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Final Report on the Status of the Social, Cultural (Sense of place) and Economic Components for the 2019 Gladstone Harbour Report Card

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Final Report

September 2019

Prepared for the Gladstone Healthy Harbour Partnership

Gladstone Healthy Harbour Partnership

Acknowledgements

Citation

Jeremy De Valck, Megan Star and Nicole Flint, 2019. Final report on the status of the social, cultural (Sense of place) and economic components for the 2019 Gladstone Harbour Report Card. CQUniversity. Final report to the Gladstone Healthy Harbour Partnership, September 2019.

Executive Summary

The Gladstone Harbour Report Card, first piloted in 2014, represents one of the early initiatives to incorporate social, cultural and economic indicators in an aquatic health report card. The report card has been associated with pioneering new methodologies and techniques in the assessment process such as the use of Bayesian Belief Networks to combine the different measures and indicators (Pascoe et al., 2016) and the application of nonmarket valuation techniques in the economic assessment (Windle et al., 2017).

The Gladstone Harbour Report Card is produced annually and 2019 is the sixth consecutive year of reporting. The report card encapsulates environmental, social, cultural and economic objectives. The focus of this report is on the last three components.

Assessment and analysis

The report card comprises four levels of assessment. In this report, the results (scores and grades) are presented for the Social, Cultural ('Sense of place') and Economic components (level 1) along with their constituent indicator groups (level 2), indicators (level 3) and measures (level 4). Scores are classified into five grades (A-E).

Baseline data used to calculate the scores for the indicator measures, are collected from both primary and secondary sources. Primary data are collected in an annual community questionnaire survey of approximately 400 respondents (N=401 in 2019). Since 2017, mobile phone as well as land line numbers have been used to recruit respondents in the Computer Assisted Telephone Interview (CATI) survey. The practice is continued this year. In 2019, an additional 38 respondents were interviewed using an online version of the CATI survey. Secondary data are obtained from a range of regularly updated, publicly available sources.

In order to establish the relationship between the indicator groups, indicators and measures, a system of weights (derived in 2014) is applied. Each element is weighted to reflect its relative importance as a management objective. To aggregate the scores for the measures into scores for indicators, indicator groups and components, a Bayesian Belief Network (BBN) is used. This model can provide a probability of an outcome rather than a deterministic outcome. From the conditional probability distributions, a mean (expected) outcome and confidence interval can be determined. The numerical score is based on the weighted average of the A-E values in the distribution of outcomes. A separate BBN is developed for each component each year. Full methodological details are described in Pascoe et al. (2014). In 2016 an automated process of data analysis was introduced to estimate the scores and grades for the report card.

Assessment modifications

In 2019 four modifications were applied to the report card assessment based on recommendations outlined in the 2018 report (Windle et al., 2018) with more details in Section 2.

Economic indicator 'Commercial fishing'

- Net fishing missing data replaced with 3-year average from previous years.

Economic indicator 'Tourism'

- Data source for tourism expenditures in Gladstone changed this year from REMPLAN to Tourism Research Australia (see Section 2.4.1).

Economic indicator group 'Economic value (recreation)'

- 'Recreational fishing': Updated values calculated in 2018 but not used in the report cards were included this year.
- 'Beach recreation' values obtained from 2019 CATI survey and recalculated using the travel cost model technique.

All indicator groups

- 2019 CATI survey also conducted online this year. 401 responses using CATI (landlines and mobile phones) + 38 online responses = 439 responses.

Overall results

A 'snap shot' impression of the harbour is captured from the community survey respondents when they were asked to provide three words to describe the harbour (Section 3.2).

The three words that dominated were 'Fishing', 'Beautiful', and 'Industry' (same as in previous years). 'Fishing' remains dominant, followed by 'Beautiful' and 'Industry' and the associated activity of a 'Busy' industrial harbour that provides many recreational opportunities and community benefits.

The importance of fishing is incorporated into the report card in terms of the economic value of both commercial and recreational fishing. The importance of industrial activity is incorporated into the report card as an indicator in the Economic component.

Social

The overall grade for the Social component is a B (score of 0.67) which represents no change from last year but a strong improvement since 2014 (0.58) (Table E1).

Table E1: Scores for the Social component, indicator groups and indicators

Indicator Group	Social component: 2019 = 0.67 (B) 2018= 0.67 (B); 2014 = 0.58 (C)						
	Score/ Grade			Indicators	Score/ Grade		
	2019	2018	2014		**2019**	**2018**	2014
Harbour usability	**0.64 C**	0.63	0.60	Satisfaction with harbour recreational activities	0.71	0.70	0.70
				Perceptions of air and water quality	0.58	0.58	0.46
				Perceptions of harbour safety for human use	0.63	0.61	0.38
Harbour access	**0.67 B**	0.67	0.61	Satisfaction with access to the harbour	0.73	0.72	0.67
				Satisfaction with boat ramps + public spaces	0.65	0.66	0.60
				Perceptions of harbour health	0.63	0.63	0.53
				Perceptions of barriers to access	0.66	0.65	0.64
Liveability wellbeing	**0.70 B**	0.70	0.64	Liveability and wellbeing	0.70	0.70	0.64

In the last year, there has been a 1-point improvement in the score for 'Harbour usability' and no change in the scores for the 'Harbour access' and 'Liveability and wellbeing' indicator groups. Since

the 2014 baseline, there has been consistent improvement in the three indicator groups. 'Harbour access' seems to have made a sustained improvement. Changes in the scores for 'Harbour usability' have fluctuated a little more, resulting in a slightly slower improvement. The 'Liveability and wellbeing' indicator group/indicator has improved its score by 6 points since 2014, partly as a result of the inclusion of the new measure 'Aesthetic value' in 2018.

Cultural ('Sense of place')

There has been little change in the score for the indicator group over time, with a slight 1-point improvement from last year and a 2-point change from the 2014 baseline (Table E2). There are relatively small annual changes in indicator scores, but no decrease in any indicator score this year. The 'Pride in the region' and 'Well-being' indicators have recorded the largest improvements from the 2014 baseline (five and six points respectively), with the 2019 increase for 'Well-being' largely due to the 4-point improvement for the measure 'Quality of life'. Despite their score improvement from last year, the 'Place attachment' and 'Continuity' indicators continue to score lower than other indicators, partially due to a decline in the average length of residency in the area compared to 2014. By contrast, the 'Appreciation' indicator continues to generate the highest score, sending a positive signal on how residents feel about the harbour.

Residents who identify as a Traditional Owner of the area continue to have significantly higher survey rating scores for the 'Values' measures, i.e. the importance of spiritually and culturally special places as harbour values.

Table E2: Scores for the cultural 'Sense of place' indicator group and indicators

Cultural component: 2019							
Indicator Group	**Score/ Grade**			**Indicators**	**Score/ Grade**		
	2019	2018	2014		**2019**	2018	2014
Sense of place	**0.66 B**	0.65 B	0.64 C	Place attachment	**0.58**	0.56	0.55
				Continuity	**0.58**	0.53	0.57
				Pride in the region	**0.74**	0.74	0.69
				Well-being	**0.61**	0.59	0.55
				Appreciation of the harbour	**0.83**	0.83	0.80
				Values	**0.66**	0.65	0.64

Economic

The overall grade for the Economic component is a B (score of 0.73) which is a slight improvement from 0.72 in 2018 but down from 0.75 in 2014. The lower score is a result of increasing unemployment and declining socio-economic status ('Economic stimulus') associated with the end of the construction boom in Gladstone and a decline in the resources sector (Table E3). There has been no change in the score for 'Economic performance' (0.90) and little change for 'Economic value (recreation)' (from 0.74 to 0.76).

'Economic performance' continues to be dominated by 'Shipping' ($483 million) and 'Tourism' ($308 million). The economic value of recreation increased in importance with the inclusion of a fourth indicator for water-based recreation in 2018. The estimated value of recreation ($141.7 million) is

46% of the estimated value for tourism. The estimated value of recreational fishing ($26.6 million) is considerably higher than commercial fishing ($0.99 million) in the harbour.

Table E3: Scores for the Economic component, indicator groups and indicators

Economic component: 2018 = 0.73 (B) 2018 = 0.72; 2014: 0.75							
Indicator Group	**Score/ Grade**			**Indicators**	**Score/ Grade**		
	2019	2018	2014		**2019**	2018	2014
Economic performance	**0.90 A**	0.90	0.83	Shipping activity	**0.90**	0.90	0.83
				Tourism	**0.90**	0.90	0.60
				Commercial fishing	**0.36**	0.35	0.66
Economic stimulus	**0.58 C**	0.58	0.87	Employment	**0.44**	0.44	0.72
				Socio-economic status	**0.64**	0.64	0.90
Economic (recreation) value	**0.76 B**	0.74	0.75	Land-based recreation	**0.77**	0.76	0.76
				Recreational fishing	**0.71**	0.68	0.67
				Beach recreation	**0.76**	0.75	0.71
				Water-based recreation	**0.76**	0.75	na

The score for the Economic component has only changed by two points since the 2014 baseline, but the trends for the three indicator groups are quite different. 'Economic performance' has stabilised (approaching the full extent of its capacity) after continued improvement, 'Economic stimulus' remains low, and 'Economic value (recreation)' remains stable.

Since the 2014 baseline, the 'Tourism' indicator has recorded the strongest improvement (30 points) although there have been influential changes in secondary data sources. The indicators 'Employment' and 'Socio-economic status' have recorded substantial declines of 28 points and 26 points respectively.

Recommendations

There are four recommendations in this report:

1. **Weightings:** The 'Community objective weightings' ('objectivedata.csv' data file) and 'Social scientist survey weighting information' ('SIdata.csv' data file) should both be updated next year through new surveys as these still rely on data that was collected in 2014 (Pascoe et al., 2014).
2. **DEA:** The data envelopment analysis (DEA) used to produce the 'Shipping activity' scores requires revision next year as this score seems to have reached a plateau since 2017, which could be due to the frontier used to calculate this score. A frontier that progressively adjusts to export/import figures year after year could be a better option. Different options have been tested and submitted to the ISP.
3. **Land-based recreation value:** The 'Land-based recreation' indicator should be updated next year through the collection of new data in the CATI survey. This indicator still relies on a travel cost value calculated in 2014 (Pascoe et al., 2014) and should therefore be updated.
4. **CATI survey:** 8.7% of survey responses (38/439) were obtained through the Internet this year, saving survey costs, increasing the speed of data collection and matching the adoption of new technologies. A decision should be made on whether a larger proportion of Internet surveys would be preferable to the 'classic' CATI approach (landlines and mobile phones). Perhaps a 200-200 ratio of online and CATI responses could be an option.

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1. Introduction

This report provides a detailed assessment of the social, cultural (Sense of place) and economic health of the Gladstone Harbour and the scores and grades generated for the 2019 Gladstone Harbour Report Card.

The challenge of assessing and reporting socio-economic indicators in a uniform and simplistic manner has, until recently, limited their inclusion in environmental health report cards. The Gladstone Harbour Report Card, first piloted in 2014, represents one of the early initiatives to incorporate social, cultural and economic indicators in an aquatic health report card. It has been associated with pioneering new methodologies and techniques in the assessment process such as the use of Bayesian Belief Networks to combine the different measures and indicators (Pascoe et al., 2016) and the application of nonmarket valuation techniques in the economic assessment (Windle et al., 2017).

The Gladstone Harbour Report Card is produced annually and 2019 is the sixth consecutive year of reporting. The report card comprises four levels of assessment. In this report, the results (scores and grades) are presented for the Social, Cultural (Sense of place) and Economic components (level 1) along with their constituent indicator groups (level 2), indicators (level 3) and measures (level 4). Scores are classified into five (A-E) grades (Figure 1).

The indicator groups for each of the three components are outlined below, and full details of the associated indicators and measures are provided in Appendix A.

Social

- Harbour usability
- Harbour access
- Liveability and wellbeing

With 8 indicators

And 23 measures

Cultural

- Sense of Place

With 6 indicators

And 17 measures

Economic

- Economic performance
- Economic stimulus
- Economic value (recreation)

With 9 indicators

And 11 measures

1.1 Context for this report

The initial report card for Gladstone Harbour was piloted in 2014 (Pascoe et al., 2014). Methods were developed to assess the scores and grades for the measures, indicators and indicator groups for the Social, Cultural and Economic components. Small modifications have been made in subsequent annual report cards, primarily related to minor changes associated with the secondary data sources in the Economic component and a lack of consistently available data. In 2014 and 2015, 'Sense of place' was the only indicator group assessed for the Cultural component. Since 2016, 'Indigenous cultural heritage' has been included as a second indicator group in the Cultural component with the assessment managed as a separate project. In 2018, that separate project automated the generation of indicator scores and grades for the cultural component (De Valck, 2018). Here, however, and as in previous years, only the 'Sense of place' assessment is undertaken.

The current project is designed to collect the necessary data to populate the 2019 report card applying the same previously determined methodology (Pascoe et al., 2014). The project team collected the baseline data to provide the scores for all measures. The process of assigning scores and combining the measures, indicators and indicator groups to determine the final grades is now

fully automated. The data is managed through the Gladstone Healthy Harbour Partnership's Data and Information Management System (DIMS).

Apart from the amendments documented in the methodology section, there are no changes to the data sources or methodology compared to those applied last year to produce the 2018 report card (Windle et al., 2018).

1.2 Aims and objectives

The aim of this project is to collect details and provide information for the 2019 Gladstone Harbour Report Card and more specifically to:

1. Generate report card grades and scores for the Social, Cultural ('Sense of place') and Economic components of the report card. Previously documented methods outlined in the 2014 report card (Pascoe et al., 2014) are to be followed.
2. Provide an interpretation of the results and comment on any trends and changes compared with the results from the baseline 2013-2014 reporting year.
   a. There was a construction boom in the baseline period and a comparison with the previous reporting year (2017-2018) will also be made to identify more recent changes in the post construction phase of harbour development.
3. Outline any recommendations for changes in methodology and data collection for application in future report cards.

1.3 Background

The Gladstone Healthy Harbour Partnership (GHHP) was established with the aim of improving the environmental management and to provide scientific knowledge to support decision-making rationales (McIntosh et al., 2014). GHHP, along with its research partners, fund the production of an annual report card to guide and assist environmental management and decision-making. The report card captures not only the bio-physical aspects of the Gladstone Harbour but also social, cultural and economic aspects. This project (reporting on the social, cultural and economic aspects) is a part of a coordinated approach led by GHHP. All the projects are designed to provide sound scientific basis for the ongoing provision of a GHHP report card to the Gladstone community, industry stakeholders and all other interested parties. Similarly, all projects are guided by the objectives identified by GHHP. These objectives were developed from the information provided by stakeholders and GHHP at collaborative workshops in 2013 and are outlined in Box 1.

Box 1: Objectives identified by GHHP

Economic objectives

- The Gladstone Harbour is managed to support shipping, transport and a diversity of industries.
- Economic activity in the Gladstone Harbour continues to generate social and economic benefits to the regional community.

Social objectives

- Maintain (relative to an agreed reference point) or improve easy access to the harbour waters and foreshore for recreation and community uses.
- Maintain (relative to an agreed reference point) or improve a safe harbour for all users (e.g. swimming, boating and foreshore activities).

Cultural objectives

- The Gladstone community's sense of identity and satisfaction with the condition of the harbour is increased.
- Registered cultural heritage sites associated with the harbour and waterways are protected.

Environmental objectives

- Maintain/improve habitat function and structure of key ecosystems.
- Maintain/improve connectivity of water within and between Gladstone Harbour, related rivers, estuaries and adjacent waters.
- Maintain sustainable populations of fauna species reliant on the harbour and waterways.
- Maintain water and sediment quality at levels compliant with the appropriate guidelines.

The GHHP report card grading system is depicted below. In this report, scores are reported for all levels of aggregation (component, indicator group, indicator and measure). Corresponding grades are either reported directly or can be inferred from colour codes in the relevant tables.

A	Very good (0.85 – 1.00)
B	Good (0.65 – 0.84)
C	Satisfactory (0.50 – 0.64)
D	Poor (0.25 – 0.49)
E	Very poor (0.00 – 0.24)

Figure 1: The grading scale used in the Gladstone Harbour report card

2. Methods

The GHHP vision includes detailed statements relating to environmental, social, cultural and economic aspects of the health of Gladstone Harbour. The vision was used to determine the indicators for the Gladstone Harbour Report Card and was developed by the local Gladstone community, including: Traditional Owners, community members, government, research organisations, conservation groups, recreational and commercial fishers and industry. A series of candidate indicators to assess the socio-economic health of the harbour was suggested by the GHHP Independent Science Panel (ISP) in 2014 (McIntosh et al., 2014).

The appropriate measures to evaluate these candidate indicators were identified in the 2014 pilot report card (Pascoe et al., 2014) with some minor modifications in subsequent reports. Data have been collected from both primary (community questionnaire survey) and secondary sources. In 2019, the same data sources described in the 2018 report are applied. Some amendments to indicator assessment are applied in 2019, based on the 2018 recommendations (Windle et al., 2018), with details outlined below.

Detailed explanations of the methods applied to calculate the report card scores and grades have been provided for the 2014 report card (Pascoe et al., 2014) and the same methods are repeated in 2019 with only a summary overview provided for reference.

2.1 Indicator measures, data sources and report card scores

Full details of the indicators, measures, data sources and baseline data used for the social, cultural and economic indicator groups are outlined in Table 1, Table 2, and Table 3 respectively. Modifications in data analysis implemented in 2019 are detailed in Table 4.

