My local council	5.15 (SE=0.052) (SD=2.51)
	My close friends & family (previously: Friends, family and/or work colleagues)	6.11 (SE=0.047) (SD=2.29)
	My work colleagues (previously: Friends, family and/or work colleagues)	5.16 (SE=0.054) (SD=2.47)
	The Great Barrier Reef Marine Park Authority	7.14 (SE=0.052) (SD=2.53)
	Scientists from research institutions (e.g., CSIRO, Universities) (previously: Scientists)	7.55 (SE=0.052) (SD=2.56)
	Australian-based environmental non-governmental organisations (e.g., Natural Resource Management groups, the Australian Conservation Foundation)	6.51 (SE=0.056) (SD=2.71)
	International environmental non-governmental organisations (e.g., GreenPeace, World Wildlife Fund)	5.74 (SE=0.062) (SD=3.03)
	Local environmental groups (e.g., North Queensland Conservation Council, Cairns and Far North Environment Centre)	6.53 (SE=0.055) (SD=2.68)
	Newspapers	4.11 (SE=0.049) (SD=2.41)
	Television news (previously: Media in 2013 and News media journalists in 2017)	4.35 (SE=0.051) (SD=2.48)
	Citizen science and community groups in the GBR (e.g., Reef Check, Coral Watch)	6.82 (SE=0.051) (SD=2.47)
	Social media (e.g., Facebook, Twitter, blogs etc.) (previously: Social media bloggers)	3.62 (SE=0.050) (SD=2.42)

Appendix D:

Demographic and attitudinal comparisons across the 3 sub-samples recruited via different channels

To evaluate the presence of any differences across the three sub-samples recruited via different channels, several cross-tabulations and analyses of variance were performed (see Table overleaf). These analyses revealed several differences, some of which are described below.

- **Age:** The panel sub-sample tended to proportionally favour a younger demographic (18- to 34-year-old participants), whereas the social media subsample had a higher representation of middle-aged (50-59 year old) participants and the telephone sub-sample, more older-aged (75-94 year old) participants.
- **Education:** The panel and telephone sub-samples comprised proportionally more participants of lower-level education (e.g., school) whereas the social media sub-sample had a higher proportion of bachelor degree- and postgraduate-qualified participants.
- **Household income:** The panel and telephone sub-samples comprised proportionally more participants in lower-income brackets whereas the social media sub-sample had a higher proportion of participants earning \$200,000 or more.
- **Years living in GBR region:** The telephone sub-sample reported living in the GBR for significantly more years (Mean=33.54 years) than either the panel (Mean=25.79 years) or social media (Mean=27.49 years) sub-samples.
- **GBR visitation in the previous 12 months:** The panel and telephone sub-samples comprised proportionally more participants who did not visit the GBR very frequently (or at all) whereas the social media sub-sample had a higher proportion of participants that visited the GBR approximately monthly or more frequently than that.
- **Climate change beliefs:** Climate change beliefs were variable across the sub-samples. The panel sub-sample tended to comprise proportionally less participants who thought that climate change is not a threat to the GBR. By comparison, there were proportionally more social media participants who reported that climate change is a threat to the GBR, requiring immediate action. However, there was also proportionally more social media participants who reported that climate change is not a threat to the GBR. Additionally, there were proportionally more telephone participants who reported that climate change is a threat to the GBR but does not require immediate action; they need more evidence to form an opinion about climate change and how it may threaten the GBR; or they do not believe in climate change.
- **Trust:** Panel participants tended to trust various sources of information about the GBR, more than social media and telephone participants did.
- **GBR services and benefits:** Panel participants also tended to place a significantly higher value on ecosystem services provided by the GBR, than did social media and telephone participants.

Appendix Table D 1 Comparisons of the 3 sub-samples in 2021 SELTMP survey (panel vs. social media vs. CATI)

	PANEL <i>n</i> =1,535	SOCIAL MEDIA <i>n</i> =653	CATI <i>n</i> =300
Sex	Pearson $\chi^2(8) = 16.12$, $p=0.041$ All Pearson residuals were ns No significant differences in the observed vs. expected frequencies for gender		
Male	656	274	140
Female	869	367	159
Non-binary	7	3	0
I use a different term	0	1	0
Prefer not to say	3	8	1
Age	Pearson $\chi^2(28) = 324.78$, $p=0.000$ Observed frequencies with significant Pearson residuals are bolded below		
18-24	133 – higher than expected	20 – lower than expected	1 – lower than expected
25-29	112 – higher than expected	23 – lower than expected	6 – lower than expected
30-34	140 – higher than expected	34 – lower than expected	9 – lower than expected
35-39	117	45	34 – higher than expected
40-44	124	53	28
45-49	112	58	16
50-54	132	90 – higher than expected	16 – lower than expected
55-59	119 – lower than expected	85 – higher than expected	31
60-64	184	96	26
65-69	145	82	35
70-74	135	52	36
75-79	65	14 – lower than expected	29 – higher than expected
80-84	15	1 – lower than expected	14 – higher than expected
85-89	1 – lower than expected	0	17 – higher than expected
90-94	1	0	2 – higher than expected
95 and over	n/a	n/a	n/a

	PANEL <i>n</i> =1,535	SOCIAL MEDIA <i>n</i> =653	CATI <i>n</i> =300
Aboriginal or Torres Strait Islander origin	Pearson $\chi^2(8) = 47.75$, $p=0.000$ Observed frequencies with significant Pearson residuals are bolded below		
No	1,444	600	288
Yes, Aboriginal Australian	52	12	11
Yes, Torres Strait Islander	8	1	0
Yes, both Aboriginal Australian and Torres Strait Islander	8	3	0
Prefer not to say	23 – lower than expected	37 – higher than expected	1 – lower than expected
Education	Pearson $\chi^2(12) = 169.36$, $p=0.000$ Observed frequencies with significant Pearson residuals are bolded below		
School education (Year 10 or below)	198	51 – lower than expected	75 – higher than expected
School education (Year 12)	301 – higher than expected	57 – lower than expected	60
Certificate	296	87 – lower than expected	42
Advanced diploma/diploma	248	125	43
Bachelor degree	274	161 – higher than expected	48
Graduate diploma/Graduate certificate	88	43	9
Postgraduate degree	130 – lower than expected	129 – higher than expected	23
Household income (per year)	Pearson $\chi^2(12) = 123.27$, $p=0.000$ Observed frequencies with significant Pearson residuals are bolded below		
\$1 to \$20,000	66	21	31 – higher than expected
\$20,001 to \$40,000	258 – higher than expected	67 – lower than expected	35
\$40,001 to \$60,000	223	65 – lower than expected	31
\$60,001 to \$80,000	185	60	28
\$80,001 to \$100,000	199	97	31
\$100,001 to \$200,000	351	159	53
\$200,001 to \$300,000	53	46 – higher than expected	9
More than \$300,000	14	19 – higher than expected	4
Prefer not to say	186 – lower than expected	119	78 – higher than expected

	PANEL <i>n</i> =1,535	SOCIAL MEDIA <i>n</i> =653	CATI <i>n</i> =300
Employment sector	Pearson $\chi^2(42) = 758.68, p=0.000$ Observed frequencies with significant Pearson residuals are bolded below		
Agricultural	50 – lower than expected	45 – higher than expected	20
Forestry	4	4	2
Fishing	8	15 – higher than expected	2
Mining	56	31	13
Manufacturing	36	14	4
Electricity, gas, water and waste	17	11	4
Construction	47	26	17
Wholesale trade	17	3	3
Retail trade	132 – higher than expected	19 – lower than expected	18
Accommodation and food	65	24	4 – lower than expected
Transport, postal and warehousing	45	15	10
Information media and telecommunication	26	9	6
Financial and insurance services	45	9	6
Rental, hiring and real estate	2	3	3 – higher than expected
Professional, scientific and technical	60 – lower than expected	81 – higher than expected	4 – lower than expected
Administrative and support	75	20	5 – lower than expected
Public administration and safety	48	19	5
Education and training	159	71	26
Health care and social assistance	164	66	44
Arts and recreation services	28	27 – higher than expected	4
Other services	451 – higher than expected	141	27 – lower than expected
Not working	0 – lower than expected	0 – lower than expected	73 – higher than expected

	PANEL <i>n</i> =1,535	SOCIAL MEDIA <i>n</i> =653	CATI <i>n</i> =300
Years living in GBR region	F(2, 2,485)=23.08, <i>p</i> =0.000 R ² =0.018 CATI participants significantly greater number of years living in GBR compared to: <ul style="list-style-type: none"> • panel participants (Bonferroni <i>t</i>=6.77, <i>p</i>=0.000) • social media participants (Bonferroni <i>t</i>=4.78, <i>p</i>=0.000) 		
	Mean=25.79 years (SD=17.57)	Mean=27.49 years (SD=18.82)	Mean=33.54 years (SD=19.36)
Visited the GBR in previous 12 months (for recreation)	Pearson $\chi^2(12) = 514.47$, <i>p</i> =0.000 Observed frequencies with significant Pearson residuals are bolded below		
Not at all	573 – higher than expected	100 – lower than expected	139 – higher than expected
Once or twice	418 – higher than expected	142 – lower than expected	50 – lower than expected
Every few months	110 – lower than expected	145 – higher than expected	18 – lower than expected
Approximately monthly	35 – lower than expected	69 – higher than expected	10
Approximately fortnightly	24 – lower than expected	57 – higher than expected	3 – lower than expected
Approximately weekly	13 – lower than expected	61 – higher than expected	3
More than once a week	9 – lower than expected	65 – higher than expected	4
Climate change beliefs	Pearson $\chi^2(10) = 86.49$, <i>p</i> =0.000 Observed frequencies with significant Pearson residuals are bolded below		
Climate change is a threat to the GBR, requiring immediate action	895	425 – higher than expected	137 – lower than expected
Climate change is a threat to the GBR, but does not require immediate action	89	20 – lower than expected	28 – higher than expected
I need more evidence to form an opinion about climate change and how it may threaten the GBR	342	98 – lower than expected	88 – higher than expected
Climate change is not a threat to the GBR	66 – lower than expected	61 – higher than expected	13
I do not have a view on climate change and how it relates to the GBR	62	10 – lower than expected	8
I do not believe in climate change	81	39	26 – higher than expected

	PANEL <i>n</i> =1,535	SOCIAL MEDIA <i>n</i> =653	CATI <i>n</i> =300
Trust			
Trust in scientists from research institutions (e.g., CSIRO, Universities)	F(2, 2,408)=7.38, <i>p</i> =0.0006 R ² =0.006 Panel participants trusted scientists significantly more than: <ul style="list-style-type: none"> Social media participants (Bonferroni <i>t</i>=-3.14, <i>p</i>=0.005) CATI participants (Bonferroni <i>t</i>=-2.86, <i>p</i>=0.012) 		
	Mean=7.71 (SD=2.25)	Mean=7.33 (SD=3.13)	Mean=7.25 (SD=2.61)
Trust in the Australian Government	F(2, 2,393)=145.06, <i>p</i> =0.0000 R ² =0.108 Panel participants trusted the Australian Government significantly more than: <ul style="list-style-type: none"> Social media participants (Bonferroni <i>t</i>=-16.79, <i>p</i>=0.000) CATI participants (Bonferroni <i>t</i>=-6.57, <i>p</i>=0.000) CATI participants trusted the Australian Government significantly more than: <ul style="list-style-type: none"> Social media participants (Bonferroni <i>t</i>=5.27, <i>p</i>=0.000) 		
	Mean=5.66 (SD=2.57)	Mean=3.61 (SD=2.60)	Mean=4.57 (SD=2.65)
Trust in the Great Barrier Reef Marine Park Authority (GBRMPA)	F(2, 2,380)=45.98, <i>p</i> =0.0000 R ² =0.037 Panel participants trusted GBRMPA significantly more than: <ul style="list-style-type: none"> Social media participants (Bonferroni <i>t</i>=-9.38, <i>p</i>=0.000) CATI participants (Bonferroni <i>t</i>=-4.06, <i>p</i>=0.000) CATI participants trusted GBRMPA significantly more than: <ul style="list-style-type: none"> Social media participants (Bonferroni <i>t</i>=2.58, <i>p</i>=0.027) 		
	Mean=7.51 (SD=2.16)	Mean=6.40 (SD=3.05)	Mean=6.86 (SD=2.61)
Trust in social media (e.g., Facebook, Twitter, blogs etc.)	F(2, 2,361)=35.82, <i>p</i> =0.0000 R ² =0.029 Panel participants trusted social media significantly more than: <ul style="list-style-type: none"> Social media participants (Bonferroni <i>t</i>=-7.80, <i>p</i>=0.000) CATI participants (Bonferroni <i>t</i>=-4.94, <i>p</i>=0.000) 		
	Mean=3.95 (SD=2.50)	Mean=3.07 (SD=2.16)	Mean=3.18 (SD=2.24)