The baseline data for all social indicator measures, except for 'Marine safety incidents' and 'Oil spills' (secondary data sources), and the cultural 'Sense of place' indicator measures are collected through a CATI (computer assisted telephone interview) community survey. This year, the community survey was also conducted online for a fraction of the respondents (CATI: N=401, Online: N=38). Survey responses are recorded on a 1 – 10 scale such as 1 = strongly disagree to 10 = strongly agree. This readily translates into a 0 to 1 index for the report card score. However, the report card scores are derived from the distribution of responses (weighted average) across the A-E grades and differ from the mean scores that are reported in the results from the survey. For example in 2014, the 'Sense of Place' indicator measure 'Gladstone Harbour is a key part of the Gladstone community' received a score of 0.79 based on a 59% likelihood that it would score an A, a 31% likelihood it would score a B, 6% likelihood it would score a C and, a 3% and 1% chance of a D and E respectively (Pascoe et al., 2014: Figure 82). The mean score from the CATI survey was 8.53 (Pascoe et al., 2014: Figure 18).

The baseline data for all economic indicator measures utilise secondary data sources apart from the indicator group 'Economic (recreation) value' where information is collected in the CATI survey. A formalised modelling approach (capacity utilisation) is applied to calculate the scores for the main measures in the 'Economic performance' indicator group. In each case, a score between 0 and 1 is produced and the same proportional allocation to grades is made as for the survey derived data. Details are provided in Pascoe et al. (2014).

2.1.1 Defining benchmarks

An assessment of performance requires measurement against some benchmark or reference level and different approaches are applied. The data from the CATI survey do not have an inbuilt reference point and the benchmark for comparison is with the baseline (first) year of reporting (2014).

A range of different inbuilt benchmarks are applied for much of the secondary data, depending on the availability and form of the data. In most cases, the data are compared to similar data for other regions or time periods. Where time series data is available a 10-year moving average is applied.

While a benchmark is designed to provide a stable basis for comparison, some benchmarks may be more fluid such as applying a 10-year moving average. People's perceptions are also known to be subject to 'shifting' benchmarks as perceptions of what is considered 'normal' change over time. For example, as more people use the harbour, overcrowding may become a problem, but over time higher levels of activity become more normal and therefore the problem may be perceived differently.

Table 1: Social component: Indicator groups, indicators, measures and data sources

Indicator Groups	Indicators	Measures	Data Source	Baseline data
Harbour usability	Satisfaction with harbour recreational activities	How satisfied with last trip	CATI Survey (avg: Questions: Q11b, Q12b1, Q15b, Q25)	10-point scale
		Quality of ramps and facilities	CATI Survey (avg: Q28, Q28a)	10-point scale
	Air and water quality	Water quality satisfaction	CATI Survey (Q40)	10-point scale
		Air quality satisfaction	CATI Survey (Q41)	10-point scale
		Water quality does not affect use of the harbour	CATI Survey (Q42)	10-point scale
	Harbour safety	Marine safety incidents	*Marine incidents in Queensland 2018* Department of Transport & Main Roads, Maritime Safety Queensland	Data 2009-2018 (calendar year). Rate of incidents in Gladstone maritime region compared to other Qld regions
		Oil spills	Queensland Dept. Transport and Main Roads, *Maritime Safety Queensland Branch, 2017-2018 and 2018-2019*	Data 2009-2018 (calendar year). Rate of incidents in Gladstone maritime region compared to other Qld regions
		Safe at night	CATI Survey (Q44)	10-point scale
		Happy to eat seafood	CATI Survey (Q43)	10-point scale
Harbour access	Satisfaction with access to the harbour	Fair access to harbour	CATI Survey (Q29)	10-point scale
	Satisfaction with ramps and public spaces	Frequency of use	CATI Survey (Q8)	10-point scale
		Number of ramps	CATI Survey (Q27)	10-point scale
		Access to public spaces	CATI Survey (Q26)	10-point scale
	Perceptions of harbour health	Great condition	CATI Survey (Q33)	10-point scale
		Optimistic about future health	CATI Survey (Q34)	10-point scale
		Improved over the last 12 months	CATI Survey (Q35)	10-point scale
	Barriers to access	Marine debris a problem	CATI Survey (Q36)	10-point scale
		Marine debris affects access	CATI Survey (Q37)	10-point scale
		Shipping reduced use	CATI Survey (Q31)	10-point scale
		Recreational boats reduced use	CATI Survey (Q32)	10-point scale
Liveability and wellbeing	Contribution of harbour to liveability and wellbeing	Makes living in Gladstone a better experience	CATI Survey (Q45)	10-point scale
		Participate in community events	CATI Survey (Q46)	10-point scale
		Aesthetic value	CATI Survey (Q45a, Q45b))	10-point scale

Table 2: Cultural component: Indicator groups, indicators, measures and data sources

Indicator Group	Indicators	Measures	Data source	Baseline data
Sense of Place	Place attachment	No place better	CATI survey (Q30)	10-point scale
		Who I am	CATI survey (Q51)	10-point scale
	Continuity	How long lived in the area	CATI survey (Q3)	10-point scale
		Stay in area five years?	CATI survey (Q53)	10-point scale
	Pride in the region	Proud living in the area	CATI survey (Q50)	10-point scale
	Well-being	Quality of life	CATI survey (Q52)	10-point scale
		Input into management	CATI survey (Q47)	10-point scale
	Appreciation of the Harbour	Key part of the community	CATI survey (Q54)	10-point scale
		Great asset to the region	CATI survey (Q58)	10-point scale
		Great asset to Queensland	CATI survey (Q59)	10-point scale
	Values	Variety of marine life	CATI survey (Q55)	10-point scale
		Opportunities for outdoor recreation	CATI survey (Q56)	10-point scale
		Affects visitors to the region	CATI survey (Q57)	10-point scale
		Enjoy scenery and sights	CATI survey (Q60)	10-point scale
		Spiritually special places	CATI survey (Q61)	10-point scale
		Culturally special places	CATI survey (Q62)	10-point scale
		Historical significance	CATI survey (Q63)	10-point scale

Table 3: Economic component: Indicator groups, indicators, measures and data sources

Indicator group	Indicator	Measure	Data source	Baseline data
Economic Performance	Shipping activity	Shipping activity productivity calculated from monthly shipping movements by cargo type (2018-19 financial year)	Gladstone Ports Corporation (GPC)	Time series data from 2009-10 to 2018-2019
	Tourism expenditure	Gladstone region's total tourism expenditure output (2017-18 financial year)	Tourism Research Australia's information at the LGA level (Gladstone): https://www.tra.gov.au/Region al/local-government-area-profiles.	10-year average 2008-09 to 2017-18
	Commercial fishing	Productivity of net fisheries	**Production (fishing effort)** Queensland Fishing (QFish), Queensland Department of Agriculture and Fisheries **Prices (fish, prawns & crabs)** ABARES – Australian fisheries and aquaculture statistics 2017 (published Dec 2018)	10-year average (time series data from 2009-10 to 2018-19
		Productivity of trawl (otter) fisheries		
		Productivity of pot fisheries		
Economic stimulus	Employment	Gladstone LGA unemployment data (2019 March quarter)	Australian Department of Employment, *Small Area Labour Markets*	Queensland 2019 distribution (March quarter)
	Socio-economic status	Index of economic resources derived from 2016 ABS census and updated using the community CATI survey	CATI survey; Australian Bureau of Statistics, 2016 census + ABS (2018)	Australian 2016 distribution
Economic value (Recreation)	Land-based recreation	Land-based recreation satisfaction + economic value	*Satisfaction*: CATI survey + economic value (Pascoe et al. 2014)	10-point scale
	Recreational fishing	Recreational fishing satisfaction + economic value	Satisfaction: CATI survey + 2018 updated economic value (Cannard et al., 2015; Windle et al., 2018)	10-point scale
	Beach recreation	Beach recreation satisfaction + economic value	Satisfaction: CATI survey + 2019 updated economic value	10-point scale
	Water-based recreation	Water-based recreation satisfaction + economic value	Satisfaction: CATI survey + economic value (Windle et al. 2017)	10-point scale

Table 4: Details of 2019 modifications to data analysis

Assessment criteria	Action	Rationale	Impact
Economic performance Indicator: Commercial fishing **Measure: Net fishing**	Missing values for grid area R29 (Rockhampton/Yeppoon) replaced with 3-year average based on prior years.	Risk of data bias. Recommendation from 2018 report.	**Low.** No perceived impact. Measure scored 0.25 as last year. However, the 2018-19 GVP for commercial fisheries in Gladstone was worth $0.99 million down from $1.64 million in 2017-18
Economic performance Indicator: Tourism **Measure: Tourism expenditure**	Data source was changed this year. See Section 2.4.1 for details.	Original data source became unavailable in 2018. Recommendation from 2018 report.	**Low**. Tourism expenditure was worth $308 million (2017-18), down from $341 million in 2016-17. However, the tourism score remained unchanged from last year (0.90).
Economic value (recreation) **Indicator/measure: Recreational fishing**	Updated values calculated in 2018 but not used in the report cards were included this year.	Recommendation from 2018 report.	**Medium/low:** Score for 'Recreational fishing' improved by 3 points from 2018 (0.68 to 0.71).
Economic value (recreation) **Indicator/measure: Beach recreation**	Beach recreation values obtained from 2019 CATI survey and recalculated using the travel cost model technique.	Recommendation from 2014 report. Values should ideally be updated every 5 years.	**Low:** Score for 'Beach recreation' improved by 1 point from 2018 (0.75 to 0.76).
All indicator groups	2019 CATI survey also conducted online this year. 401 responses using CATI (landlines and mobile phones) + 38 online responses = 439 responses.	Evolution of communication technologies and difficulty to reach desired survey response numbers solely from standard CATI. Reduction of survey costs.	**Medium/low:** The 8.7% of online responses did not seem to have a significant impact on the final scores as little changes were observed, but an increased proportion could possibly impact scores further. Further tests are needed.

2.2 Weightings and aggregation for indicator groups, indicators and measures

Combining the different elements within a grouping requires some assumption about the relative importance of those elements. In this project it is assumed that the importance of elements varies, and a system of weightings is applied in the aggregation process. Each element is weighted to reflect its relative importance as a management objective. This means each measure is weighted and the weighting combinations of measures are unique to each indicator. It is the combination of the measures for each indicator that reflects the grade and not an average of the measure scores. The same applies in terms of weightings for the elements at other higher levels of aggregation.

The relative weights were derived from the opinions of both the community and experts with information collected in 2014 (Pascoe et al., 2014). The opinions of the two groups were very similar. Three different surveys were conducted with:

- Management experts (those with a management or industry role) (n=31): respondents provided weightings for the different **indicator groups** in all three components

- Community members (n=83): respondents provided weightings for the different **indicator groups** in all three components

- Technical experts (marine or coastal-social scientists) (n=19): respondents provided weightings for the **social and cultural indicator groups, indicators and measures**.

Note: It is recommended that new community and expert surveys be carried out next year to update these weightings (see Recommendation 1, Section 5.1).

Three commonly used approaches to determine weights were trialled: simple ranking approaches, scoring based approaches and the Analytic Hierarchy Process based on a series of pair-wise comparisons. The weights derived from the scoring approach were applied as they had the lowest variance (Pascoe et al., 2014).

In the Economic component, no external information was collected to inform the weightings for the economic indicators/measures. Weights were determined through a combination of impact weighting and subjective (expert) assessment for the indicator groups.

To aggregate the scores for the measures into indicator scores, indicator groups and components, a Bayesian Belief Network (BBN) approach is applied. This model can provide the probability of an outcome rather than a deterministic outcome. From the conditional probability distributions, a mean (expected) outcome and confidence interval can be determined. In other words, a score is not estimated and then a weighting applied as in a deterministic approach. The numerical score for the report card is based on the weighted average of the A-E values in the distribution of outcomes. For example, in 2014 the 'Sense of place' cultural indicator group scored 0.64 based on a 2.1% probability it would score an A, a 67.7% likelihood that it would score a B, a 29.5% likelihood it would score a C, and a 0.7% chance of a D (Pascoe et al., 2014: Figure 82).

This means that a table of the specific weights applied cannot be produced and the conditional probability tables are too unwieldly to report as there are A^x rows associated with each level of aggregation, where A represents the number of grades (5) and x represent the number of elements. For example, the probability tables for the indicator groups in both the Social and Economic components would comprise of 125 rows as each has five grades and three elements (indicator groups).

2.3 Primary data collection

Primary data are collected directly from the Gladstone community in an annual questionnaire survey. In 2019, the CATI survey was conducted with residents in the month of June and 401 responses were collected. An additional 38 responses were collected using an online version of the same survey. This online survey relied on a community database of citizens local to Gladstone (N=153 usable emails) who had registered their interest to be contacted for surveys related to Gladstone. This database was obtained from the GHHP Independent Science Panel (ISP). There were no notable events that may have influenced the opinions of respondents during the survey period. The survey included questions related to the GHHP social, cultural and economic objectives which were designed to be answered on a 10-point agree-disagree (Likert) scale to produce quantifiable results.

Information collected in the CATI survey is primarily applied to calculate the baseline scores for the social indicator measures (apart from two measures of harbour safety), and cultural ('Sense of place') measures. Some additional information is collected and applied to assess economic indicators relating to recreation values and socio-economic status (see Table 3).

2.4 Secondary data sources

In the Economic component of the report card, secondary data sources are applied to assess the scores for the indicators in the 'Economic performance' and 'Economic stimulus' indicator groups. Information is also collected about some harbour safety measures ('Marine safety incidents' and 'Oil spills') in the Social component. Details are outlined in Table 1 and Table 3.

2.4.1 Economic performance

The 'Economic performance' indicator group consists of three indicators ('Shipping activity', 'Tourism' and 'Commercial fishing'), which represent the key industries using the harbour. The relative contributions to revenue share across the three activities are applied as impact weightings.

Shipping

Data on monthly shipping movements by cargo type is sourced from the Gladstone Ports Corporation and a 10-year data array is analysed. A capacity utilisation approach (current level of activity relative to potential level of activity) is applied and the report card score is estimated through data envelopment analysis with details provided in Pascoe et al. (2014).

Tourism

Tourism expenditure is applied as a measure for the 'Tourism' indicator. A standard 10-year data array is used in the analysis. The measures are based on the most recent year's tourism expenditure (2018) as compared to the average over the previous 10-year period (2009-18). In previous years, tourism expenditure values were obtained from information provided on the Gladstone Regional Council website (http//www.economicprofile.com.au/Gladstone/tourism/output) because the Gladstone Regional Council used statistics from the REMPLAN consultancy group on their website. However, they have stopped using this service in 2018, so another source of information needed to be found.

The new source of information used this year is Tourism Research Australia's information at the Local Government Area level and selected for Gladstone: https://www.tra.gov.au/Regional/local-government-area-profiles. The latest information available is dated from 2017 and was updated on 29/08/2018 at the time the website was accessed this year (08/07/2019).

Commercial fishing

The assessment for 'Commercial fishing' is based on both reported catch data (kg) and fishing effort (# licences and # days fished). Data are sourced from the QFish database through the Queensland Department of Agriculture and Fisheries. Information is applied from three fisheries sectors: net (fish), otter trawl (prawn) and pot (mud crab), with each assessed as a separate measure for the indicator. A standard 10-year data array is analysed with production data updated for 2018-19. Additional information about the average price for fish, prawns and crabs is derived from ABARES fisheries statistics, with updated information for 2017 sourced from Mobsby (2018: p. 56, Table S9).

Production data are collected primarily from Grid area S30 which covers Gladstone Harbour and the open coastal waters immediately adjacent to the harbour. However, the harbour area only captures part of the total activity of the Gladstone commercial fishing fleet and information is also included

from the waters adjacent to Mackay (grid area 025) and Rockhampton/Yeppoon (grid area R29). Including these areas helps control for spatial differences in catch across years as they provide more balanced information on fishing productivity in that region.

A capacity utilisation approach is applied, and the measures of relative productivity are estimated using data envelopment analysis.

The three different fisheries/measures are weighted by their relative contribution to the gross value of production (GVP). It must be noted that an ongoing issue of incomplete data in the QFish records has been observed since 2017. Information applied for analysis relates to the financial year for which, at the time of reporting (July), QFish records for the last three months (April–June) are generally unavailable (as they were for the 2017 and 2018 reports). However, a similar data structure has been used each year since 2014 so results are comparable across years. The data update was completed as late as possible this year (22/07/2019) to ensure that the scores were based on most up to date QFish records available.

One issue in previous editions of the GHHP report cards was the conversion of missing values to zeros, which introduced a bias in fish catch values. Following the '2018 Recommendation 3', missing values were replaced this year with the average value corresponding to the three previous years. As missing values were observed for Rockhampton/Yeppoon (grid area R29), this change was only made there.

2.4.2 Economic stimulus

The 'Economic stimulus' indicator group consists of two indicators: 'Employment' and 'Socio-economic status'.

The score for 'Employment' is based on unemployment statistics for the Gladstone Local Government Area (LGA) provided by the Australian Bureau of Statistics (ABS) via the Queensland Government Statistician's Office. The most recent data available for this report are for the March 2019 quarter (Queensland Government, 2019). Unemployment in the Gladstone LGA is compared with unemployment rates in all Queensland LGAs.

The score for 'Socio-economic status' is derived using an economic measure known as the Index of Economic Resources (IER) which is a composite measure of the economic wellbeing of a community focusing on variables such as income, housing expenditure and ownership, cost of living and assets of households.

The 'Socio-economic status' indicator is afforded a slightly higher weighting than Employment (55:45) as it includes more variables.

Index of Economic Resources (IER)

The IER is formally calculated by the ABS using a system of weightings applied to the 14 nominated variables. The index is adjusted for the Gladstone region, and updated annually, by applying information collected in the CATI survey. In all previous report cards, the IER for Gladstone has been based on the ABS weightings established from 2011 census data.