	PANEL <i>n</i> =1,535	SOCIAL MEDIA <i>n</i> =653	CATI <i>n</i> =300
Services and benefits associated with the GBR			
Value placed on Biodiversity	F(2, 2,479)=56.98, <i>p</i> =0.0000 R ² =0.044 Panel participants valued biodiversity significantly less than: <ul style="list-style-type: none"> • Social media participants (Bonferroni <i>t</i>=10.36, <i>p</i>=0.000) • CATI participants (Bonferroni <i>t</i>=4.81, <i>p</i>=0.000) CATI participants valued biodiversity significantly less than: <ul style="list-style-type: none"> • Social media participants (Bonferroni <i>t</i>=-2.58, <i>p</i>=0.027) 		
	Mean=9.15 (SD=1.33)	Mean=9.72 (SD=0.76)	Mean=9.51 (SD=1.16)
Value placed on Lifestyle	F(2, 2,299)=73.36, <i>p</i> =0.0000 R ² =0.059 Panel participants valued lifestyle significantly less than: <ul style="list-style-type: none"> • Social media participants (Bonferroni <i>t</i>=10.47, <i>p</i>=0.000) Panel participants valued lifestyle significantly more than: <ul style="list-style-type: none"> • CATI participants (Bonferroni <i>t</i>=-3.53, <i>p</i>=0.001) CATI participants valued lifestyle significantly less than: <ul style="list-style-type: none"> • Social media participants (Bonferroni <i>t</i>=-10.24, <i>p</i>=0.000) 		
	Mean=7.15 (SD=2.28)	Mean=8.34 (SD=2.29)	Mean=6.60 (SD=2.88)
Value placed on Livelihood	F(2, 1,1670)=39.04, <i>p</i> =0.0000 R ² =0.044 CATI participants valued livelihood significantly less than: <ul style="list-style-type: none"> • Panel participants (Bonferroni <i>t</i>=-7.80, <i>p</i>=0.000) • Social media participants (Bonferroni <i>t</i>=-8.55, <i>p</i>=0.000) 		
	Mean=5.48 (SD=2.91)	Mean=5.87 (SD=3.43)	Mean=3.70 (SD=3.28)
Threat severity			
Loss of coral cover	F(2, 2,410)=3.96, <i>p</i> =0.019 R ² =0.003 Panel participants perceived loss of coral cover as more problematic than: <ul style="list-style-type: none"> • Social media participants (Bonferroni <i>t</i>=-2.48, <i>p</i>=0.036) CATI participants perceived loss of coral cover as more problematic than: <ul style="list-style-type: none"> • Social media participants (Bonferroni <i>t</i>=2.34, <i>p</i>=0.051) 		
	Mean=4.10 (SD=0.99)	Mean=3.97 (SD=1.36)	Mean=4.16 (SD=1.24)
Loss of access	F(2, 2,356)=21.26, <i>p</i> =0.000 R ² =0.017 Panel participants perceived loss of access as more problematic than: <ul style="list-style-type: none"> • Social media participants (Bonferroni <i>t</i>=-4.22, <i>p</i>=0.000) CATI participants perceived loss of access as more problematic than: <ul style="list-style-type: none"> • Panel participants (Bonferroni <i>t</i>=3.90, <i>p</i>=0.000) • Social media participants (Bonferroni <i>t</i>=6.37, <i>p</i>=0.000) 		
	Mean=2.91 (SD=1.25)	Mean=2.64 (SD=1.36)	Mean=3.24 (SD=1.47)

	PANEL <i>n</i> =1,535	SOCIAL MEDIA <i>n</i> =653	CATI <i>n</i> =300
Threat susceptibility			
Ports and shipping	$F(2, 2,439)=4.51, p=0.011$ $R^2=0.003$ CATI participants perceived ports and shipping as more of a threat than: <ul style="list-style-type: none"> Panel participants (Bonferroni $t=2.75, p=0.017$) Social media participants (Bonferroni $t=2.87, p=0.011$) 		
	Mean=3.65 (SD=1.01)	Mean=3.62 (SD=1.21)	Mean=3.84 (SD=1.14)
Place attachment			
Affect	$F(2, 2,485)=30.95, p=0.000$ $R^2=0.024$ Panel participants were significantly less attached (in terms of sense of belonging) to where they live than: <ul style="list-style-type: none"> Social media participants (Bonferroni $t=7.06, p=0.000$) CATI participants (Bonferroni $t=4.96, p=0.000$) 		
	Mean=7.26 (SD=2.38)	Mean=8.05 (SD=2.42)	Mean=8.01 (SD=2.52)
Dependence	$F(2, 2,485)=101.08, p=0.000$ $R^2=0.075$ CATI participants were significantly less attached (in terms of lifestyle) to living close to the GBR than: <ul style="list-style-type: none"> Panel participants (Bonferroni $t=-4.18, p=0.000$) Social media participants (Bonferroni $t=-12.04, p=0.000$) Panel participants were significantly less attached (in terms of lifestyle) to living close to the GBR than: <ul style="list-style-type: none"> Social media participants (Bonferroni $t=12.33, p=0.000$) 		
	Mean=6.19 (SD=2.68)	Mean=7.76 (SD=2.62)	Mean=5.47 (SD=3.18)
Social bonding	$F(2, 2,485)=21.27, p=0.000$ $R^2=0.016$ CATI participants were significantly more attached (in terms of family/friends) to the region than: <ul style="list-style-type: none"> Panel participants (Bonferroni $t=2.76, p=0.016$) Social media participants (Bonferroni $t=5.95, p=0.000$) Panel participants were significantly more attached (in terms of family/friends) to the region than: <ul style="list-style-type: none"> Social media participants (Bonferroni $t=-5.15, p=0.000$) 		
	Mean=6.27 (SD=3.14)	Mean=5.48 (SD=3.44)	Mean=6.83 (SD=3.43)

	PANEL <i>n</i> =1,535	SOCIAL MEDIA <i>n</i> =653	CATI <i>n</i> =300
Place identity			
	F(2, 2,485)=66.65, <i>p</i> =0.000 R ² =0.050 Social media participants reported significantly higher place identity than: <ul style="list-style-type: none"> • Panel participants (Bonferroni <i>t</i>=10.69, <i>p</i>=0.000) • CATI participants (Bonferroni <i>t</i>=8.87, <i>p</i>=0.000) 		
	Mean=5.59 (SD=2.72)	7.01 (SD=3.01)	5.25 (SD=3.16)
Pride			
	F(2, 2,485)=5.25, <i>p</i> =0.005 R ² =0.003 CATI participants felt significantly more pride in the GBR than: <ul style="list-style-type: none"> • Panel participants (Bonferroni <i>t</i>=2.89, <i>p</i>=0.011) 		
	Mean=8.53 (SD=1.99)	Mean=8.74 (SD=2.30)	Mean=8.91 (SD=2.11)
Aesthetic perceptions			
	F(2, 2,485)=33.90, <i>p</i> =0.000 R ² =0.026 Social media participants rated the GBR as significantly more aesthetically beautiful than: <ul style="list-style-type: none"> • Panel participants (Bonferroni <i>t</i>=8.22, <i>p</i>=0.000) • CATI participants (Bonferroni <i>t</i>=4.32, <i>p</i>=0.000) 		
	Mean=8.69 (SD=1.72)	Mean=9.34 (SD=1.45)	Mean=8.83 (SD=1.93)

Appendix E:

Sentiment analysis and word clouds

Word clouds were produced using R Statistical Software v4.1.2 (R Core Team, 2021), with the text cleaned and the coding for sentiment (i.e., negative, positive, or neutral valence, in the context of the GBR) applied using MS Excel. We assigned positive sentiment coding to a word on the basis that:

- The word is a generic, positive adjective. For example: ‘good’, ‘fun’, ‘incredible’, ‘nice’, ‘amazing’, ‘wonderful’, ‘magnificent’.
- The word describes an aesthetic attribute of the GBR that most people would find pleasant or desirable. For example: ‘beautiful’, ‘pretty’, ‘vibrant’, ‘gorgeous’.
- The word indicates a human sensory experience or affective state that most people would find pleasant or desirable. For example: ‘tranquil’, ‘proud’, ‘pleasure’, ‘joy’, ‘relax’, ‘breathtaking’, ‘awe’, ‘happy’, ‘idyllic’.
- The word indicates an attribute of the GBR that relates to its Outstanding Universal Value and/or iconic status. For example: ‘World Heritage’, ‘unique’, ‘icon’, ‘treasure’, ‘attraction’, ‘irreplaceable’, ‘valuable’, ‘prestigious’, ‘priceless’, ‘famous’, ‘immense’.
- The word indicates a healthy and/or resilient ecosystem state. For example: ‘pristine’, ‘clean’, ‘bountiful’, ‘diversity’, ‘thriving’, ‘flourishing’, ‘durable’, ‘adaptable’.

We assigned negative sentiment coding to a word on the basis that:

- The word is a generic, negative adjective. For example: ‘bad’, ‘poor’, ‘disappointing’, ‘trouble’, ‘negative’.
- The word describes an aesthetic attribute of the GBR that most people would find unpleasant or undesirable. For example: ‘dull’, ‘lifeless’, ‘boring’.
- The word indicates a human sensory experience or affective state that most people would find unpleasant or undesirable. For example: ‘anger’, ‘shame’, ‘concern’, ‘grief’, ‘heartbreaking’, ‘worried’, ‘guilt’.
- The word indicates an attribute of the GBR that is counter to its Outstanding Universal Value and/or iconic status. For example: ‘threatened’, ‘risk’, ‘struggling’, ‘fragile’, ‘ruined’, ‘risk’, ‘overrated’.
- The word indicates an unhealthy, damaged, impacted and/or vulnerable ecosystem state for a coral reef ecosystem. For example: ‘endangered’, ‘dying’, ‘sick’, ‘decline’, ‘damage’, ‘bleaching’, ‘deteriorating’, ‘stress’, ‘trashed’.
- The word indicates a threat or pressure that does/would cause or contribute to a negative impact to the GBR ecosystem, including words suggesting poor governance and/or human behaviour/intent. For example: ‘oil’, ‘greed’, ‘crisis’, ‘crown of thorns starfish’, ‘threat’, ‘coal’, ‘controversy’, ‘failure’, ‘abused’, ‘fraud’, ‘idiots’, and ‘climate change’.

We assigned neutral sentiment coding to a word on the basis that:

- The word did not meet the above criteria for positive or negative sentiment, and/or its sentiment in the context of the GBR was considered unclear or ambiguous. See word clouds for examples.

Appendix F:

Coding of threats

Consistent with previous iterations of SELTMP and published reports and papers (Curnock et al., 2019; Marshall et al., 2019), responses to the open-ended question ‘What do you think are the three (3) most serious threats to the GBR’ were sorted into thematically aligned categories to enable comparison of the major themes. The order and ranking of the threats were not considered, and for those respondents who listed the same threat more than once, a count of only one (1) was allocated to the total number of responses per theme. For example, if a respondent provided three items such as: ‘climate change’, ‘global heating’ and ‘warming oceans’, their contribution to the *climate change* category was recorded only once.

Appendix G:

Agricultural workers (subset analysis)

Appendix Table G 1 Tables of results for agricultural workers

Participation in agricultural practice programs

Participation in programs

	FREQUENCY (%)
Participation in agricultural programs	
Industry best management practice programs	40 (34.8%)
Nutrient management planning programs	26 (22.6%)
Sediment reduction or gully remediation programs	31 (27.0%)
Pesticide Improvement programs	24 (20.9%)
I don't participate in organised programs but have improved my practices to reduce run-off	40 (34.8%)
I haven't done anything to reduce run-off from my farm	19 (16.5%)

Note: The percentages do not sum to 100% because respondents could select more than one option.

Number of programs participated in

	FREQUENCY (%)
None	59 (51.3%)
1	23 (20.0%)
2	14 (12.2%)
3	6 (5.2%)
4	13 (11.3%)
Total	115 (100.0%)

The following tables present results for **all agricultural workers** ($n=115$) in comparison to the overall sample ($n=2,488$). Additionally, results for agricultural workers are broken down by program participation as follows:

- **Non-program participants** include 59 participants who had not participated in any of the organised agricultural practice programs listed.
- **Program participants** include 56 participants who had participated in at least one of the organised agricultural practice programs listed.

Commodity type

	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)
	Non-program participants (n=59)	Program participants (n=56)	
	FREQUENCY (%)	FREQUENCY (%)	
Agricultural commodity			
Grazing (cattle, sheep)	23 (39.0%)	21 (37.5%)	44 (38.3%)
Sugar Cane	12 (20.3%)	15 (26.8%)	27 (23.5%)
Bananas	2 (3.4%)	6 (10.7%)	8 (7.0%)
Horticulture	11 (18.6%)	12 (21.4%)	23 (20.0%)
Grains	2 (3.4%)	4 (7.1%)	6 (5.2%)
Other	13 (22.0%)	8 (14.3%)	21 (18.3%)

Note: The percentages do not sum to 100% because respondents could select more than one option.

Sample demographics

	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participants (n=59)	Program participants (n=56)		
	FREQUENCY (%)	FREQUENCY (%)	FREQUENCY (%)	FREQUENCY (%)
Gender				
Male	33 (55.9%)	31 (55.4%)	64 (55.7%)	1,070 (43.0%)
Female	26 (44.1%)	25 (44.6%)	51 (44.4%)	1,395 (56.1%)
Other	0 (0.0%)	0 (0.0%)	0 (0.0%)	11 (0.4%)
I prefer not to say	0 (0.0%)	0 (0.0%)	0 (0.0%)	12 (0.5%)
Age				
18-24	2 (3.4%)	1 (1.8%)	3 (2.6%)	154 (6.2%)
25-29	4 (6.8%)	4 (7.1%)	8 (7.0%)	141 (5.7%)
30-34	4 (6.8%)	5 (8.9%)	9 (7.8%)	183 (7.4%)
35-39	3 (5.1%)	3 (5.4%)	6 (5.2%)	196 (7.9%)
40-44	4 (6.8%)	8 (14.3%)	12 (10.4%)	205 (8.2%)
45-49	2 (3.4%)	8 (14.3%)	10 (8.7%)	186 (7.5%)
50-54	5 (8.5%)	3 (5.4%)	8 (7.0%)	238 (9.6%)
55-59	11 (18.6%)	4 (7.1%)	15 (13.0%)	235 (9.5%)
60-64	8 (13.6%)	9 (16.1%)	17 (14.8%)	306 (12.3%)
65-69	5 (8.5%)	3 (5.4%)	8 (7.0%)	262 (10.5%)
70-74	4 (6.8%)	4 (7.1%)	8 (7.0%)	223 (9.0%)
75-79	6 (10.2%)	3 (5.4%)	9 (7.8%)	108 (4.3%)
80-84	1 (1.7%)	0 (0.0%)	1 (0.9%)	30 (1.2%)
85-89	0 (0.0%)	1 (1.8%)	1 (0.9%)	18 (0.7%)
90 and over	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (0.1%)
Aboriginal or Torres Strait Islander origin				
Yes	1 (1.7%)	3 (5.4%)	4 (3.5%)	95 (3.8%)
No	55 (93.2%)	51 (91.1%)	106 (92.2%)	2,332 (93.7%)
I prefer not to say	3 (5.1%)	2 (3.6%)	5 (4.4%)	61 (2.5%)