In 2018, the ABS released the updated loadings and descriptions for the composite variables based on the 2016 Census data (Table 5) which have now been applied to estimate the IER for Gladstone in 2019. The relative decline in socio-economic status in Gladstone between the 2011 census and 2016 census is evident. The ABS estimated the IER score for Gladstone from the 2011 census data as 1040 which placed it in the 9th decile in the distribution of LGAs in Australia. In 2016, the IER was estimated at 994, placing it in the 7th decile (ABS Catalogue No. 2033.0.55.001).

Table 5: 2016 Census revised IER variable descriptions and loadings

Variable	2011 Variable description *Source*: Pink 2013	2011 Loading	2016 Variable *Source*: ABS 2018	2016 Loading
INC_LOW	% People with stated annual household equivalised income between $1 and $20,799 (approx. 1st and 2nd deciles) (disadvantage)	-0.79	income between $1 and $25,999	-0.77
INC_HIGH	% People with stated annual household equivalised income greater than $52,000 (approx. 9th and 10th deciles) (advantage)	0.63	income greater than $78,000	0.55
UNEMP_RATIO	% People aged 15 and over who are unemployed (dis)	0.57	same	0.54
UNINCORP	% Occupied private dwellings with at least one person who is an owner of an unincorporated enterprise (adv)	0.49	same	0.52
OWNING	% Occupied private dwellings owning the dwelling they occupy (without a mortgage) (adv)	0.33	same	0.36
MORTGAGE	% Occupied private dwellings owning the dwelling they occupy (with a mortgage) (adv)	0.66	same	0.67
HIGHMORTGAGE	% Occupied private dwellings paying more than $2,800 per month in mortgage repayments (adv)	0.67	same	0.68
LOWRENT	% Occupied private dwellings paying less than $166 per week in rent (excluding $0 per week) (dis)	-0.72	rent less than $215 per week	-0.72
GROUP	% Occupied private dwellings who are group occupied private dwellings	-0.31	same	-0.37
LONE	% Occupied private dwellings who are lone person occupied private dwellings	-0.66	same	0.66
OVERCROWD	% Occupied private dwellings requiring one or more extra bedrooms (based on Canadian National Occupancy Standard)	-0.54	same	-0.51
HIGHBED	% Occupied private dwellings with four or more bedrooms (adv)	0.74	same	0.74
ONEPARENT	% Families that are one parent families with dependent offspring only (dis)	-0.66	same	-0.63
NOCAR	% Occupied private dwellings with no cars (dis)	-0.77	same	-0.73

2.4.3 Harbour usability

The social indicator 'Perceptions of harbour safety for human use' ('Harbour usability' group) includes two measures ('Marine safety incidents' and 'Oil spills') which are assessed from secondary data sourced from Queensland Department of Transport and Main Roads. In the initial 2014 pilot report, the number of both domestic and commercial vessels were combined to determine the incident rate. However, new regulations have meant jurisdictional changes and since 2014

Queensland reporting only includes information on *Queensland regulated ships* (99.8 % recreational vessels) and not commercial vessels.

2.5 Valuation of recreational activity

One of the three economic indicator groups to be assessed in the GHHP report card is 'Economic value (recreation)'. There are two components of value that can be assessed. The first is the commercial value of recreation and tourism, with both direct use and indirect use values. These values can be determined from financial records of commercial tourist operators and are assessed as part of the 'Economic performance' indicator ('Tourism expenditure'). The second type of recreation value is classified as non-market value. This is the value associated with local residents who use the harbour area for recreational purposes, but their activity is not reflected in the financial records of commercial service providers. Economists refer to this as non-market value because they are not captured in formal market estimates. Non-market values for recreation comprise both use and non-use values. The latter relates to economic values held by people who might not currently use the harbour for recreation but might wish to do so in the future or they might value the fact that other people can use it.

A section of the CATI survey focuses on collecting information to estimate the non-market values of recreation. While it is possible to assess both use and non-use recreation values in a community survey, practical limitations restricted the focus to use values only. The Travel Cost Method (TCM) was applied as the valuation format, with full details provided in Pascoe et al. (2014).

Four types of recreational activities are assessed and based on recommendations in the 2014 pilot report card (Pascoe et al., 2014), the recreational trip values only require updating every five years. In 2014, the economic value of a recreational trip was estimated for beach recreation ($40 per trip) and other land-based recreation ($61 per trip). In 2015, supplementary information was collected to provide a value estimate for recreational fishing ($143 per trip). In 2017, information was collected to provide a value estimate for other (non-fishing) water-based recreation ($95 per trip). In 2019, information was collected to update beach recreation values.

Two factors are included in the calculation of the report card score for each of the four recreational activity indicators: the economic value of the recreational activity and the quality of the recreational experience. The value of a recreational trip has been established and the economic value of the activity is updated annually based on changes in participation frequency rates (collected in the CATI survey). Details about trip satisfaction for the four types of activity are also collected in the CATI survey.

The scores for the four types of recreational activities are based on the satisfaction ratings for each activity which are then weighted by their relative contribution to the economic value of recreation (value of a recreation trip multiplied by the participation frequency rate).

2.6 Reporting zones

The Gladstone Local Government area (LGA) was used as the broader geographic scope for the collection of social, cultural and economic data. However, slightly different geographic boundaries within the broader Gladstone LGA were used for some primary and secondary data as outlined below.

- **Shipping data**: is limited to the Port of Gladstone.

- **Commercial fishing data**: involves the Gladstone Harbour area (Grid S30) and the nearby open coastal waters of Mackay (Grid O25) and Rockhampton/Yeppoon (Grid R29).

- **Marine safety incidents and oil spills data:** relates to the Gladstone maritime region which includes 1868 km of mainland coastline from Double Island Point to St. Lawrence, 1342 km of island coastline and 26,190 km of inland waterways[1]. This region incorporates the Port of Gladstone, Port Alma, Port of Bundaberg and marinas in Hervey Bay, Bundaberg and Rosslyn Bay.
- **CATI survey:** the community survey is only administered to residents within the Gladstone Postal area (4680). A map to illustrate the geographical area covered by the survey is provided in Figure 2.
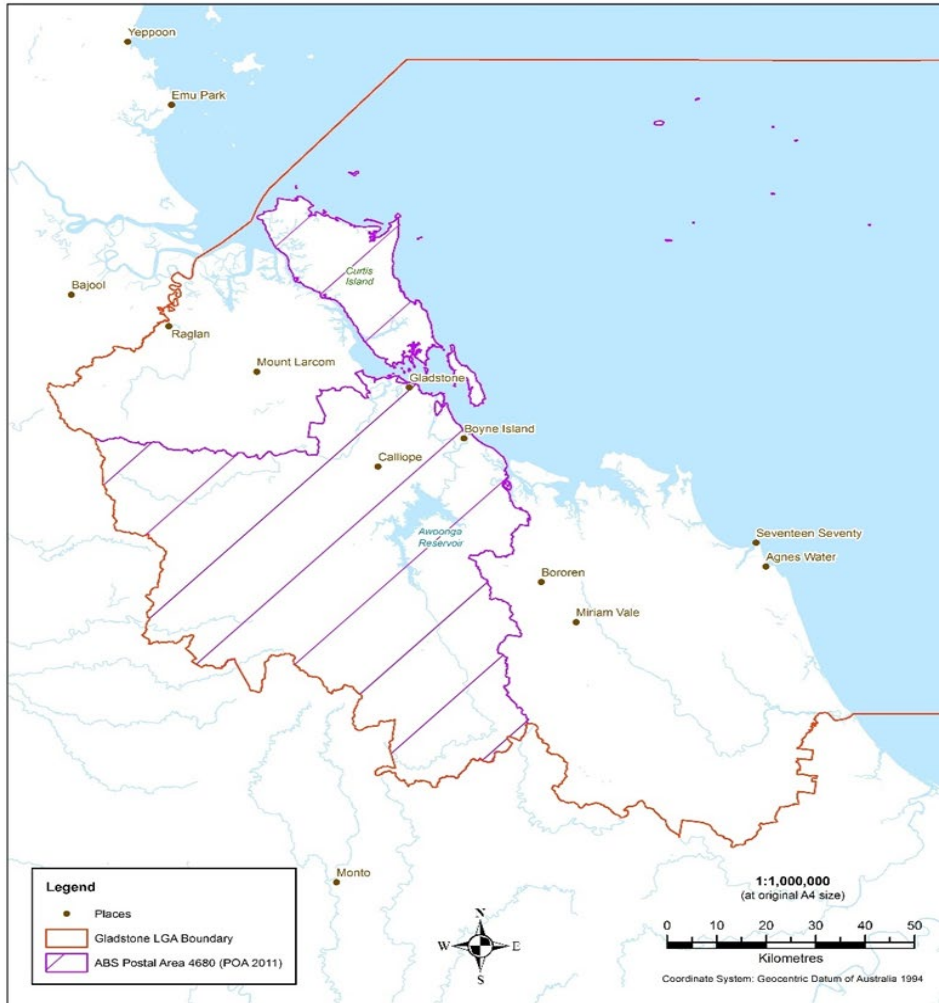
Figure 2: Gladstone Local Government area and Gladstone postal area (Source: Map courtesy of Peter Smith, Fitzroy Basin Association as presented in Cannard et al., 2015).

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[1] Qld Dept. Transport and Main Roads (2013) Queensland's Maritime Regions, December 2013

3. Results

The results for this project are presented in the following subsections. Initially, a demographic overview of the CATI survey respondents is provided before displaying the outcomes of the word cloud analysis. Subsection three presents a summary of recreational activity and valuation update, while the remaining sections address the specific results of the Social, Cultural and Economic components.

3.1 Key demographics of the CATI community survey respondents

A total of 439 responses were collected in June for the 2019 CATI survey (CATI: N=401, Online: N=38). The small fraction (8.7%) of online responses were part of an experiment conducted with the ISP to explore an increased use of Internet-based surveys in the future to ease data collection and match technological changes. CATI respondents were recruited through mobile phones (65.8%) and landlines (34.2%) based on their postcode. Overall, the distribution of respondents adequately matches the target population. The data collection process is adjusted multiple times to meet this constraint as much as possible. Nevertheless, some slight divergences are observed: over-representation of highly educated people, which is common for such surveys. The younger age groups (18 to 34 yrs) are a little underrepresented this year, which confirms the need to turn towards modern technologies for data collection. Unsurprisingly, the 38 responses obtained through the online version of the survey diverge a little more from the target population..

The community database that was used to obtain these online responses contained 182 email addresses, of which only 153 were usable. Several rounds of reminders were sent to obtain more responses. Fifty respondents participated in the survey (33%) and 76% of them (N=38) completed the entire survey, taking 17 minutes on average. For the CATI survey, a total of 7,606 people were contacted, of whom only 5% (N=401) completed the survey. CATI respondents took 21 minutes on average to complete the survey. The superior response rate for the online survey (38/153=24.8%) confirms that this option has several advantages for future report cards. Web-based data collection is cheaper and faster than standard CATI surveys, and it relies on a technology that allows reaching a wider age spectrum.

Table 6: Demographic details of survey respondents and comparison with previous years

% respondents	Online survey 2019 (N=38)	CATI only 2019 (N=401)	CATI survey (full sample) 2019 (N=439)	CATI survey 2018 (N=400)	ABS Census (2016)
Gender					
% male	31.6%	50.1%	48.5%	50%	51%
Age category					
18-24 yrs	7.9%	3.7%	4.1%	7.0%	11%
25-34 yrs	7.9%	14.2%	13.7%	18.8%	19%
35-44 yrs	31.6%	19.7%	20.7%	20.5%	20%
45-54 yrs	21.0%	23.9%	23.7%	22.5%	21%
55-64 yrs	13.2%	22.2%	21.4%	21.3%	16%
65+ yrs	18.4%	16.2%	16.4%	10.0%	13%
Annual household income					
Less than $25,999	5.7%	11.1%	10.7%	9.8%	8%
$26,000 – $51,999	14.3%	14.0%	14.0%	12.2%	18%
$52,000 – $77,999	11.4%	11.6%	11.6%	12.7%	14%

$78,000 – $103,999	20.0%	15.3%	15.7%	17.6%	12%
$104,000 – $129,999	2.9%	13.0%	12.1%	15.5%	15%
$130,000 – $181,999	25.7%	17.2%	17.9%	16.6%	17%
Greater than $182,000	20.0%	17.7%	17.9%	15.5%	16%
Education					
Post school qualification	89.5%	65.8%	67.9%	53%	56%
Tertiary level	68.4%	25.4%	29.1%	24%	14%

Most survey respondents were long term residents and had lived in the area for an average of 24.6 years, against 20.3 years in 2018. The median length of residency in 2019 was 22 years (17.2 years in 2018). The residency profile of respondents continues to change compared to the 2014 baseline (Figure 3) and may in part be related to the increased representation of younger residents in survey responses.
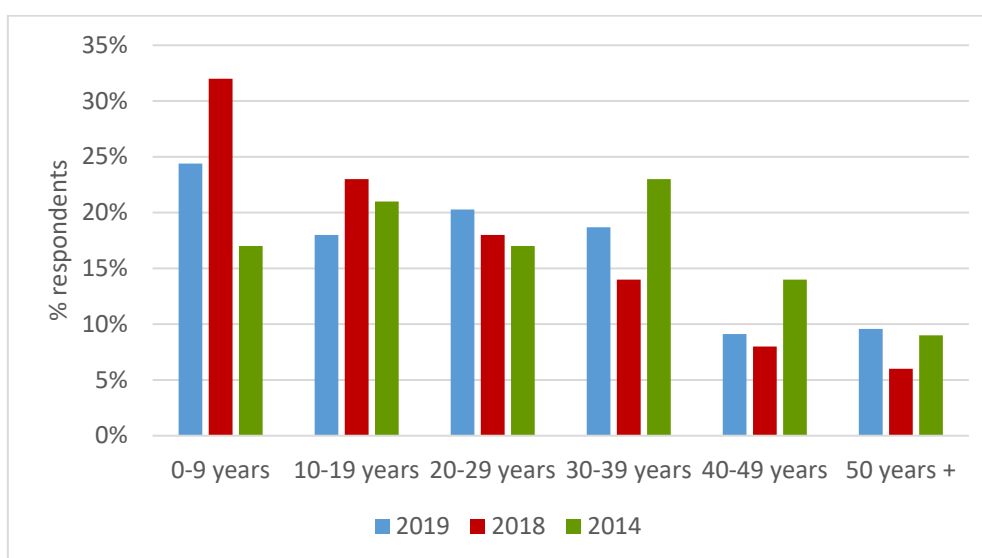
Figure 3: Length of residency in the Gladstone region

Most respondents own their homes without a mortgage (35.5%) or with a mortgage (41.9%), while 22.6% are renting. The proportion of rentals is smaller than in 2018 (30%), aligns with 2017 (22%) and has increased relative to 2014 (14%).

About 8.7% of participants identified themselves as Traditional Owners of the area which is a decline from 10.2% last year but still higher than the population of 4% Indigenous residents (ABS 2016 Census).

Usage of the harbour for recreation remains very high and the proportion of recreational visits has increased substantially (from 86% in 2018 to 94% in 2019). Boat ownership (35% in 2019) has increased since 2018 (30%) and aligns well with the 2014 baseline (36%). Interestingly, the use of boat ramps has substantially increased, from 41% in 2018 to 51% in 2019 (Figure 4).
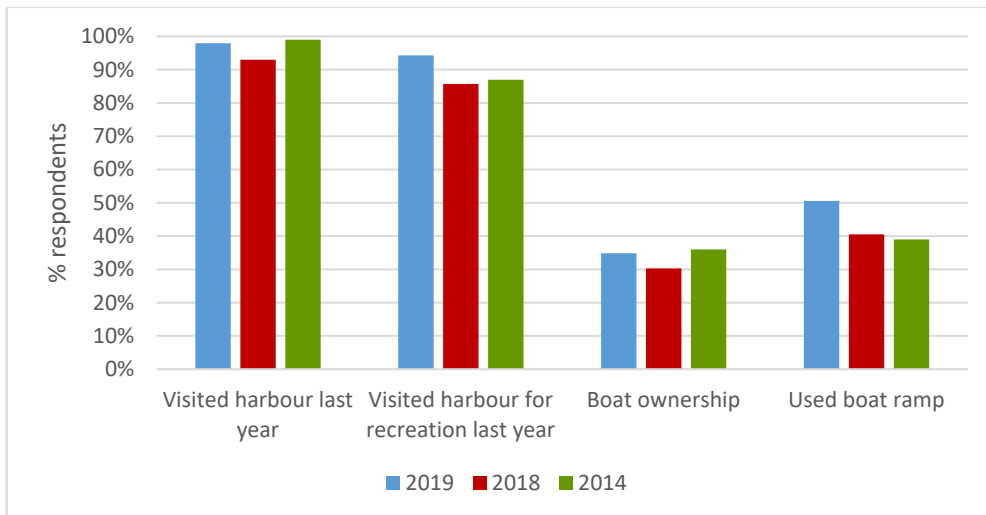
Figure 4: Recreational use of the harbour

3.2 Word cloud results

Word clouds enable the visual identification of key recurring issues or themes in an area. At the start of the CATI survey participants were asked *"when you think of the Gladstone Harbour area, what are the first three words that come to mind?"* These words were analysed using the web‐based application *Wordle* (www.wordle.net) to produce the word clouds. This analysis gives greater prominence to words that appear more frequently.