	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participants (n=59)	Program participants (n=56)		
	FREQUENCY (%)	FREQUENCY (%)		
Education				
School education (Year 10 or below)	18 (30.5%)	8 (14.3%)	26 (22.6%)	324 (13.0%)
School education (Year 12)	10 (17.0%)	6 (10.7%)	16 (13.9%)	418 (16.8%)
Certificate	6 (10.2%)	11 (19.6%)	17 (14.8%)	425 (17.1%)
Advanced diploma/ diploma	8 (13.6%)	10 (17.9%)	18 (15.7%)	416 (16.7%)
Bachelor degree	12 (20.3%)	13 (23.2%)	25 (21.7%)	483 (19.4%)
Graduate diploma/ Graduate certificate	2 (3.4%)	1 (1.8%)	3 (2.6%)	140 (5.6%)
Postgraduate degree	3 (5.1%)	7 (12.5%)	10 (8.7%)	282 (11.3%)
Household income (per year)				
\$1 to \$20,000	5 (8.5%)	1 (1.8%)	6 (5.2%)	118 (4.7%)
\$20,001 to \$40,000	8 (13.6%)	7 (12.5%)	15 (13.0%)	360 (14.5%)
\$40,001 to \$60,000	9 (15.3%)	3 (5.4%)	12 (10.4%)	319 (12.8%)
\$60,001 to \$80,000	4 (6.8%)	7 (12.5%)	11 (9.6%)	273 (11.0%)
\$80,001 to \$100,000	12 (20.3%)	7 (12.5%)	19 (16.5%)	327 (13.1%)
\$100,001 to \$200,000	7 (11.9%)	14 (25.0%)	21 (18.3%)	563 (22.6%)
\$200,001 to \$300,000	0 (0.0%)	5 (8.9%)	5 (4.4%)	108 (4.3%)
More than \$300,000	0 (0.0%)	2 (3.6%)	2 (1.7%)	37 (1.5%)
Prefer not to say	14 (23.7%)	10 (17.9%)	24 (20.9%)	383 (15.4%)
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

GBR visitation and regional QLD residence

	2021 AGRICULTURAL WORKERS (n=115)		ALL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participants (n=59)	Program participants (n=56)		
	FREQUENCY (%)	FREQUENCY (%)	FREQUENCY (%)	FREQUENCY (%)
Have you ever visited the GBR?				
Yes	49 (83.1%)	53 (94.6%)	102 (88.7%)	2,048 (82.3%)
No	10 (17.0%)	3 (5.4%)	13 (11.3%)	440 (17.7%)
In the previous 12 months, how often did you visit the GBR for recreation?				
Not at all	16 (27.1%)	14 (25.0%)	30 (26.1%)	812 (32.6%)
Once or twice	14 (23.7%)	14 (25.0%)	28 (24.4%)	610 (24.5%)
Every few months	7 (11.9%)	12 (21.4%)	19 (16.5%)	273 (11.0%)
Approximately monthly	6 (10.2%)	7 (12.5%)	13 (11.3%)	114 (4.6%)
Approximately fortnightly	2 (3.4%)	2 (3.6%)	4 (3.5%)	84 (3.4%)
Approximately weekly	4 (6.8%)	4 (7.1%)	8 (7.0%)	77 (3.1%)
More than once a week	0 (0.0%)	0 (0.0%)	0 (0.0%)	78 (3.1%)
Total who visited GBR at least once in the previous 12 month	33 (55.9%)	39 (69.6%)	72 (62.6%)	1,236 (49.7%)
For how many years have you lived in regional Queensland?	Mean=38.51 years (SD=21.81) (range 1 to 79 years)	Mean=39.36 years (SD=21.19) (range 2 to 78 years)	Mean= 38.92 years (SD=21.42) (range 1 to 79 years)	Mean= 27.17 years (SD=18.29) (range 0 to 80 years)

Notes. The 'Visited the GBR in previous 12 months' question was only presented to the 102 respondents who had answered 'yes' to the previous question 'Have you ever visited the GBR?'. However, the percentages are calculated based on the whole sample (n=115) including those who have never visited the GBR.

Best practices

When you visit the GBR, how often do you engage in the following actions?	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)	MEAN (SD)	MEAN (SD)
Practice responsible anchoring (e.g., anchoring in sandy areas away from corals)	4.43 (1.06) n=40	4.34 (0.94) n=38	4.38 (1.00) n=78	4.41 (1.12) n=1,293
Dispose of food scraps and rubbish appropriately (i.e., in a rubbish bin on shore, not overboard)	4.50 (1.15) n=46	4.73 (0.84) n=52	4.62 (1.00) n=98	4.67 (0.96) n=1,982
Report sightings of unusual or interesting marine life using the 'Eye on the Reef' sightings network app	1.83 (1.38) n=42	2.10 (1.36) n=49	1.98 (1.37) n=91	1.86 (1.27) n=1,667
Report suspicious activity to the authorities (e.g., fishing in no-take or 'green' zones, dumping rubbish)	2.91 (1.74) n=43	3.14 (1.64) n=43	3.02 (1.69) n=86	2.80 (1.63) n=1,500
Avoid touching corals and marine life (e.g., when snorkelling or diving)	4.40 (1.07) n=43	4.57 (0.68) n=49	4.49 (0.88) n=92	4.54 (0.90) n=1,859
Participate in GBR-related community activities or programs (e.g., monitoring surveys, clean-ups, habitat restoration)	1.98 (1.16) n=46	2.33 (1.33) n=49	2.16 (1.26) n=95	2.14 (1.18) n=1,829

Notes. The scale ranged from 1=Never to 5=All the time. To calculate the mean for each source, the sample varied in size because some participants selected the 'not applicable' option.

Perceptions of GBR interventions

Importance of interventions

How important are the following initiatives for managing the GBR?	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)		
	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)
Marine park zoning to restrict certain activities in some areas of the GBR	7.53 (2.69) n=58	6.96 (2.46) n=56	7.25 (2.58) n=114	8.21 (2.21) n=2,448
Culling of crown of thorns starfish to protect corals on reefs	8.32 (2.25) n=59	7.19 (2.96) n=53	7.79 (2.66) n=112	8.29 (2.12) n=2,374
'Coral restoration' to replenish damaged reefs	7.37 (3.09) n=57	6.48 (3.22) n=54	6.94 (3.17) n=111	8.16 (2.33) n=2,423
Community and citizen science programs that involve local people in reef monitoring, clean-ups, and coral restoration	7.75 (2.19) n=57	7.30 (2.68) n=56	7.53 (2.44) n=113	8.13 (2.02) n=2,439
Increased compliance to reduce illegal fishing	8.41 (2.10) n=58	7.85 (2.58) n=55	8.14 (2.35) n=113	8.56 (1.93) n=2,445
Assisted coral 'adaptation' to increasing sea temperatures	6.55 (3.27) n=56	6.17 (3.35) n=53	6.37 (3.30) n=109	7.66 (2.54) n=2,297
Improved land management to improve GBR water quality	6.93 (3.28) n=58	6.82 (3.06) n=56	6.88 (3.16) n=114	8.30 (2.26) n=2,448
Efforts to reduce rubbish and plastics from urban areas entering GBR waters	8.78 (1.67) n=59	9.09 (1.69) n=56	8.93 (1.68) n=115	9.11 (1.52) n=2,462
Improving indigenous Traditional Owner co-management and custodianship of the GBR	5.76 (3.53) n=58	5.82 (3.23) n=55	5.79 (3.37) n=113	6.47 (3.09) n=2,372
Efforts to improve on-water practices by recreational users and tourists	7.40 (2.53) n=57	7.58 (2.30) n=55	7.49 (2.41) n=112	8.27 (2.03) n=2,448
Government and industry initiatives to reduce carbon emissions and tackle climate change	5.84 (3.50) n=58	5.87 (3.34) n=55	5.86 (3.41) n=113	7.72 (2.95) n=2,413

Notes. The scale ranged from 1=not at all important to 10=extremely important. To calculate the mean for each source, the sample varied in size because some participants selected the 'I don't know/I am unsure' option.