The word cloud produced and shown in Figure 5 is based on the first word provided by respondents. The results highlight the primary importance of 'Fishing' as the most frequently mentioned first word (N=34), followed by 'Beautiful' (N=33). The industrial nature of the harbour is well recognised as 'Industry' comes third (N=26). Gladstone Harbour is also seen as a 'Busy' place with prominence given to commercial and recreational traffic (Boats, Shipping, Marina). Positive associations with the harbour (Beautiful, Nice, Great, Pretty, Clean) are more prevalent than potentially negative associations (Coal, Dirty).

Figure 5: Word cloud for first word response from survey respondents (size indicates frequency)

The word cloud produced from the combination of the first three words provided by respondents is shown in Figure 6. When all three words are compiled, other features of the harbour become more prominent ('Water', N=38; 'Islands', N=23; 'Dolphins', N=15). However, the same key elements dominate the word cloud as featured in the first-word cloud above. 'Fishing' remains dominant (N=90), followed by 'Beautiful' (N=58) and by words associated with the activity of an industrial harbour ('Busy', N=48; 'Industry', N=45) that provides many recreational opportunities ('Boats', N=22; 'Fish', N=17; 'Recreation', N=14; 'Fun', N=14; 'Beach', N=14) and community benefits ('Clean', N=29; 'Picturesque', N=12).

Figure 6: Word cloud for all three-word responses (size indicates frequency)

The importance of fishing is incorporated in the report card in terms of the economic value of both commercial and recreational fishing. The importance of industrial activity is incorporated in the report card as an indicator of economic performance. The natural beauty of the harbour was assessed for the first time in 2018 as a measure of aesthetic value for the social indicator 'Liveability and wellbeing'.

3.3 Recreational activity and valuation update

A section of the CATI survey is designed to collect information about recreational activity which is applied to estimate the scores and grades for the 'Economic (recreational) value' indicator group in the Economic component of the report card. Four types of recreational activity (beach, land-based, fishing and water-based recreation) are assessed as separate indicators. The report card scores for the four recreational indicators are based on the satisfaction ratings for the last recreational trip undertaken for each activity in the past year. These ratings are then weighted by the relative economic value of the activity to determine the scores and grades for the report card. A full analysis of the results is provided in Appendix D with summary information presented below.

A total of 439 responses were collected in the 2019 Gladstone CATI survey. Nearly all respondents (98%) had visited the Gladstone Harbour area in the last 12 months (an increase of 5% from last year), and 414 respondents (94.3%) had visited the harbour for recreational purposes (an 8% increase from last year).

Most respondents (67.7%) indicated that their recreational use of the harbour had not changed in the last 12 months, 17.5% reported increased use (19% in 2018) and 14.8% reported decreased use (13% in 2018).

Beach and land-based recreational activity were much more prevalent than recreational fishing and other water-based recreation. Ninety-two per cent of respondents had participated in beach (93% in 2018) and 93% in land-based recreation (88% in 2018), while 45% had participated in recreational fishing (41% in 2018) and 54% in other water-based recreation (47% in 2018). In the past 12 months all forms of recreation have therefore increased, except beach recreation which remained fairly stable.

Just above a third of respondents (35%) indicated they owned a boat (30.3% in 2018). In the last 12 months, 222 (51%) respondents had used a boat ramp for an average of 26 times (average of 13 times for the whole sample).

3.3.1 Satisfaction rating scores

Information about the level of satisfaction with each of the recreational activities was derived from the CATI survey, based on a 10-point satisfaction scale. Overall, respondents reported high levels of satisfaction with all types of recreational activity in the harbour area with mean scores of 8.23, 8.4, 7.7 and 8.29 for beach, land-based, fishing and water-based recreation respectively. There has been no statistically significant (Independent Samples T-test at 5%) change from 2018 for any activity, except for recreational fishing which increased from 7.36 to 7.7.

3.3.2 Annual economic value of recreational activity

The annual economic value of the four types of recreational activity was estimated from the information collected about trip frequency (this survey) and the trip values which had already been established[2] in 2014 for beach and land-based recreation at $40 per trip and $60 per trip respectively (Pascoe et al., 2014) and in 2015 for recreational fishing at $143 per trip (Cannard et al., 2015) and in 2017 for other (non-fishing) water-based recreation at $95 per trip (Windle et al., 2017).

In 2019 there was no significant change in participation frequency for any of the four categories of recreational activities present in the survey. Independent samples T-tests at 5% significance level were carried out to compare this year's results with 2018 but no statistical differences were observed ("NS": tested not significant).

- **Beach recreation: Avg trips/yr**
  2019: users (N=406) = 40.2 NS; full sample (N=439) = 37.18 NS
  2018: users (N=371) = 39.35; full sample (N=400) = 36.49

- **Other land-based recreation: Avg trips/yr**
  2019: users (N=409) = 38.95 NS; full sample (N=439) = 36.29 NS
  2018: users (N=351) = 42.97; full sample (N=400) = 37.71

- **Fishing recreation: Avg trips/yr**
  2019: users (N=199) = 20.73 NS; full sample (N=439) = 9.40 NS
  2018: users (N=164) = 24.49; full sample (N=400) = 10.04

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[2] The travel cost recreation value estimates for the different activities remain constant for a five-year period before an update is recommended (Pascoe et al. 2014).

- **Other water-based recreation: Avg trips/yr**
  2019: users (N=236) = 19.59 NS; full sample (N=439) = 10.53 NS
  2018: users (N=189) = 20.01; full sample (N=400) = 9.45

Last year, the Gladstone population figure used to upscale these estimations to the whole Gladstone community was of 63,052 residents. This was slightly higher than the number from ABS for that same period: 62,800 residents (ABS Cat#3218.0 Regional Population Growth – March 2019). In 2019, the 2018 population value for the Gladstone Local Government Area was applied: 62,979 residents.

The average annual value of recreational trips for 2019 is:

- $44.5 million for beach recreation ($35 million in 2018)
- $49 million for land-based recreation ($51 million in 2018)
- $26.6 million for recreational fishing ($31.2 million in 2018)
- $21.6 million for water-based recreation ($20.2 million in 2018)

3.4 Social component results

The overall grade for the Social component is a B (score of 0.67) which is similar to last year but still represents a strong improvement since 2014 (0.58).

The Social component is assessed through three social indicator groups ('Harbour usability', 'Harbour access' and 'Liveability and wellbeing') and their associated indicators. In total there are eight indicators and 23 measures applied to determine the scores and grades for the three indicator groups (Table 7).

Table 7: Summary of grades and scores for the Social component

Social component: 2019 = 0.67 (B) 2018 = 0.67 (B); 2014 = 0.58 (C)									
Indicator Group	**Score**	**Indicators**	**Score**			**Measures**	**Score**		
			2019	2018	2014		**2019**	2018	2014
Harbour usability	**0.64 C** *2018: 0.63* *2014:0.60*	Satisfaction with harbour recreational activities	**0.71**	0.70	0.70	How satisfied last recreational trip	0.74	0.71	0.74
						Quality of ramps and facilities	0.67	0.68	0.63
		Perceptions of air and water quality	**0.58**	0.58	0.46	Water quality (WQ) satisfaction	0.58	0.61	0.39
						Air quality satisfaction	0.48	0.47	0.40
						WQ does not affect harbour use	0.67	0.66	0.58
		Perceptions of harbour safety for human use	**0.63**	0.61	0.38	Marine safety incidents	0.54	0.54	0.24
						Oil spills	0.66	0.56	0.15
						Safety at night	0.62	0.65	0.58
						Happy to eat seafood	0.68	0.67	0.55
Harbour access	**0.67 B** *2018: 0.67* *2014: 0.61*	Satisfaction with access to the harbour	**0.73**	0.72	0.67	Fair access to harbour	0.73	0.72	0.67
		Satisfaction with boat ramps + public spaces	**0.65**	0.66	0.60	Frequency of use	0.51	0.51	0.46
						Number of boat ramps	0.69	0.72	0.65
						Access to public spaces	0.74	0.75	0.68
		Perceptions of harbour health	**0.63**	0.63	0.53	Great condition	0.68	0.66	0.54
						Optimistic about future health	0.63	0.64	0.56
						Improved over the last 12 months	0.59	0.60	0.50
		Perceptions of barriers to access *(Note: scores are reversed. A higher score denotes a decrease in the barrier)*	**0.66**	0.65	0.64	Marine debris a problem	0.48	0.50	0.51
						Marine debris affects access	0.72	0.72	0.70
						Shipping reduced my use	0.69	0.67	0.63
						Recreation boats reduced my use	0.72	0.67	0.69
Liveability wellbeing	**0.70** *2018: 0.70* *2014: 0.64*	Liveability and wellbeing	**0.70**	0.70	0.64	Makes living in Gladstone a better experience	0.76	0.77	0.71
						Participate in community events	0.56	0.52	0.53
						Aesthetic value	0.73	0.75	na

The measures to construct most of the social indicator scores were assessed from information collected in the CATI survey based on participants' satisfaction or agreement ratings using a 10-point Likert scale. The distribution of the 10-point scale was applied as the baseline for all measures, except for 'Oil spills' and 'Marine safety incidents' where secondary data was applied (Table 1). Full details of the CATI survey results (unweighted scores) are provided in Appendix C.

The weighting for the social indicators and measures were derived from the 2014 survey of Technical experts. Aggregation weighting for the indicator groups were derived from the Management experts, Technical experts and Community surveys.

In the past 12 months there has been no change in scores for the 'Harbour access', 'Harbour usability' and 'Liveability and wellbeing' indicator groups. The scores for all the indicators and measures are reported in Table 7 and summary comments are made in the subsections below.

3.4.1 Harbour usability

The 'Harbour usability' indicator group was assessed as a C-grade (score of 0.64), a 1-point increase from last year and a 3-point improvement from 2014 (0.60). This indicator group includes three indicators with minor change in scores over the last year. The score for the 'Harbour safety' indicator has increased by 2 points from last year, with 'Satisfaction with harbour recreational activities' increasing by one point and 'Perceptions of air and water quality' remaining unchanged.

Satisfaction with recreational activities

The indicator 'Satisfaction with recreational activities' scored 0.71, a 1-point increase compared with 2018 and 2014 (0.70). There are two measures for this indicator. The first measure, 'How satisfied with last recreational trip' (average across the four types of recreational activity [beach, land, fishing and water]) had decreased to 0.71 in 2018 but is back to the score observed in 2014 (0.74). The second measure 'Quality of ramps and facilities (associated with boat ramps)' scored 0.67, a slight decrease from last year (0.68) but still better than in 2014 (0.63).

Perceptions of air and water quality

The indicator 'Perceptions of air and water quality' has a score of 0.58 the same as in 2018, which remains an improvement from 2014 (0.46). As in previous years, the measure assessing perceptions of air quality has the lowest score (0.48), but with a slight improvement from last year (0.47). There has been a slight decline in perceptions about water quality but that does not seem to affect people's perception of harbour use.

- 'Water quality satisfaction' (Q40. 'I think water quality in Gladstone Harbour is in good condition') has scored 0.58 (like in 2017). This is a decline compared to 2018 (0.61) but still a considerable improvement from 2014 (0.39).
- 'Air quality satisfaction' (Q41. 'I think air quality in Gladstone Harbour is in good condition') seems to slightly increase year after year: from 0.40 in 2014 to 0.47 in 2018 and 0.48 in 2019.
- 'Water quality does not affect harbour use' (Q42. 'The water quality in Gladstone Harbour has not affected how often I use the area in the last 12 months') continues to steadily increase: 0.58 in 2014, 0.66 in 2018 and 0.67 in 2019.

Perceptions of harbour safety for human usage

The indicator 'Perception of harbour safety for human use' received a score of 0.63, which represents a slight increase from 2018 (0.61) and still a major improvement from 2014 (0.38)[3].

The score reflecting concerns about personal safety at night has decreased from last year (0.62 vs 0.65). The score about seafood consumption safety has improved slightly from last year (0.68 vs 0.67).

The score for 'Marine safety incidents' surged in 2017 (0.76) and had sharply declined in 2018 (0.54). In 2019, this score remains unchanged. The score for 'Oil spills' has substantially improved from last year (0.66 vs 0.56). Information about these two measures comes from secondary data sources.

There were 69 reported marine incidents and an incident rate of 14.45 (per 10,000 *Queensland regulated ships* [99.8% recreational vessels]) in the Gladstone maritime region in 2017. This represents a small decrease from the previous year with 72 incidents and an incident rate of 15. The distribution of marine safety incidents across the 10-year array in Queensland is provided in Figure 7. The Gladstone incident rate of 14.45 falls in the 46th percentile (just as last year's rate), but as higher levels are less desirable this value is reversed to determine the score for the report card (i.e. 1-0.46 = 0.54).

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[3] The low score for the indicator in 2014 is driven by very low scores (E grade) for the Marine incidents and Oil spill measures (scores of 0.24 and 0.15 respectively). New jurisdictional changes have meant that since 2014 information to estimate incident rates is only available for Queensland recreational vessels and does not include commercial vessels as occurred in 2014. This was noted in 2016.
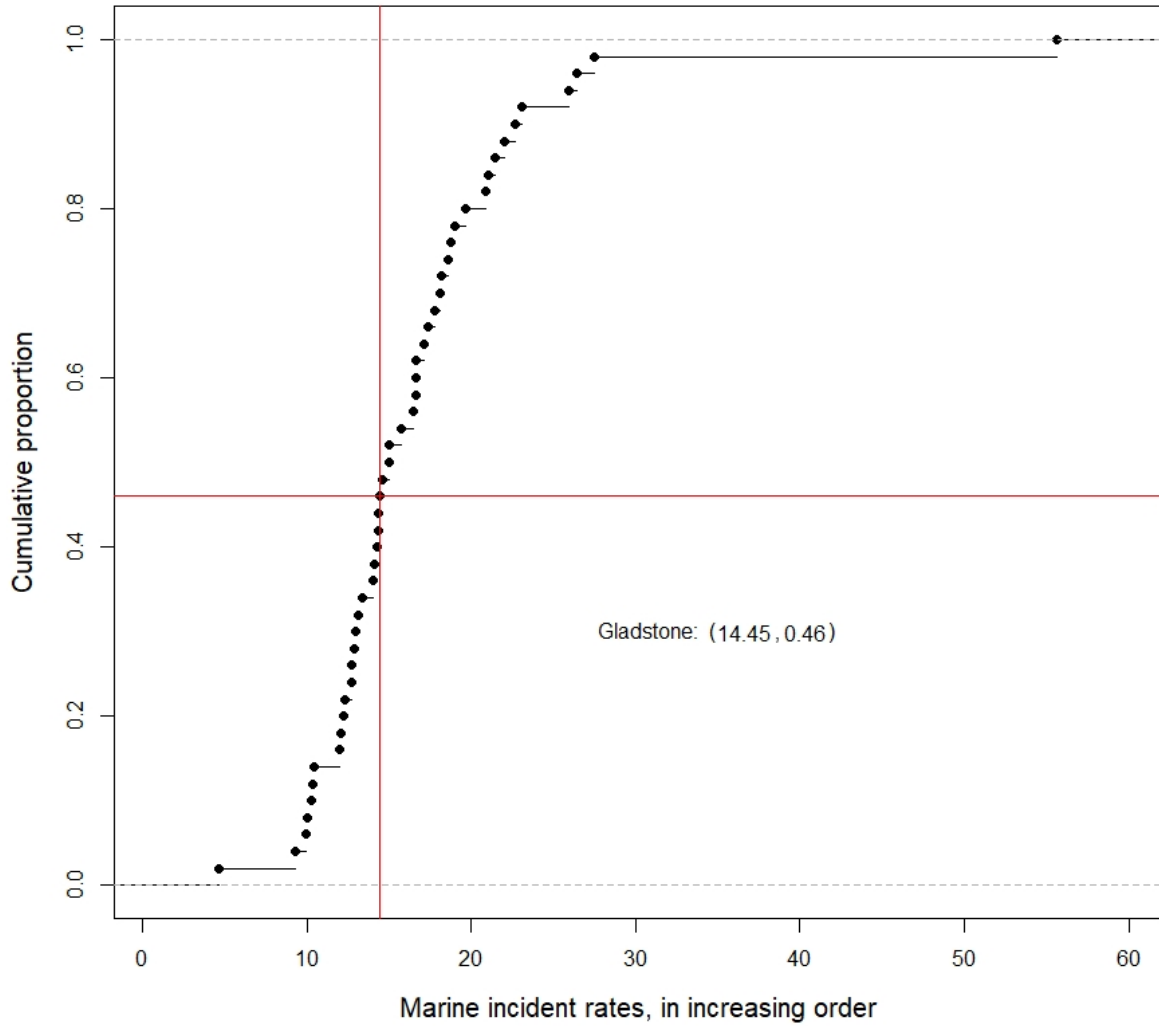
Figure 7: Distribution of marine safety incidents for Queensland

In 2018 there were eight oil spills reported in the Gladstone maritime region, three less than in 2017, with an incident rate declining from 2.30 to 1.68. Only two (25%) of the 2018 spills in the Gladstone maritime region actually took place in the Gladstone Harbour area[4]. The distribution of oil spills across the 10-year array in Queensland is provided in Figure 8. The incident rate of 1.68 falls in the 34th percentile, but as higher levels are less desirable this value is reversed to determine the score for the report card (i.e. 1-0.34 = 0.66).