Need for interventions

	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)		
	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)
I think adopting additional interventions (such as the ones just described) to manage the GBR is...	3.46 (1.34)	3.30 (1.28)	3.38 (1.31)	3.91 (1.11)
	n=59	n=56	n=115	n=2,488
1=not needed at all				
2=somewhat needed				
3= moderately needed				
4=greatly needed				
5=critically needed				

Notes. The scale ranged from 1=not needed at all to 5=critically needed.

Perceptions of GBR health

Of the places you have visited in the GBR, how would you rate the health of the....	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)		
	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)
...beaches	4.26 (0.79)	4.34 (0.65)	4.30 (0.72)	3.98 (0.79)
	n=47	n=53	n=100	n=2,000
...creeks and rivers	3.91 (0.94)	4.02 (0.87)	3.97 (0.90)	3.64 (0.87)
	n=46	n=53	n=99	n=1,846
...ocean and sea	4.26 (0.93)	4.19 (0.86)	4.22 (0.89)	3.84 (0.89)
	n=46	n=52	n=98	n=1,983
...islands	4.35 (0.79)	4.27 (0.70)	4.31 (0.74)	3.93 (0.82)
	n=46	n=51	n=97	n=1,884
...coral reefs	4.04 (0.92)	3.92 (0.98)	3.98 (0.95)	3.40 (1.09)
	n=46	n=51	n=97	n=1,921
...mangroves	4.31 (0.85)	4.21 (0.75)	4.26 (0.80)	3.76 (0.87)
	n=45	n=47	n=92	n=1,764
...seagrass	3.68 (1.23)	3.93 (0.88)	3.81 (1.06)	3.39 (1.01)
	n=37	n=41	n=78	n=1,438
...fish and other marine life	4.11 (1.04)	4.13 (0.73)	4.12 (0.88)	3.74 (0.93)
	n=46	n=53	n=99	n=1,935

Notes. The scale ranged from 1=very poor to 5=excellent. To calculate the mean for each source, the sample varied in size because some participants selected the 'Not applicable' or 'I don't know' options.

Emotions when hearing about GBR degradation

When you hear about damage to the GBR to what extent does it make you feel...	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)		
	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)
...sad	3.10 (1.41) n=59	2.73 (1.50) n=56	2.92 (1.46) n=115	3.64 (1.32) n=2,488
...angry	2.61 (1.44) n=59	2.50 (1.65) n=56	2.56 (1.54) n=115	3.19 (1.43) n=2,488
...afraid	2.36 (1.39) n=59	2.29 (1.42) n=56	2.32 (1.40) n=115	2.94 (1.41) n=2,488
...helpless	3.00 (1.49) n=59	2.63 (1.60) n=56	2.82 (1.55) n=115	3.33 (1.37) n=2,488
...disappointed	3.24 (1.41) n=59	2.98 (1.47) n=56	3.11 (1.44) n=115	3.62 (1.32) n=2,488

Notes. The scale ranged from 1=not at all to 5=a great deal.

Wellbeing from living in GBR region

	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)		
	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)
Living in this region contributes positively to my overall well-being	7.73 (2.38) n=59	8.04 (1.85) n=56	7.88 (2.14) n=115	7.81 (2.29) n=2,488

Notes. The scale ranged from 1=very strongly disagree to 10=very strongly agree.

Perceptions of services and benefits associated with the GBR

How much do you value the following aspects of the GBR?	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)	MEAN (SD)	MEAN (SD)
The GBR supports a variety of marine life, such as fish and corals	9.44 (1.10) n=59	9.21 (1.22) n=56	9.33 (1.16) n=115	9.34 (1.21) n=2,482
The GBR supports my lifestyle and recreational interests	7.15 (2.80) n=55	7.91 (1.98) n=55	7.53 (2.45) n=110	7.40 (2.44) n=2,302
The fact that the GBR exists, even if I don't use or benefit from it	8.83 (1.86) n=58	9.04 (1.22) n=56	8.93 (1.57) n=114	9.08 (1.53) n=2,453
The GBR is an important part of my culture	7.04 (2.97) n=51	7.75 (2.27) n=53	7.40 (2.65) n=104	7.20 (2.62) n=2,206
The GBR provides a place where people can continue to pass down wisdom, traditions, and a way of life	7.81 (2.41) n=57	7.80 (2.02) n=54	7.80 (2.22) n=111	7.78 (2.35) n=2,427
The GBR provides a place for me to spend time with family and friends	8.13 (2.26) n=56	8.45 (1.87) n=55	8.29 (2.08) n=111	7.97 (2.17) n=2,362
The GBR attracts people from all over the world	8.97 (1.46) n=59	8.27 (2.12) n=55	8.63 (1.84) n=114	8.75 (1.83) n=2,475
The GBR provides fresh seafood	8.49 (2.21) n=59	8.45 (1.93) n=56	8.47 (2.07) n=115	7.54 (2.63) n=2,405
People can learn about the environment through scientific discoveries made on the GBR	8.15 (2.52) n=59	7.91 (2.43) n=55	8.04 (2.47) n=114	8.62 (1.83) n=2,471
The GBR has rich Traditional Owner Heritage	6.16 (3.32) n=57	7.09 (2.73) n=53	6.71 (3.07) n=110	7.28 (2.78) n=2,385
The GBR has historic maritime heritage (e.g., shipwrecks)	8.41 (1.83) n=58	7.75 (2.16) n=56	8.09 (2.02) n=114	7.88 (2.17) n=2,431
The GBR supports my livelihood (e.g., employment, income)	5.14 (3.39) n=42	5.56 (3.33) n=48	5.37 (3.35) n=90	5.34 (3.17) n=1,671
The GBR supports the local economy	8.51 (1.88) n=59	8.70 (1.64) n=56	8.60 (1.76) n=115	8.55 (1.87) n=2,457

Notes. The scale ranged from 1=I don't value this at all to 10=I value this extremely highly. To calculate the mean for each source, the sample varied in size because some participants selected the 'not applicable' option.