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[4] Incidents outside the Gladstone Harbour area were included to retain consistency with prior methodology.
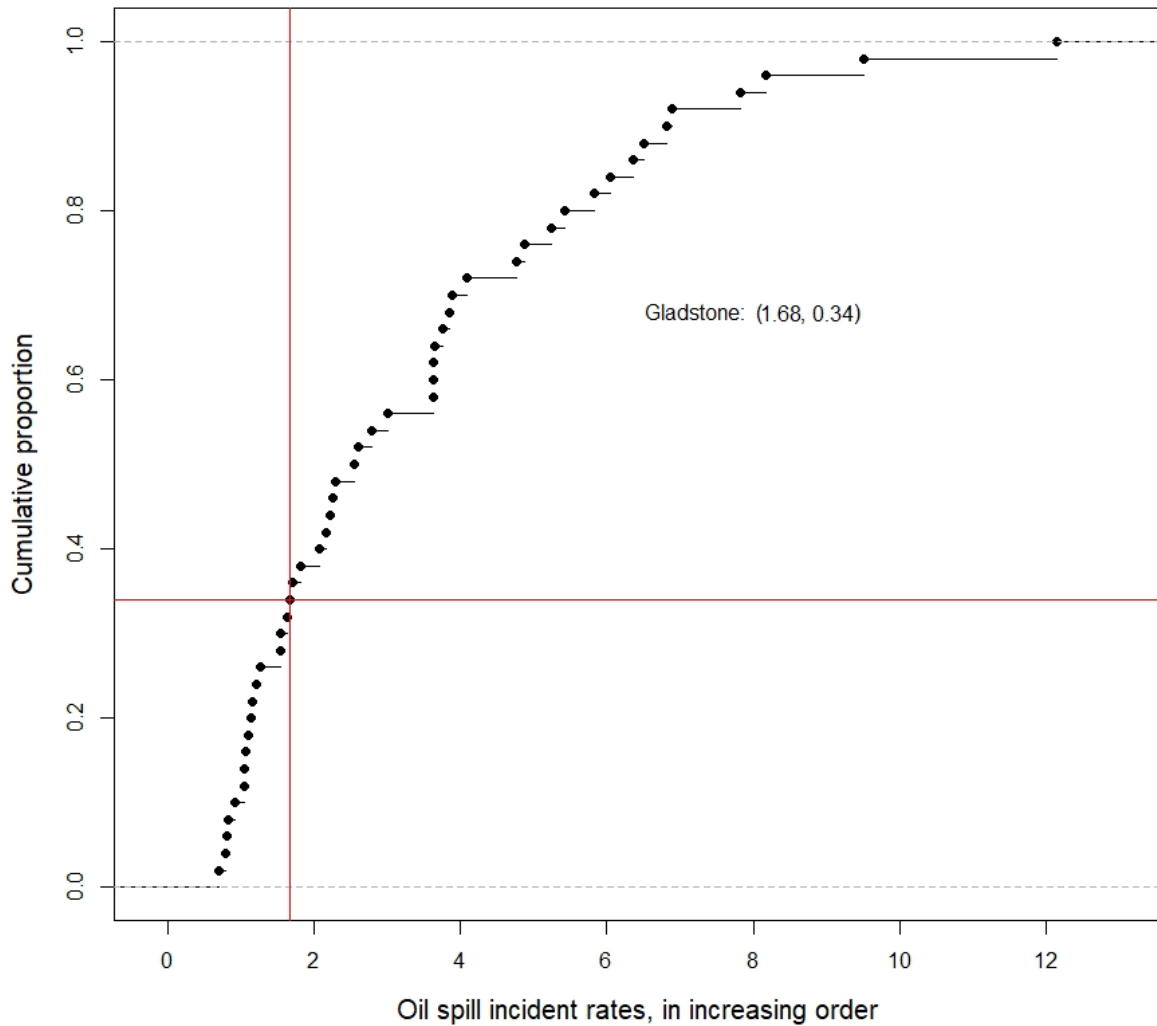
Figure 8: Distribution of oil spills for Queensland

3.4.2 Harbour access

The 'Harbour access' indicator group was assessed as a B-grade and a score of 0.67 with no change from last year but an improvement compared to 2014 (0.61). This indicator group includes four indicators with relatively even scores contributing to the overall group score.

Satisfaction with access to the harbour

The indicator 'Satisfaction with access to the harbour' scored 0.73, a 1-point improvement from last year and a 6-point improvement from 0.67 in 2014. The one measure refers to Q29 in the CATI survey (Q29. 'I have fair access to Gladstone Harbour compared to other users of the harbour').

Satisfaction with boat ramps and public spaces

The indicator 'Satisfaction with boat ramps and public spaces' scored 0.65, a 1-point decline from last year but an improvement from 0.60 in 2014. While the measures 'Fair access to harbour' and 'Access to public spaces' have relatively good scores (0.73 and 0.74 respectively; 0.72 and 0.75 in 2018), the score for the indicator is reduced by the lower score for 'Frequency of use' (0.51) which remains low but unchanged from 2018. The last measure, 'Number of boat ramps', scores a little worse than last year (0.69 vs 0.72). However, most people do not own a boat (65%) or use a boat ramp (49.4%) as reported in Section 3.1.

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Perceptions of harbour health

The indicator 'Perceptions of harbour health' scored 0.63, with no change from last year but an improvement from 0.53 in 2014. In the last 12 months, the perception that Gladstone Harbour is in great condition has improved (0.68 vs 0.66), but the optimism about future harbour health has slightly declined (0.63 vs 0.64) and the feeling that it had improved over the past year declined a little (0.59 vs 0.60) ('Optimistic about future health') (Table 7).

Perceptions of barriers to access

The indicator 'Perceptions of barriers to access' scored 0.66, a 1-point improvement from 2018 and only a 2-point improvement since 2014. Three out of four measures scored as good or better than last year, with values equal or superior to 0.69, suggesting that marine debris did not adversely impact on harbour access and, shipping and boating activity did not adversely impact on harbour use. However, the overall score was reduced by the low score for the 'Problem of marine debris' (0.48), which lost two points since last year. Although it does not seem to affect access yet, marine debris therefore represents a growing concern for Gladstone residents. This could also indicate that residents are becoming more aware of the problem over the years.

3.4.3 Liveability and wellbeing

Just as in 2018, the 'Liveability and wellbeing' indicator group was assessed as being B-grade (score of 0.70). This represents a 4-point increase from 2014.

The overall score for this indicator is typically influenced by a high score for the measure 'Makes living in Gladstone a better experience' (Q45. 'Gladstone Harbour makes living in Gladstone a better experience') (0.76 in 2019; 0.77 in 2018) and a lower score for the measure 'Participate in community event' (Q46. 'I rarely participate in community events in the Gladstone Harbour area') (0.56 in 2019; 0.52 in 2017). It must be noted though that this measure scored four points higher than last year.

The third new measure 'Aesthetic value' (Q45a. 'I enjoy going to the Harbour because it is beautiful to look at' and Q45b. 'I enjoy going to the Harbour because of its natural beauty') received a relatively high score of 0.73 (slightly lower than last year's 0.75) which further offsets the lower score of the measure 'participation in community events'.

3.4.4 Social component summary

The overall grade for the Social component is a B (score of 0.67) which represents no change from 2018, but an improvement since 2014 (0.58). There has been little change (two points at most) in the scores for all three indicator groups.

There has been no change in the score for 'Marine safety incidents' but a significant, 10-point increase in the score for 'Oil spills' ('Harbour usability'). The unbalanced influence of these two secondary source measures in the indicator 'Perceptions of harbour safety' is evident. A relatively small change in the raw data (incident rate) for either measure translates into a bigger change in score compared to the measures assessed from primary source (CATI survey) data. The two measures are not an accurate reflection of incidents in Gladstone harbour as the source data covers a broader regional area. In addition, neither are an effective measure of community perceptions as the indicator suggests. Although it was not formulated as a specific recommendation for the next report cards, an improvement of the 'Oil spill' measure could be to concentrate on the incidents that occurred near Gladstone Harbour rather in the entire Gladstone Maritime Region.

3.5 Cultural 'Sense of place' indicator group

The overall grade for the cultural 'Sense of place' indicator group is a B Grade (score of 0.66) with little change from previous years (0.65 in 2018 and 0.64 in 2014). The scores for all the indicators and measures are reported in Table 8 and summary comments are made in the subsections below.

Table 8: Summary of grades and cores for the 'Sense of place' indicator group

Indicator group Score/grade	Indicators	Score			Measures	Score		
		2019	2018	2014		**2019**	2018	2014
Sense of place **0.66** **B** *2018: 0.65* *2014: 0.64*	Place attachment	**0.58**	0.56	0.55	No place better	**0.51**	0.51	0.49
					Who I am	**0.64**	0.61	0.61
	Continuity	**0.58**	0.53	0.57	How long lived in area	**0.44**	0.41	0.46
					Plan to stay the next 5 years	**0.71**	0.65	0.68
	Pride in the region	**0.74**	0.74	0.69	Feel proud living in Gladstone	**0.74**	0.74	0.69
	Well-being	**0.61**	0.59	0.55	Quality of life	**0.69**	0.65	0.64
					Input into management	**0.54**	0.53	0.46
	Appreciation of the harbour	**0.83**	0.83	0.80	Key part of community	**0.82**	0.82	0.79
					Great asset to region	**0.82**	0.82	0.79
					Great asset to Queensland	**0.81**	0.81	0.81
	Values	**0.66**	0.65	0.64	Variety of marine life	**0.73**	0.73	0.64
					Opportunities for outdoor recreation	**0.78**	0.79	0.76
					Affects visitors to the region	**0.73**	0.73	0.67
					Enjoy scenery and sights	**0.76**	0.77	0.75
					Spiritually special places	**0.50**	0.47	0.52
					Culturally special places	**0.51**	0.50	0.50
					Historical significance	**0.52**	0.53	0.58

The indicator group comprises six indicators and 17 measures. The baseline scores for the measures to construct the indicator scores and grades were collected in the CATI survey based on participants' satisfaction or agreement ratings on a 10-point Likert scale. Full details of the results from the CATI survey are provided in Appendix C.

The weighting for the cultural indicators and measures were derived from the 2014 survey of Technical experts.

Statistical testing was conducted to determine whether survey responses differed between respondents who identified as a Traditional Owner of the area and the rest of the sample. No significant differences could be identified, except for two measures: 'spiritually special places' (p=0.008) and culturally special places' (p=0.0082). However, the low proportion of 'Traditional Owners' in the sample (38/439=8.7%) might partially explain the lack of differences in opinions from other residents. Full details are provided in Appendix C.

While there are relatively small annual changes in indicator scores, it must be observed that all indicators are performing better or as well as last year. The scores for the 'Appreciation of the harbour' indicator and associated measures remain the highest and continue to increase over time. They are now close to obtaining an 'A' grade. The scores for the 'Continuity' indicator had declined in 2018 as the average length of residency in the area had decreased but is recovering this year. The 'Plan to stay the next 5 years' measure is particularly encouraging, increasing by 6 points from 2018 and exceeding the 2014 score by 3 points.

The 'Well-being' indicator is scoring well this year, fuelled with score improvements for 'Quality of life' and 'Input into management'. The lowest recorded scores are for measures stressing the importance of the Gladstone Harbour as a spiritually, culturally or historically special place, or as a place with obvious distinctiveness. On the contrary, Gladstone Harbour seems to be increasingly valued for its touristic and recreational attractiveness (i.e. the following measures: 'Variety of marine life', 'Opportunities for outdoor recreation', 'Affects visitors to the region', 'Enjoy scenery and sights').

3.5.1 Place attachment

The 'Place attachment' indicator scored 0.58, which represent a 2-point increase from 2018 and a 3-point increase since 2014. There are two measures for this indicator. The measure 'There are other places that are better than the Gladstone Harbour area for the recreational activities that I do' (Q30) scored 0.51 with no change from 2018. The other measure 'The Gladstone Harbour area is part of who I am' (Q51) scored 0.64, a 3-point increase from 2018. Overall, these results suggest that, although the Gladstone Harbour may not yet appear distinctive from other places, it has been increasing in importance as a symbol of local residents' identity since 2014.

3.5.2 Continuity

As mentioned earlier, the 'Continuity' indicator scored 0.58, an improvement from last year (0.53). There are two measures for this indicator. The 'How long lived in the area' measure (Q3) had a low score of 0.41 in 2018 which has increased back to 0.44 in 2019. The average time respondents have lived in the area has increased substantially, from 20.3 years in 2018 to 24.6 in 2019. These fluctuations from one year to the other could be explained by a fraction of respondents staying in Gladstone for a few years and then moving away, giving more or less weight to long-term residents in the sample. The other measure 'Plan to stay in the next five years' (Q53) received a higher score of 0.71, representing a sharp increase from 2018 (0.65).

3.5.3 Pride in the region

The 'Pride in the region' indicator scored 0.74 just like in 2018. This remains a 5-point improvement compared with 2014 (0.69). This indicator score is made of only one measure and relates to Q50 ('I feel proud that I live in the Gladstone community') in the CATI survey. The trend on this indicator clearly shows that respondents enjoy living in Gladstone.

3.5.4 Well-being

As stated earlier, the 'Well-being' indicator scored 0.61 representing a 2-point increase from 2018 and a 6-point increase from 2014 (0.55). There are two measures for this indicator. The 'Quality of life' measure (Q52. 'The Gladstone Harbour area improves my quality of life') scored 0.69, increasing from 0.65 in 2018. The other measure, 'Input into management' (Q47. 'I feel able to have input into

the management of the Gladstone Harbour if I choose to') continues to receive a low score of 0.54, although it has increased significantly since 2014 (0.46) and gained one point from 0.53 in 2018.

3.5.5 Appreciation of the harbour

As in 2018, the 'Appreciation of the harbour' indicator received the highest score of all indicators in this group. The 2018 score of 0.83 remains unchanged in 2019 but shows a 3-point improvement since 2014. There are three measures in this indicator: Q54. 'The Gladstone Harbour is a key part of the Gladstone community'; Q58. 'The Gladstone Harbour area is a great asset for the economy of this region'; and Q59. 'The Gladstone Harbour area is a great asset for the economy of Queensland'. The scores of 0.82, 0.82, and 0.81 respectively are exactly similar to the ones from last year.

3.5.6 Values

The 'Values' indicator received a score of score of 0.66, a 1-point progression from last year that complements the 'B' grade it received in 2018. There are seven measures for this indicator with details and scores outlined in Table 8. There is little change in the scores of all measures since 2018 (zero or one point at most) apart from a 3-point increase in 'Spiritually special places' which had obtained a low score in 2018 (0.47) but seems now to be recovering.

Respondents who identify as a Traditional Owner of the area had significantly higher rating scores for the importance of spiritually and culturally special places.

3.6 Economic component results

The overall grade for the Economic component is a B (score of 0.73) which is a slight improvement from 0.72 in 2018 but a decline from 0.75 in 2014. There are nine indicators and 11 measures applied to determine the scores and grades for the three indicator groups in the Economic component with details and scores summarised in Table 9.

In the Economic component, no external information was collected to inform the weightings for the economic indicators/measures and economic impact weightings were applied. Aggregation weighting for the indicator groups were derived from the management experts, technical experts and community surveys.

In the last year, there has been no change in the scores for 'Economic performance' (0.90) and for 'Economic Stimulus' (0.58). A slight improvement has been observed for 'Economic value (recreation)' (from 0.74 to 0.76).

Table 9: Summary of grades and scores for the Economic component

Indicator group Score/grade	Indicators	Score			Measures	Score		
Economic component: 2019 = 0.73 (B) 2018 = 0.72; 2014: 0.75								
		2019	2018	2014		2019	2018	2014
Economic performance 0.90 (A) *2018: 0.90 2014: 0.83*	Shipping activity	**0.90**	0.90	0.83	Shipping activity: productivity	0.90	0.90	0.83
	Tourism	**0.90**	0.90	0.60	Tourism expenditure	0.90	0.90	0.60
	Commercial fishing	**0.36**	0.35	0.66	Net fisheries: productivity	0.25	0.25	na
					Trawl fisheries: productivity	0.29	0.29	na
					Pot fisheries: productivity	0.64	0.64	na
Economic stimulus 0.58 (C) *2018: 0.58 2014: 0.87*	Employment	**0.44**	0.44	0.72	Unemployment statistics for the Gladstone LGA	0.44	0.44	0.72
	Socio-economic status	**0.64**	0.64	0.90	Index of economic resources	0.64	0.64	0.90
Economic value 0.76 (B) *2018: 0.74 2014: 0.75*	Land-based recreation	**0.77**	0.76	0.76	Satisfaction rating from CATI survey + value from 2014 survey	**0.77**	0.76	0.76
	Recreational fishing	**0.71**	0.68	0.67	Satisfaction rating from CATI survey + value from 2015 survey	**0.71**	0.68	0.67
	Beach recreation	**0.76**	0.75	0.71	Satisfaction rating from CATI survey + value from 2014 survey	**0.76**	0.75	0.71
	Water-based recreation	**0.76**	0.75	na	Satisfaction rating from CATI survey + value from 2017 survey	**0.76**	0.75	na

3.6.1 Economic performance

Economic performance retains an A-grade with a score of 0.90 which has not changed from last year but has increased from 0.83 in 2014.

The three indicators of 'Economic performance' are 'Shipping', 'Tourism' and 'Commercial fishing' with 'Shipping' the dominant performer. In 2017-18, the Gladstone Ports Corporation generated **$483 million** in total income, a substantial increase from $471 million in 2016-17 and $453 million in 2014-15. Tourism expenditure was worth **$308 million** (2017-18), down from $341 million in 2016-17. It should be noted, however, that the data source for tourism expenditure was changed this year, which likely explains this variation. The 2018-19 GVP for commercial fisheries in Gladstone was worth **$0.99 million** down from $1.64 million in 2017-18[5].

The relative contributions to revenue share across the three activities were applied as impact weightings and consequently the score for the indicator group is dominated by the indicator score for 'Shipping'. The score for 'Commercial fishing' has little influence on the indicator score.

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[5] The Queensland Government's QFISH database is constantly updated. At the time fish catch data were extracted to populate the report card in 2018, Gladstone GVP was indeed $1.64M. However, based on this year's extract, the GVP for 2017-18 appears to have increased to $2.43M in Gladstone, as shown in Figure 12.

Shipping activity

The indicator 'Shipping activity' has a score of 0.90, which has not changed in the last year but represents a strong improvement from 0.83 in 2014.

The measure for this indicator is calculated from data on monthly vessel movements by cargo type. Cargo is categorised into four types: coal exports, other exports (including LNG), bauxite imports and other imports. In 2018-19, there has been some changes in the number of vessel movements (Figure 9) with coal exports surging from 665 in 2018 to 739 this year (from a monthly mean of 55 to 62), and other exports increasing from 653 to 668 (from a monthly mean of 54 to 56). Over the past year, imports of bauxite have slightly declined from 247 to 227 (monthly mean of 21 to 19) and other imports have experienced a similar decline from 221 to 202 (although it is only a reduction from 18 to 17 ships a month on average). From last year, these changes resulted in an average increase from 149 to 153 in monthly ship movements in Gladstone.
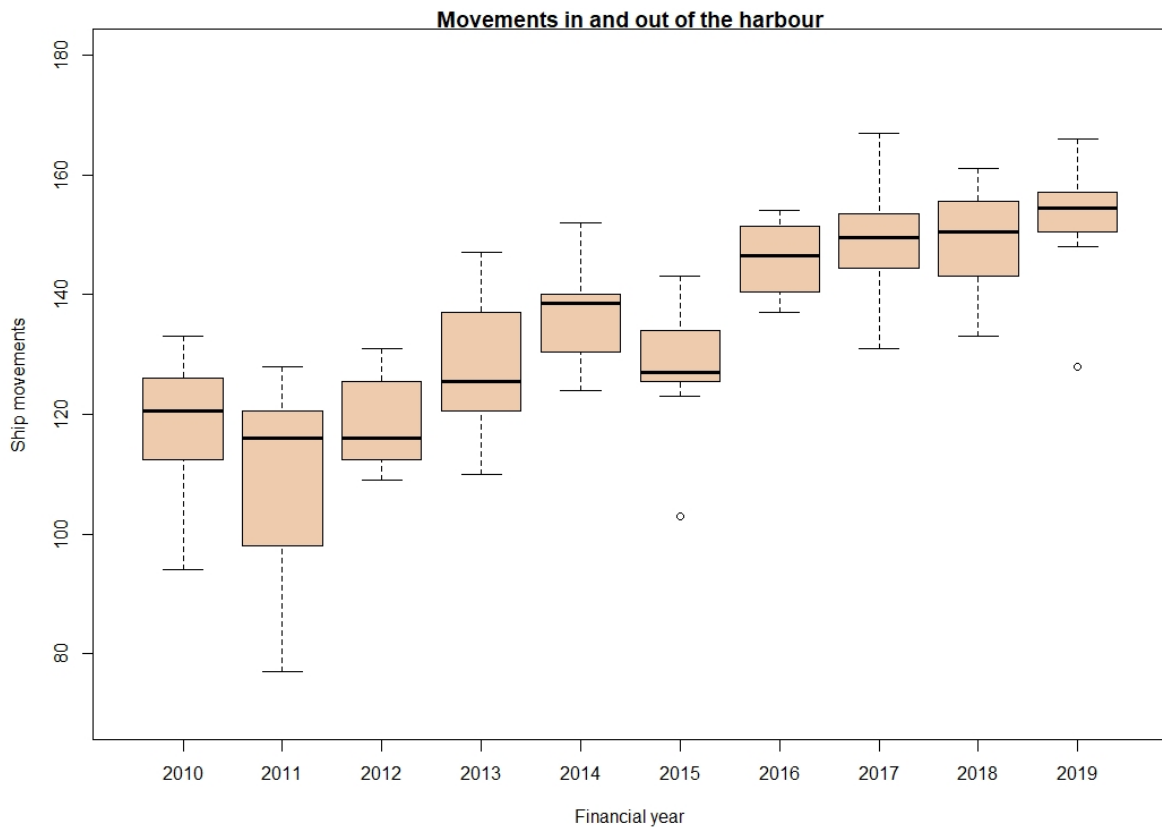
Figure 9: Gladstone Harbour shipping activity, 2010-2019

Shipping activity continues to be dominated by coal exports but in the last three years there has been more variation in activity compared with more stable shipping patterns for LNG and alumina exports which have been more stable (Figure 10).
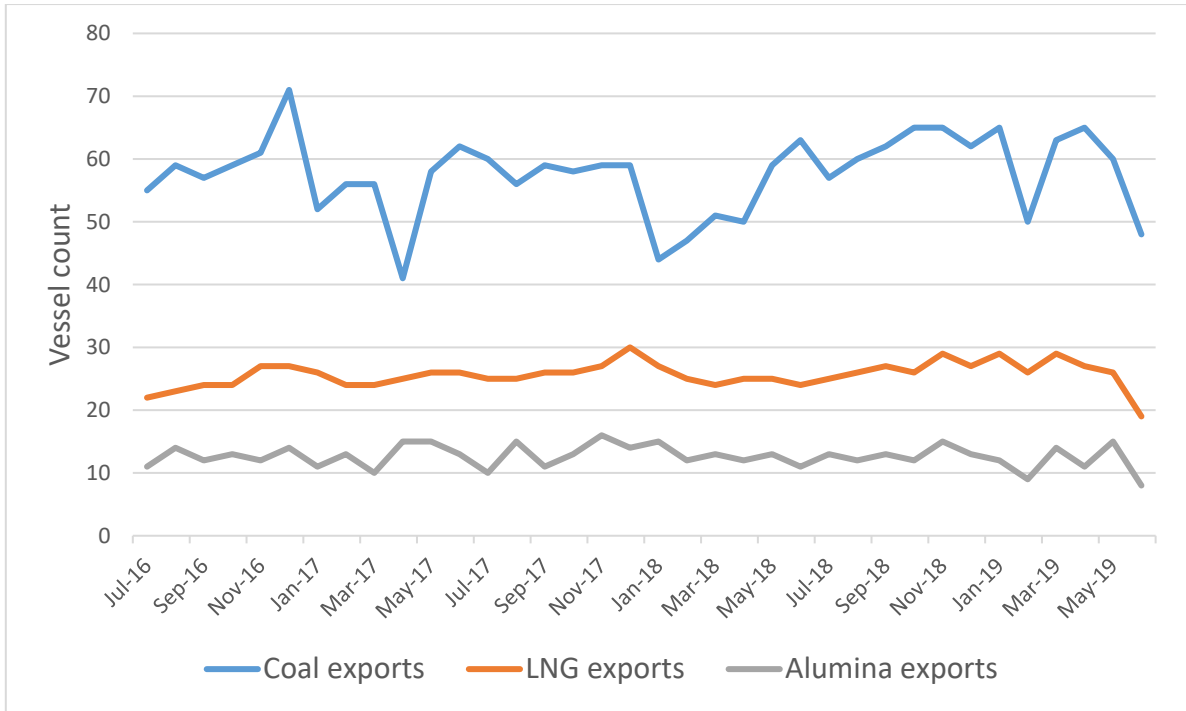
Figure 10: Trends in the three main commodity exports in Gladstone, 2016-19

Overall capacity utilisation remains high even when the Fisherman's Landing expansion is taken into consideration (which has now been completed) (Figure 11), explaining the high score of 0.90 for the indicator.
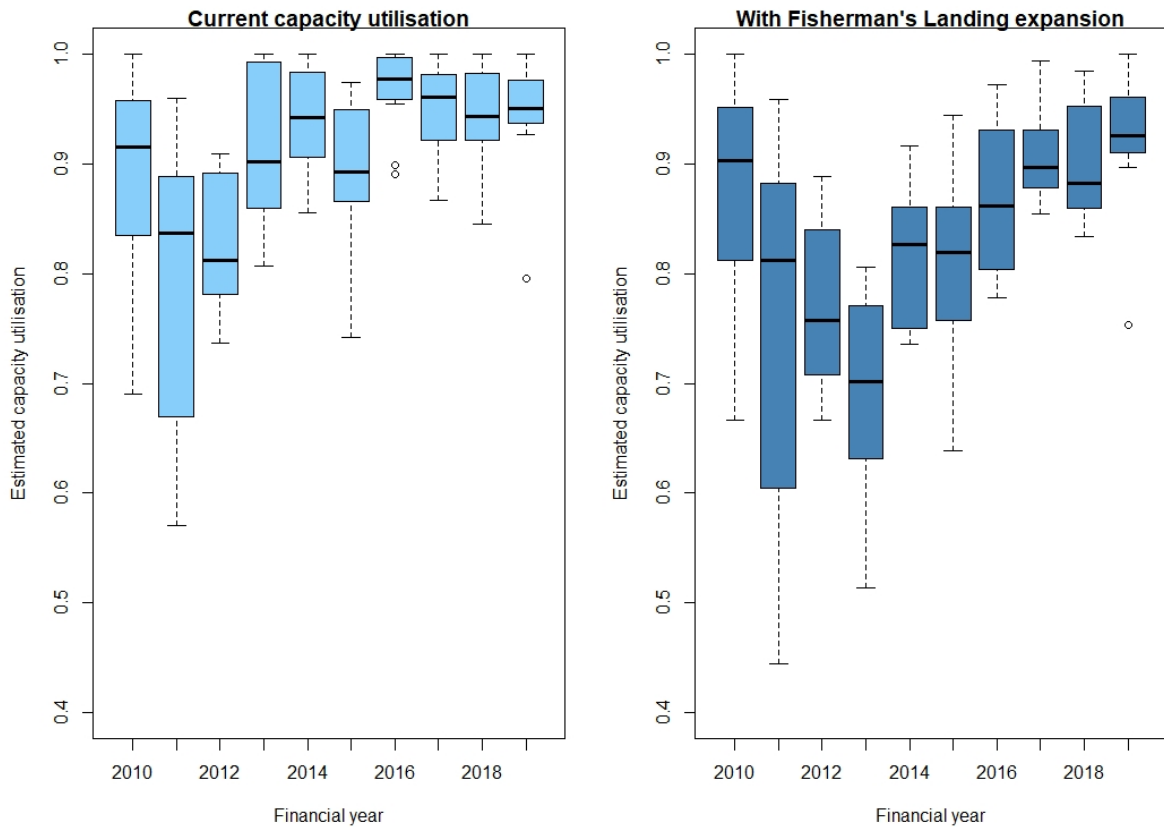
Figure 11: Capacity utilisation with a) current facilities and b) with Fisherman's Landing expansion

Tourism

'Tourism' retains its strong A-grade performance with the score of 0.90 remaining unchanged from last year but representing a substantial increase from 0.60 in 2014. The tourism score is based on expenditure relative to the 10-year average (2009-18). The total expenditure on tourism (expenditure on accommodation, food and other local services) in the Gladstone region was $308 million in 2017-18, decreasing from $341 million in 2016-17. In previous years, tourism expenditure values were obtained from information provided on the Gladstone Regional Council website (http//www.economicprofile.com.au/Gladstone/tourism/output) because the Gladstone Regional Council used statistics from the REMPLAN consultancy group on their website. However, this service was discontinued in 2018, so another source of information needed to be found.

The new source of information used this year is Tourism Research Australia's information at the Local Government Area level and selected for Gladstone: https://www.tra.gov.au/Regional/local-government-area-profiles. The latest information available is dated from 2017 and was updated on 29/08/2018 at the time the website was accessed this year (08/07/2019). These data are based on a four-year average from 2014 to 2017, which may explain why this year's value ($308M) is slightly lower than the one recorded last year ($341M). This trend may also be explained by the apparent reduction in numbers of visitor nights in 2017-18 (575,358). Compared to 2016-17 (644,239), a 10.7% reduction was observed: https://economy.id.com.au/gladstone/tourism-visitors-nights. These numbers seem to fluctuate substantially, with trends ranging from +31.6 to -21.1% change from one year to another over the past five years.

Commercial fishing

The 'Commercial fishing' indicator has a low score of 0.36 which remains almost as low as the previous year (0.35) and represents a decline from 0.66 in 2014. This score relies upon the calculation of the Gross Value of Production (GVP) for Gladstone Harbour fisheries for 2018-19 which is based on 2018-19 catch and effort data and the latest price information from 2017. The baseline is a 10-year moving average.

This year, the GVP for Gladstone Harbour fisheries was of $0.99 million, a decline from last year ($1.64 million) and 2013-14 ($4.68 million). Although the 2018-19 dataset was incomplete at the time of reporting (Section 2.4), the comparison with last year is realistic as the data was accessed at the same time last year and was similarly incomplete.

Historically, there has been considerable variation in the GVP for Gladstone fisheries, but there is a substantial decline in recent years from $4.68 million in 2013-14 (Figure 12b). It should be noted, however, that line fishing data used to be included in these numbers but were removed in 2018. Nevertheless, there still is a significant decline in fish catch over the past few years.

Despite the recent decline in productivity, the economy of the Gladstone region remains relatively strong when compared with 10-year mean GVPs of neighbouring regions (Figure 12a). In 2018-19 the 10 year mean GVP from Gladstone was $3.17 million, compared with $1.28 million for Rockhampton/Yeppoon and $1.86 million for the Mackay region.
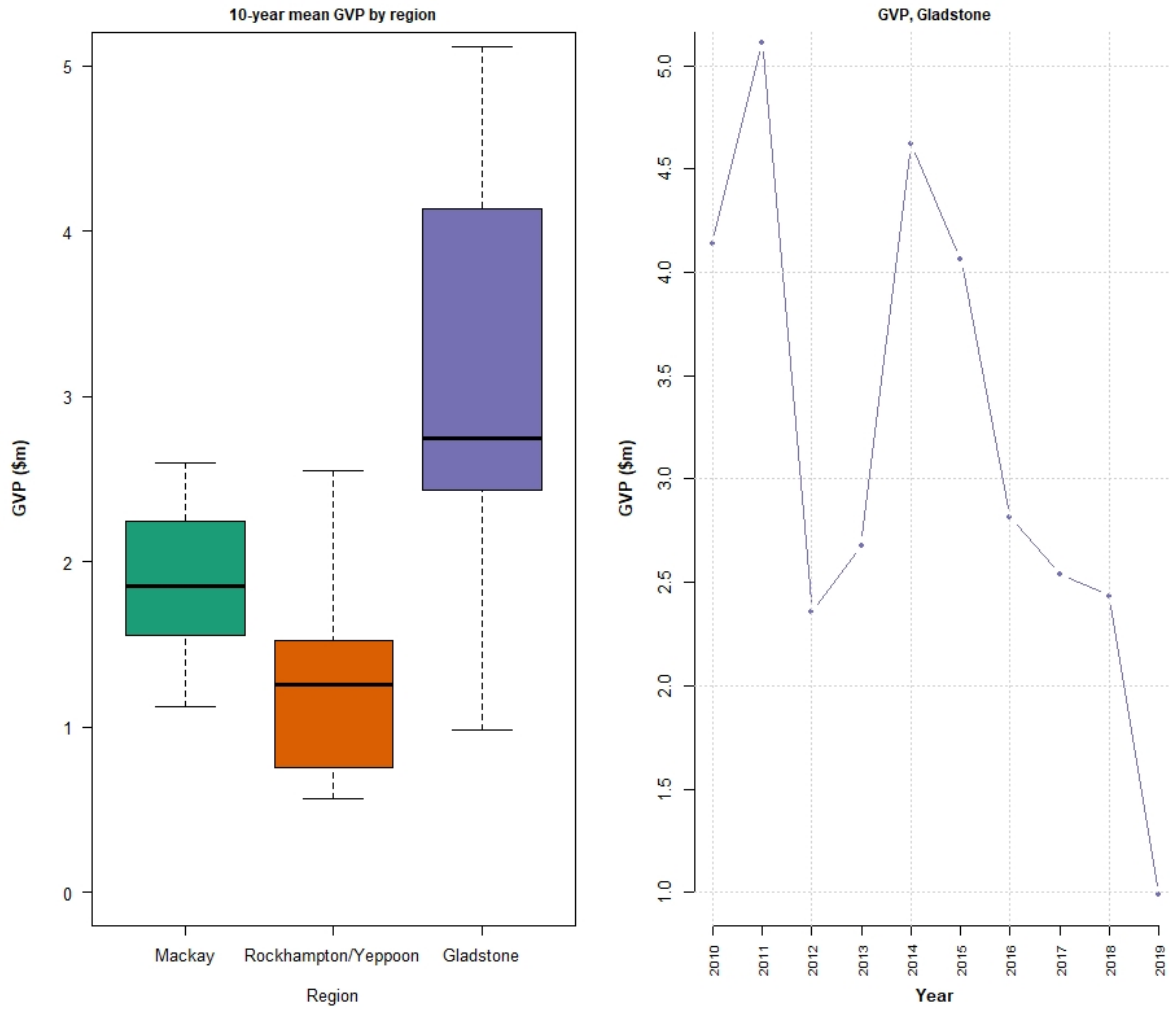
Figure 12: GVP variation for a) the three regions and for b) Gladstone over time

Seafood prices have remained relatively steady over the five years of reporting with the 2017 price information applied to estimate the GVP for this year (Figure 13).