Threat susceptibility

For the following list of issues, please rate the extent to which you think they represent a threat to the GBR	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)		
	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)
Crown of thorns starfish	3.98 (0.98) n=58	3.57 (1.28) n=51	3.79 (1.15) n=109	3.94 (1.02) n=2,297
Illegal fishing practices	3.83 (1.23) n=59	3.82 (1.21) n=56	3.83 (1.22) n=115	4.08 (0.97) n=2,435
Land-based runoff	3.15 (1.30) n=59	3.02 (1.35) n=55	3.09 (1.32) n=114	3.94 (1.16) n=2,449
Climate change	3.25 (1.53) n=59	3.00 (1.44) n=55	3.13 (1.48) n=114	3.88 (1.36) n=2,445
Tourism	2.92 (1.13) n=59	3.05 (1.09) n=56	2.98 (1.11) n=115	3.02 (1.05) n=2,463
Coastal development and land clearing	3.66 (1.17) n=59	3.57 (1.22) n=56	3.62 (1.19) n=115	3.90 (1.07) n=2,449
Ports and shipping	3.37 (1.19) n=59	3.38 (1.10) n=55	3.38 (1.14) n=114	3.67 (1.08) n=2,442
Mining	3.39 (1.33) n=59	3.07 (1.30) n=55	3.24 (1.32) n=114	3.68 (1.29) n=2,397
Population growth	3.24 (1.19) n=59	3.70 (1.04) n=56	3.46 (1.14) n=115	3.56 (1.08) n=2,436
Governance	3.37 (1.43) n=57	3.73 (1.30) n=55	3.54 (1.37) n=112	3.52 (1.20) n=2,281

Notes. The scale ranged from 1=does not represent a threat at all to 5=represents an extremely serious threat. To calculate the mean for each source, the sample varied in size because some participants selected the 'I don't know' option.

Threat severity

In your opinion how problematic are each of the following issues in the GBR?	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participant (n=59)	Program participant (n=56)		
	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)
Loss of coral cover	3.37 (1.46) n=57	3.35 (1.52) n=54	3.36 (1.48) n=111	4.07 (1.13) n=2,413
Loss of mangroves	3.42 (1.51) n=57	3.40 (1.46) n=53	3.41 (1.48) n=110	3.77 (1.17) n=2,317
Loss of seagrass	3.62 (1.31) n=55	3.48 (1.35) n=46	3.55 (1.32) n=101	3.89 (1.09) n=2,214
Poor coastal water quality	3.47 (1.48) n=58	3.04 (1.47) n=55	3.26 (1.48) n=113	3.80 (1.19) n=2,386
Low abundance of fish	3.56 (1.44) n=57	3.22 (1.50) n=51	3.40 (1.47) n=108	3.83 (1.10) n=2,351
Loss of access to parts of the Reef	3.26 (1.36) n=57	3.23 (1.26) n=52	3.25 (1.31) n=109	2.88 (1.32) n=2,359

Notes. The scale ranged from 1=not a problem at all to 5=a very big problem. To calculate the mean for each source, the sample varied in size because some participants selected the 'I don't know' option.

Climate change beliefs

	2021 AGRICULTURAL WORKERS (n=115)		TOTAL AGRICULTURAL WORKERS (n=115)	2021 GBR CATCHMENT RESIDENTS (n=2,488)
	Non-program participants (n=59)	Program participants only (n=56)		
	FREQUENCY (%)	FREQUENCY (%)	FREQUENCY (%)	FREQUENCY (%)
Climate change is a threat to the GBR, requiring immediate action	23 (39.0%)	19 (33.9%)	42 (36.5%)	1,457 (58.6%)
Climate change is a threat to the GBR, but does not require immediate action	2 (3.4%)	1 (1.8%)	3 (2.6%)	137 (5.5%)
I need more evidence to form an opinion about climate change and how it may threaten the GBR	12 (20.3%)	21 (37.5%)	33 (28.7%)	528 (21.2%)
Climate change is not a threat to the GBR	9 (15.3%)	10 (17.9%)	19 (16.5%)	140 (5.6%)
I do not have a view on climate change and how it relates to the GBR	3 (5.1%)	1 (1.8%)	4 (3.5%)	80 (3.2%)
I do not believe in climate change	10 (17.0%)	4 (7.1%)	14 (12.2%)	146 (5.9%)
Total	59 (100.0%)	56 (100.0%)	115 (100.0%)	2,488 (100.0%)

References

- Antoci, A., Bonelli, L., Paglieri, F., Reggiani, T., & Sabatini, F. (2019). Civility and trust in social media. *Journal of Economic Behavior & Organization*, 160, 83-99.
- Australian Government. (2022). *Responsible Reef Practices*. Great Barrier Reef Marine Park Authority.
- Barnes, M. L., Wang, P., Cinner, J. E., Graham, N. A. J., Guerrero, A. M., Jasny, L., Lau, J., Sutcliffe, S. R., & Zamborain-Mason, J. (2020). Social determinants of adaptive and transformative responses to climate change. *Nature Climate Change*, 10(9), 823-828.
- Benham, C. (2016). Change, opportunity and grief: Understanding the complex social-ecological impacts of liquefied natural gas developments in the Australian coastal zone. *Energy Research and Social Science*, 14, 61-70.
- Bissing-Olson, M. J., Fielding, K. S., & Iyer, A. (2016). Experiences of pride, not guilt, predict pro-environmental behavior when pro-environmental descriptive norms are more positive. *Journal of Environmental Psychology*, 45, 145-153.
- Bradley, G. L., Babutsidze, Z., Chai, A., & Reser, J. P. (2020). The role of climate change risk perception, response efficacy, and psychological adaptation in pro-environmental behavior: A two nation study. *Journal of Environmental Psychology*, 68.
- Cinner, J. E., & Barnes, M. L. (2019). Social Dimensions of Resilience in Social-Ecological Systems. *One Earth*, 1(1), 51-56.
- Commonwealth of Australia. (2011). *A vulnerability assessment for the Great Barrier Reef. Seagrass*. Great Barrier Reef Marine Park Authority.
- Commonwealth of Australia. (2021). *Reef 2050 Long-Term Sustainability Plan*. Department of Agriculture, Water and the Environment.
- Cook, C. N., Mascia, M. B., Schwartz, M. W., Possingham, H. P., & Fuller, R. A. (2013). Achieving conservation science that bridges the knowledge-action boundary. *Conservation Biology*, 27, 669-678.
- Cotton, M., & Devine-Wright, P. (2011). Discourses of Energy Infrastructure Development: A Q-Method Study of Electricity Transmission Line Siting in the UK. *Environment and Planning A: Economy and Space*, 43(4), 942-960.
- Cunsolo, A., & Ellis, N. R. (2018). Ecological grief as a mental health response to climate change-related loss. *Nature Climate Change*, 8, 275-281.
- Curnock, M. I., Marshall, N. A., Thiault, L., Heron, S. F., Hoey, J., Williams, G., Taylor, B., Pert, P. L., & Goldberg, J. (2019). Shifts in tourists' sentiments and climate risk perceptions following mass coral bleaching of the Great Barrier Reef. *Nature Climate Change*, 9(7), 535-541.
- Dean, A. J., Gulliver, R. E., & Wilson, K. A. (2020). 'Taking action for the Reef?'—Australians do not connect Reef conservation with individual climate-related actions. *Conservation Letters*, 14(2).
- Devine-Wright, P. (2012). Explaining 'NIMBY' Objections to a Power Line. *Environment and Behavior*, 45(6), 761-781.
- Devine-Wright, P., & Howes, Y. (2010). Disruption to place attachment and the protection of restorative environments: A wind energy case study. *Journal of Environmental Psychology*, 30(3), 271-280.
- Dube, E., Ward, J. K., Verger, P., & MacDonald, N. E. (2021). Vaccine hesitancy, acceptance, and anti-vaccination: Trends and future prospects for public health. *Annual Review of Public Health*, 42, 175-191.
- Fitzpatrick, A., Hamlyn, B., Jouahri, S., Sullivan, S., Young, V., Busby, A., Matousek, R., Ogunshakin, S., Roberts, N., Suffield, M., & Wiginton, L. (2020). *Public attitudes to science 2019 Main report*.
- Germani, F., & Biller-Andorno, N. (2021). The anti-vaccination infodemic on social media: A behavioral analysis. *PLoS One*, 16.
- Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Gärling, T. (2003). Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology*, 23(2), 109-123.
- Hobman, E. V., Mankad, A., Carter, L., & Ruttley, C. (2022). Genetically engineered heat-resistant coral: An initial analysis of public opinion. *PLoS One*, 17(1), e0252739.
- Hornsey, M. J., Harris, E. A., & Fielding, K. S. (2018). The psychological roots of anti-vaccination attitudes: A 24-nation investigation. *Health Psychology*, 37, 307-315.
- Horton, C. C., Peterson, T. R., Banerjee, P., & Peterson, M. J. (2016). Credibility and advocacy in conservation science. *Conservation Biology*, 30(23-32).
- Huber, B., Barnidge, M., Gil de Zuniga, H., & Liu, J. (2019). Fostering public trust in science: The role of social media. *Public Underst Sci*, 28(7), 759-777.
- Irvin, R. A., & Stansbury, J. (2004). Citizen participation in decision making: Is it worth the effort? *Public Administration Review*, 64, 55-65.
- Keniger, L. E., Gaston, K. J., Irvine, K. N., & Fuller, R. A. (2013). What are the benefits of interacting with nature? *Int J Environ Res Public Health*, 10(3), 913-935.
- Korpela, K. M., Ylen, M., Tyrvaenen, L., & Silvennoinen, H. (2008). Determinants of restorative experiences in everyday favorite places. *Health Place*, 14(4), 636-652.