	2013-14	2014-15	2015-16	2016-17
fish	7.53	7.2	7.27	7.41
crab	10.73	10.3	9.4	9.85
prawns	11.7	11.58	11.94	12.15
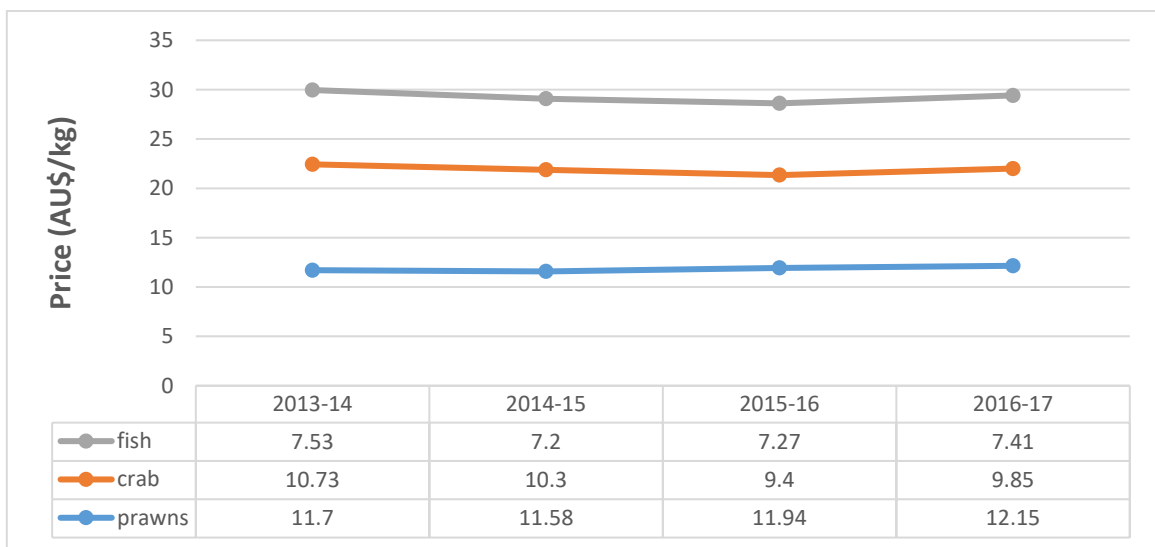
Figure 13: Price changes over time for fish, prawns and crabs

The indicator is comprised of scores originating from three measures: Net fisheries (0.22), Trawl fisheries (0.37) and Pot fisheries (0.54) (Table 9). These measures are weighted by their relative contribution to GVP which is dominated by otter trawl fisheries (43% of production [catch]; 47 % in 2017-18), Net fisheries (36% of production; 32% in 2017-18) and Pot fisheries (21% of production; 21% in 2017-18) (Figure 14).
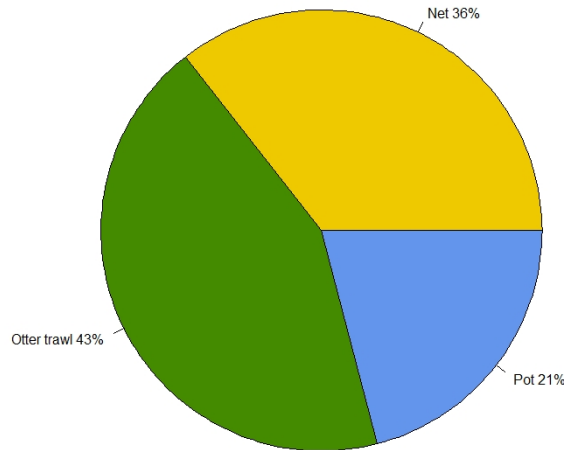
Figure 14: Contribution to total production by fishery sector

3.6.2 Economic stimulus

Just as in 2018, the 'Economic stimulus' indicator group obtains a C-grade with a score of 0.58. This represents a 29-point decline from its height of 0.87 in 2014. There are two indicators in this group: 'Employment' and 'Socio-economic status', which both remained unchanged since last year.

Employment

The 'Employment' indicator receives a score of 0.44 like in 2018. Although it has apparently remained stable over the past year, it represents a substantial decline from 2017 (0.53) and more notably from 2014 (0.72). The 'Employment' score is based on unemployment in the Gladstone LGA compared with the benchmark of unemployment rates in all Queensland LGAs.

In 2019, the unemployment rate for the March quarter was 7.3% compared to a rate of 8.0 for the same period in 2018, suggesting a slight improvement. In the last 12 months the relative position of Gladstone has remained unchanged. Compared to other LGAs in Queensland, Gladstone is in the 56% percentile of the cumulative unemployment proportion for the State[6] (Figure 15). Gladstone now has a higher unemployment rate than the State unemployment rate of 6.1% for March 2019

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[6] In the 'Queensland Regional Profile March 2019' report (Queensland Government, 2019), the Aurukun LGA was not included due to a lack of accuracy in the data. That LGA had recorded a very high unemployment rate in 2017 (66.6%) which, however, acts to increase the overall rate for Queensland and improves the relative position of Gladstone.

(Queensland Government, 2019) which has remained roughly equal to what it was last year around the same period (6.0% in March 2018[7]). For comparison, the unemployment rate in Gladstone is similar to that of the neighbouring regional population centre (LGAs) of Bundaberg (7.3%) and Rockhampton (7.4%).
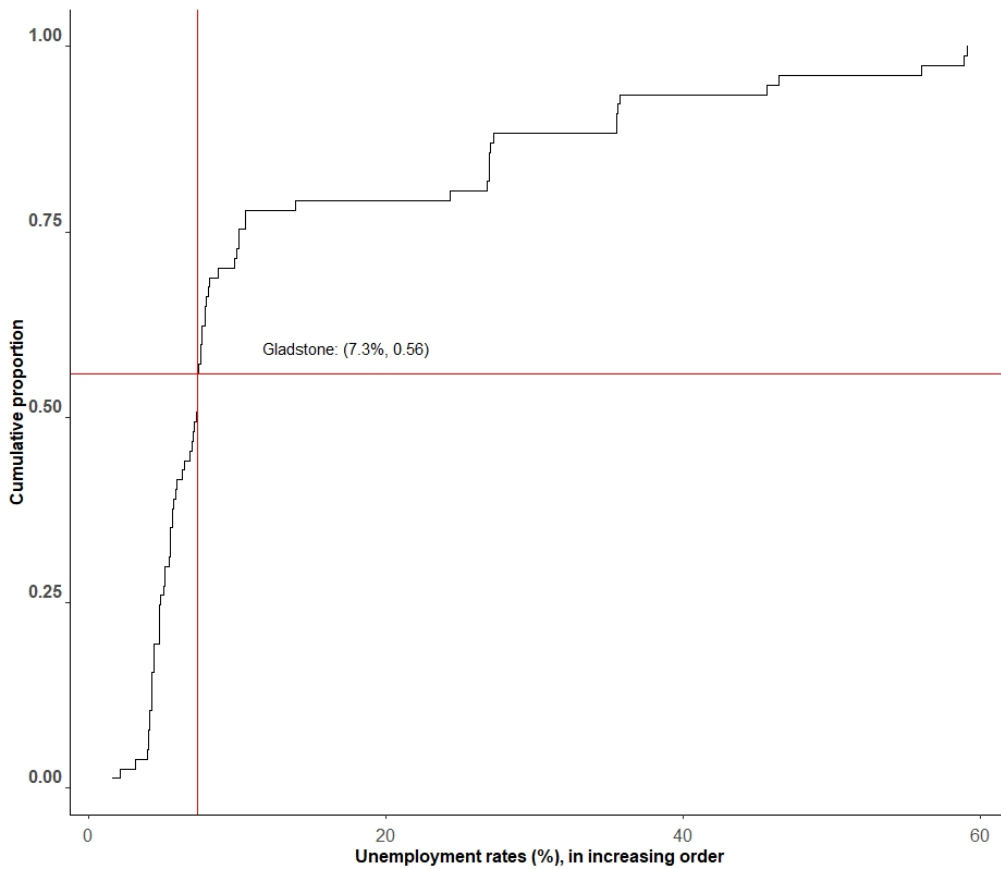
Figure 15: Distribution of unemployment rates for Queensland, March 2019

Socio-economic status

Like in 2018, the 'Socio‑economic status' indicator continues to score 0.64, which remains low compared with 0.70 in 2017 and 0.90 in 2014. 'Socio-economic status' is measured through the Index of Economic Resources (IER), a composite measure of the economic wellbeing of a community. The IER is formally calculated from the ABS Census data with established loadings for the composite variables. An annually revised estimate for the Gladstone region is derived from information collected in the CATI survey. In 2018 the ABS released the updated loadings and descriptions for the composite variables based on the 2016 Census data (Table 5) which are now applied to estimate the revised estimate for Gladstone. The same loadings are used this year.

The IER score for Gladstone estimated by the ABS for the 2011 and 2016 census data highlight the five-year decline in socio-economic status. The ABS estimated the IER score for Gladstone from the 2011 census data as 1040 which placed it in the 9th decile in the distribution of LGAs in Australia. In 2016, the IER was estimated at 994, placing it in the 7th decile (ABS Catalogue No. 2033.0.55.001).

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[7] ABS 6202.0, Labour force, March 2017, released 13 April 2017.

In 2019, the revised index for Gladstone was estimated at 999.41 (compared to 999.49 for last year) which places it in the 70th percentile in the 2016 distribution of LGAs in Australia (Figure 16). This translates into a score of 0.64 for the 'Socio‐economic status' indicator, similar to last year.
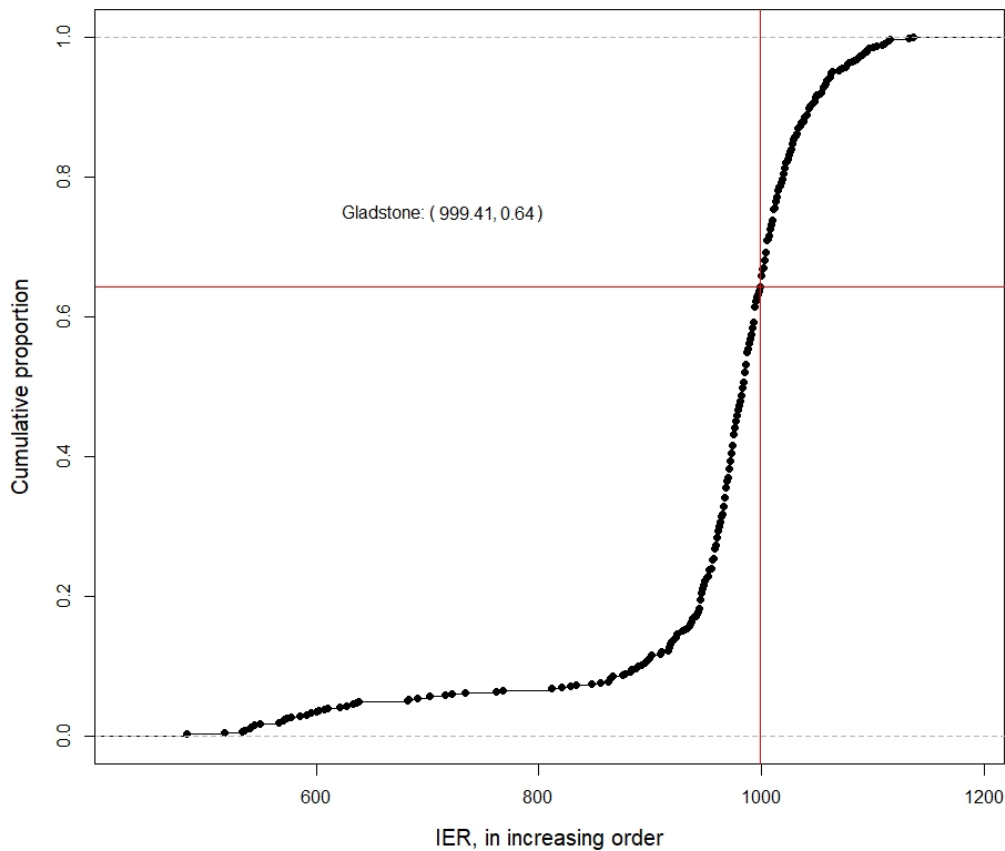
Figure 16: Distribution of IER scores Australia 2016, and 2019 estimate for Gladstone

3.6.3 Economic value (recreation)

The 'Economic value' indicator group was assessed as being B-grade with a score of 0.76 which represents a 2-point increase from 2018 and a 1-point increase from 0.75 in 2014. There are four indicators in this group representing the main types of recreational activity: land-based recreation, recreational fishing (land and water), beach recreation and water-based recreation. The scores are determined by the satisfaction rating (for the last recreational trip for each type of activity) and these are then weighted according to their relative economic value.

The score for 'Land-based recreation' (0.77) improved by one point from last year, driven by an improvement in satisfaction ratings (from 8.26 to 8.40),despite a reduced participation frequency (from 42.97 to 38.95 trips/yr). The score of 0.71 for 'Recreational fishing' represents a 3-point increase from last year with improvements in satisfaction ratings (from 7.36 to 7.7) and despite a reduced participation frequency (from 24.49 to 20.73 trips/yr). 'Beach recreation' (0.76) improved its score by one point from last year. Beach satisfaction ratings remained relatively stable from last year (from 8.22 to 8.23) and participation frequency increased slightly (from 39.35 to 40.2 trips/yr). Finally, the score for 'Water-based recreation' (0.76) increased by one point from 2018. Its satisfaction ratings also improved from 8.13 to 8.29 from last year. Participation frequency slightly declined from 20.01 to 19.59 trips/yr this year.

Details about the economic value of recreational activities have been outlined in Section 3.3. The overall value was estimated at $141.7 million, nearly a $4 million improvement from last year.

3.6.3 Economic component summary

The overall grade for the Economic component is a B (score of 0.73) which is a slight improvement from 0.72 in 2018 and 0.75 in 2014. The lower score is a result of increasing unemployment, declining socio-economic status ('Economic stimulus') associated with the end of the construction boom in Gladstone and a decline in the resources sector.

There has been no change in the score for 'Economic performance' (0.90) and little change for 'Economic value (recreation)' (from 0.74 to 0.76).

'Economic performance' continues to be dominated by 'Shipping' ($483 million) and 'Tourism' ($308 million). The economic value of recreation increased in importance with the inclusion of a fourth indicator for water-based recreation in 2018. The estimated value of recreation ($141.7 million) is 46% of the estimated value for tourism. The estimated value of recreational fishing ($26.6 million) is considerably higher than commercial fishing ($0.99 million).

The decline in 'Commercial fishing' values over the past few years warrants investigation. 'Shipping' scores seem to have reached a plateau which may be a consequence of the frontier chosen in 2014 (Pascoe et al., 2014) to assess capacity utilisation. The frontier might need to be adjusted every year to better assess productivity in Gladstone. A 2019 recommendation is made to explore different approaches for progressive frontier adjustment (Recommendation 2, Section 5.2).

4. Summary of results and trend analysis

A summary overview of the mean scores and standard deviations, as well as the distribution of the A-E grades is presented below for the three components. Each section also includes a trend analysis provided in a summary table of scores for all four reporting periods.

In each figure below there are two graphs. The top graph provides information about the mean report card scores and their standard deviations. The bottom graph provides information about how the mean score was derived from the different proportions in each of the A-E grades. For example, for the Social component (Figure 17) the mean score for 'Harbour access' is 0.67 which is comprised a 3.3% probability of being in Grade A, 78.6% in Grade B, 17.9% in Grade C and 0.2% in Grade D.

Overall, across the three components there has been relatively little change in the health of the harbour since 2018, but notable improvements since the 2014 baseline year of reporting are maintained. Recent changes in the past year have occurred mainly in the Economic component, with continuing declines in the indicators 'Employment' and 'Socio-economic status' in the 'Economic stimulus' group. Notable changes are also evident in 'Oil spills' ('Harbour safety') in the Social component.

4.1 Social component

The overall grade for the Social component is a B (score of 0.67) which represents no change from the previous year and an improvement since 2014 (0.58).

In the last year there has been no change in the scores for the 'Harbour access' and 'Liveability and wellbeing'. The 'Harbour usability' indicator group improved by one point from last year.

There has been a considerable change in the scores for 'Oil spills' (from 0.56 in 2018 to 0.66 this year), due to the lower number of oil spill incidents. This measure had scored 0.15 in 2014 and 0.38 in 2017, so there has been a steady improvement, especially when we consider that only 25% of the incidents occurred this year near the Gladstone Harbour. 'Marine safety incidents' scored 0.54 just as last year. It must be noted though that this measure fluctuates considerably from year to year; it had scored 0.24 in 2014, 0.76 in 2017 and 0.54 now and in 2018.

A summary overview of the mean scores and standard deviations, as well as the distribution of the A-E grades is presented for the Social component in Figures 17-20.