- Lacey, J., & Lamont, J. (2014). Using social contract to inform social licence to operate: an application in the Australian coal seam gas industry. *Journal of Cleaner Production*, 84, 831-839.
- Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology*, 31(3), 207-230.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 140, 1-55.
- López-Hoffman, L., Varady, R. G., Flessa, K. W., & Balvanera, P. (2010). Ecosystem services across borders: a framework for transboundary conservation policy. *Frontiers in Ecology and the Environment*, 8(2), 84-91.
- Maas, J., Verheij, R. A., Groenewegen, P. P., de Vries, S., & Spreeuwenberg, P. (2006). Green space, urbanity, and health: how strong is the relation? *J Epidemiol Community Health*, 60(7), 587-592.
- Mankad, A., Hobman, E. V., & Carter, L. (2021). Genetically Engineering Coral for Conservation: Psychological Correlates of Public Acceptability. *Frontiers in Marine Science*, 8.
- Marshall, N., Adger, W. N., Benham, C., Brown, K., I Curnock, M., Gurney, G. G., Marshall, P., L Pert, P., & Thiault, L. (2019). Reef Grief: investigating the relationship between place meanings and place change on the Great Barrier Reef, Australia. *Sustainability Science*, 14(3), 579-587.
- Moffat, K., & Zhang, A. (2014). The paths to social licence to operate: An integrative model explaining community acceptance of mining. *Resources Policy*, 39, 61-70.
- National Ocean Service. (2021). *How does climate change affect coral reefs?*
- Ohl, C., Lexer, W., Risnoveanu, G., Geamana, N., Beckenkamp, M., Fiorini, S., & al., e. (2008). Governing biodiversity: Procedural and distributional justice in social dilemmas. 12th Biennial Conference of the International Association for the Study of Commons 'Governing shared resources: connecting local experience to global challenges
- Ophir, Y., & Jamieson, K. H. (2021). The effects of media narratives about failures and discoveries in science on beliefs about and support for science. *Public Underst Sci*, 30(8), 1008-1023.
- Pert, P. L., Thiault, L., Curnock, M. I., Becken, S., & Claudet, J. (2020). Beauty and the reef: Evaluating the use of non-expert ratings for monitoring aesthetic values of coral reefs. *Sci Total Environ*, 730, 139156.
- Peterson, R. A. (2000). *Constructing effective questionnaires*. Sage.
- Prior, L. (2003). Belief, knowledge and expertise: The emergence of the lay expert in medical sociology. *Sociology of Health & Illness*, 25, 44-57.
- R Core Team. (2021). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing.
- Roy Morgan Research. (2020). *It's official: Internet is Australia's main source of news; TV remains most trusted*.
- Schernhammer, E., Weitzer, J., Laubichler, M. D., Birmann, B. M., Bertau, M., Zenk, L., Caniglia, G., Jager, C. C., & Steiner, G. (2022). Correlates of COVID-19 vaccine hesitancy in Austria: trust and the government. *J Public Health (Oxf)*, 44(1), e106-e116.
- Song, Z., Daryanto, A., & Soopramanien, D. (2019). Place attachment, trust and mobility: Three-way interaction effect on urban residents' environmental citizenship behaviour. *Journal of Business Research*, 105, 168-177.
- StataCorp. (2021). *Stata Statistical Software: Release 17*. In StataCorp LLC.
- Sudman, S., Bradburn, N. M., & Schwarzs, N. (1996). *Thinking about answers: The application of cognitive processes to survey methodology*. Jossey-Bass.
- Taylor, B., Vella, K., Newlands, M., Ritchie, B., Lockie, S., Lacey, J., Baresi, U., Barber, M., Siehoyono, S. L., Martin, M., Marshall, N., & Koopman, D. (2019). *Technical process and detailed findings: Stakeholder, traditional owner & community engagement assessment*.
- The State of Queensland. (2022). *Queensland Regional Profiles*.
- van der Werff, E., Steg, L., & Keizer, K. (2013). It is a moral issue: The relationship between environmental self-identity, obligation-based intrinsic motivation and pro-environmental behaviour. *Global Environmental Change*, 23(5), 1258-1265.
- van Riper, C. J., Kyle, G. T., Sutton, S. G., Barnes, M., & Sherrouse, B. C. (2012). Mapping outdoor recreationists' perceived social values for ecosystem services at Hinchinbrook Island National Park, Australia. *Applied Geography*, 35(1-2), 164-173.
- Wendelboe-Nelson, C., Kelly, S., Kennedy, M., & Cherrie, J. W. (2019). A Scoping Review Mapping Research on Green Space and Associated Mental Health Benefits. *Int J Environ Res Public Health*, 16(12).
- White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013). Coastal proximity, health and well-being: results from a longitudinal panel survey. *Health Place*, 23, 97-103.
- Witt, K., Whitton, J., & Rifkin, W. (2018). Is the gas industry a good neighbour? A comparison of UK and Australia experiences in terms of procedural fairness and distributive justice. *The Extractive Industries and Society*, 5(4), 547-556.

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