4.1.1 Social component summary figures
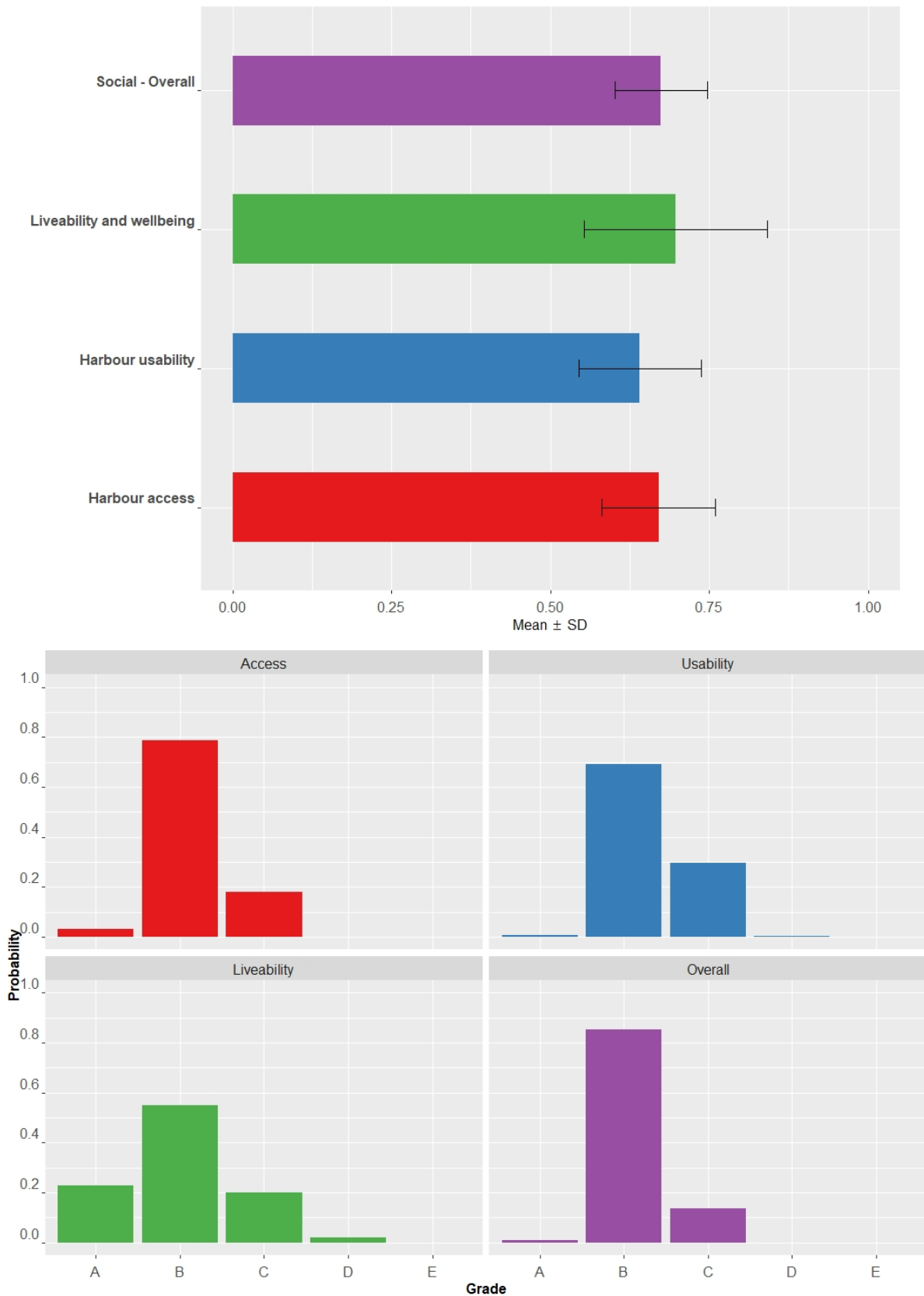
Figure 17: **Social component.** Mean scores, standard deviations and A-E grade distribution for the component and indicator groups
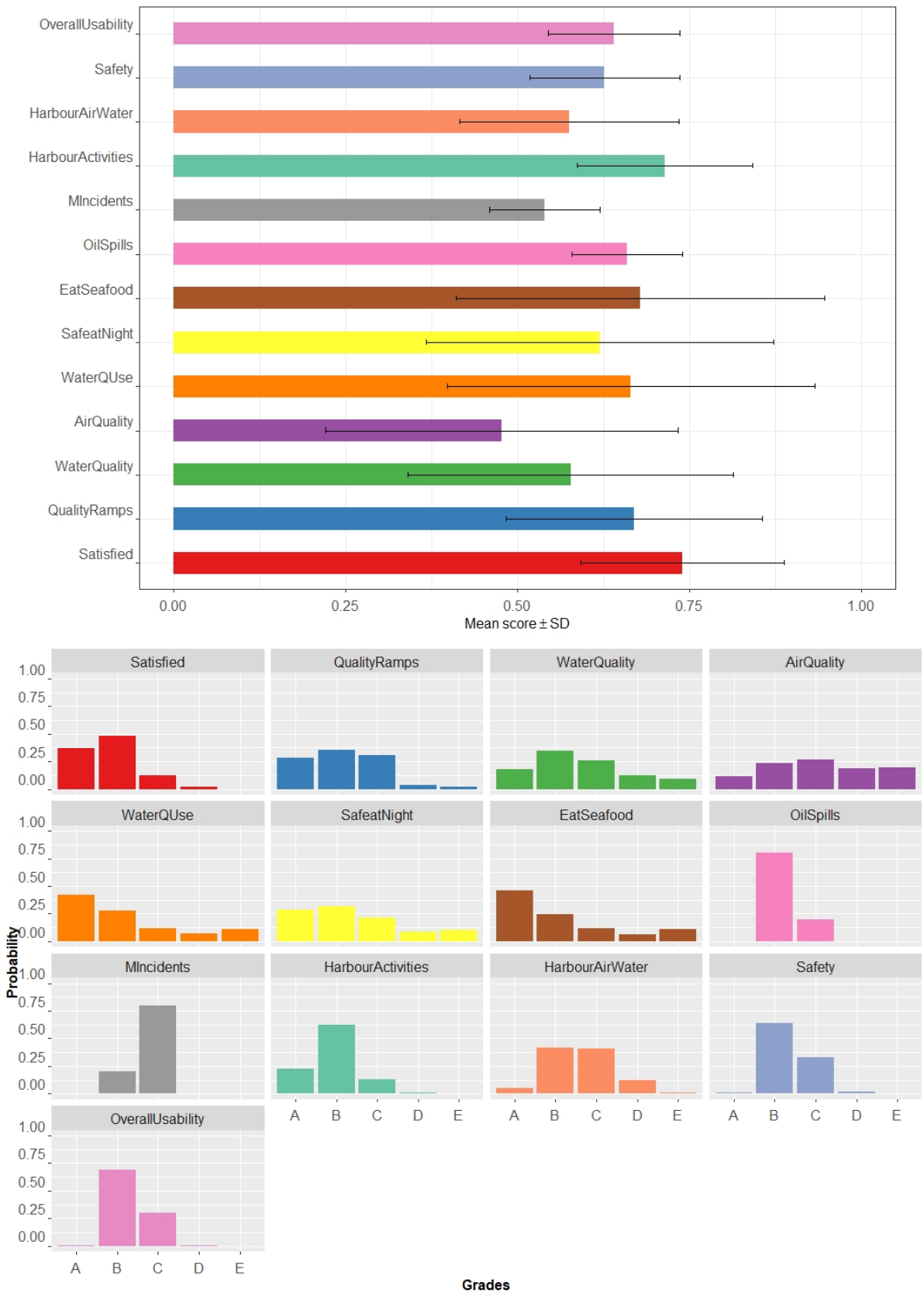
Figure 18: **Harbour usability.** Mean scores, standard deviations and A-E grade distribution for the group, indicators and measures
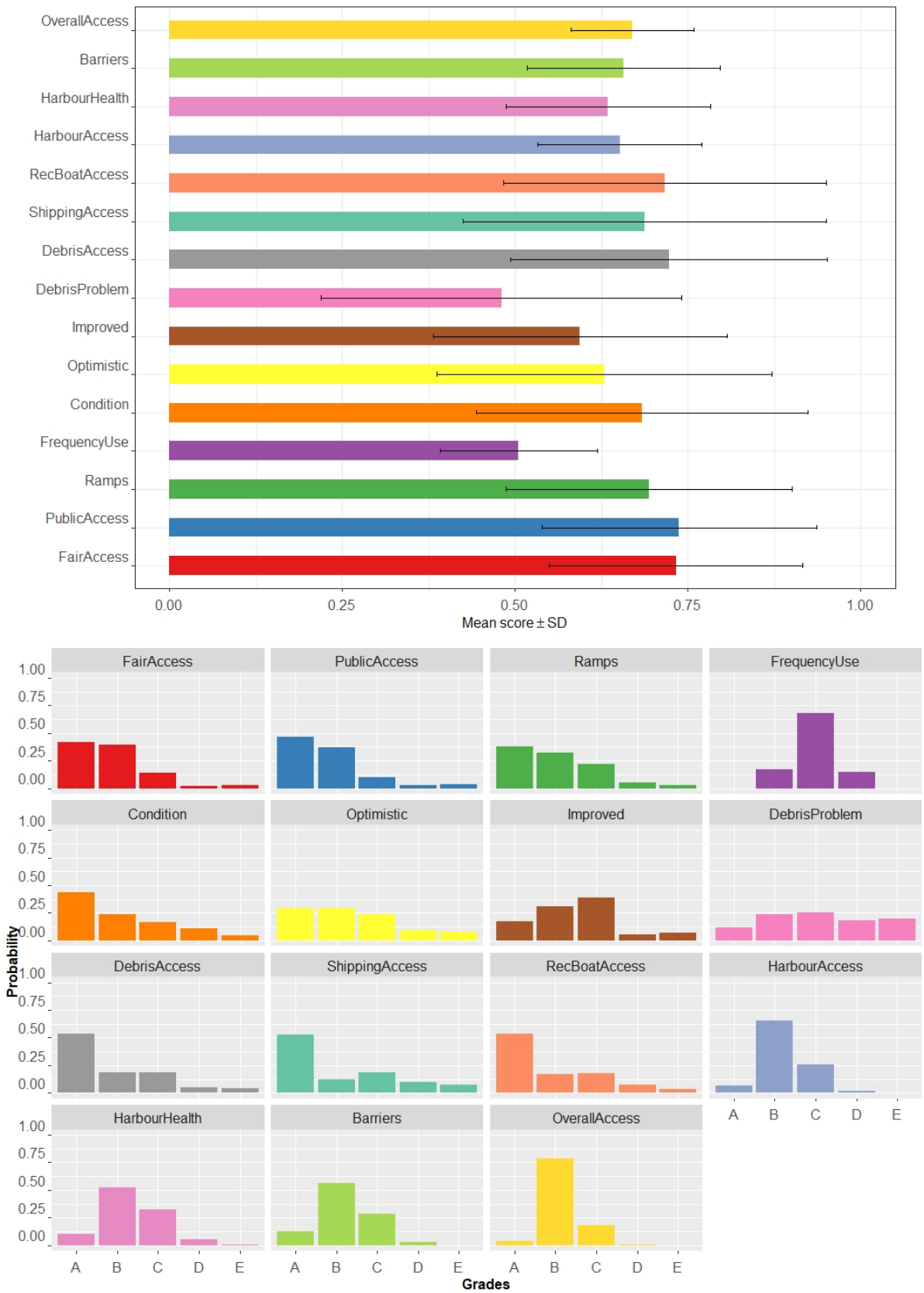
Figure 19: **Harbour access**. Mean scores, standard deviations and A-E grade distribution for the group, indicators and measures
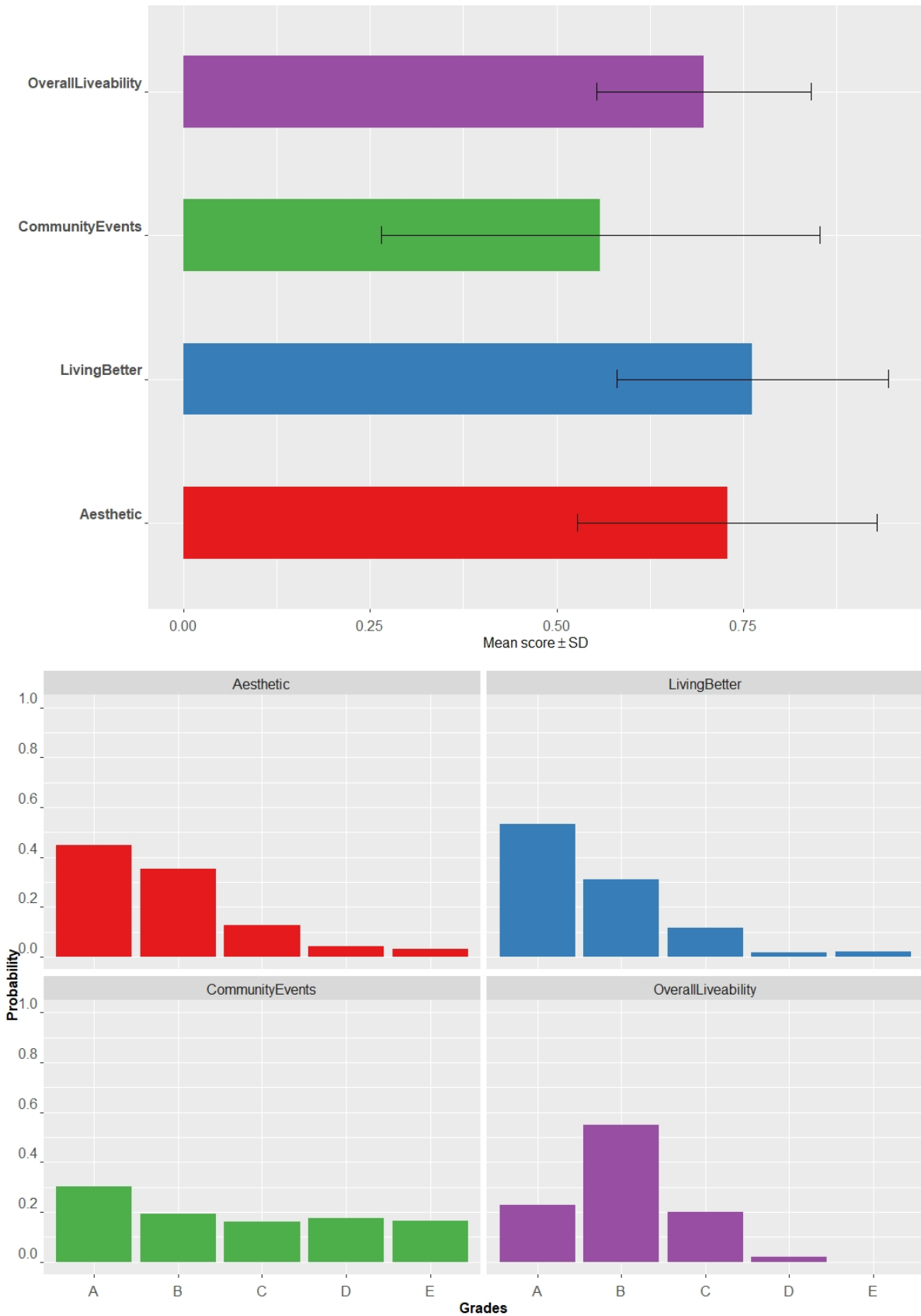
Figure 20: **Liveability and wellbeing.** Mean scores, standard deviations and A-E grade distribution for the group/indicators and measures

4.1.2 Social component summary of scores for trend analysis

There has been consistent improvement in the three indicator groups since the 2014 baseline (Figure 21). 'Liveability and Wellbeing' and 'Harbour access' seem to have made a sustained improvement while 'Harbour usability' has fluctuated. As stated earlier, fluctuations in 'Oil spills' and 'Marine safety incidents' numbers have had significant influence in driving 'Harbour usability'.
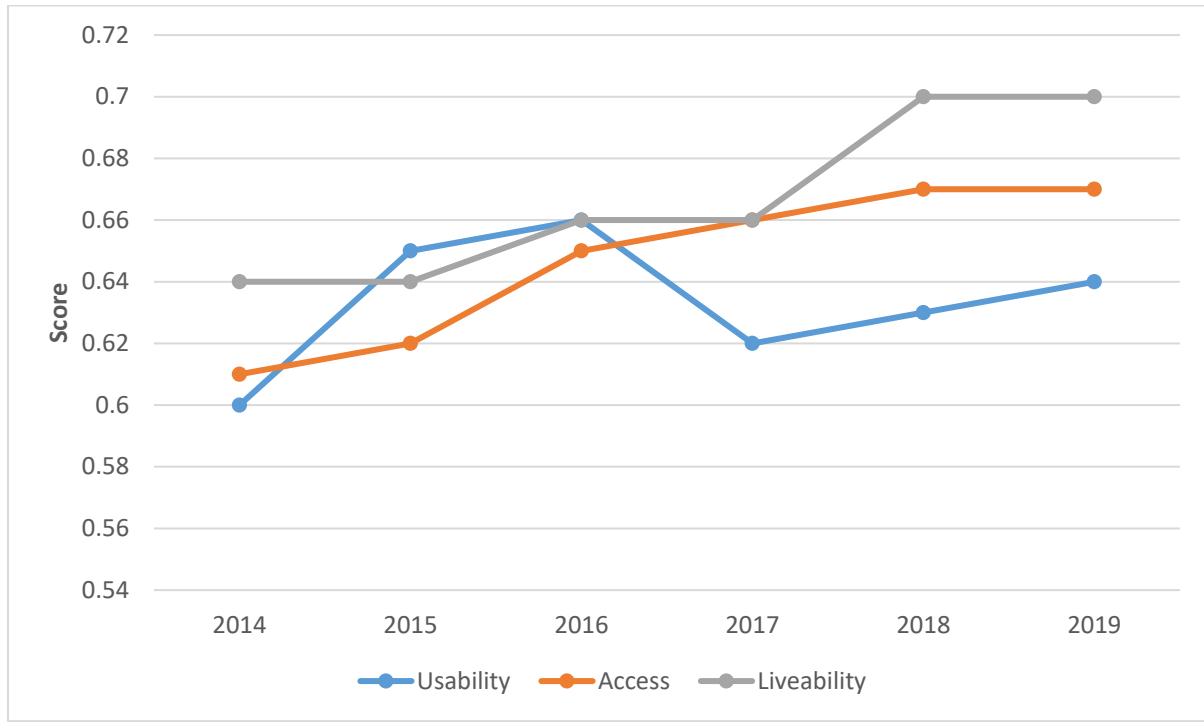
Figure 21: Temporal trends in scores for social indicator groups

Although there has been little change in the scores for most of the indicators in the past year, all indicators have improved in score since 2014 and some have even increased substantially (Table 10).

There have been some considerable improvements in indicators since 2014:

- Safety for human use (Harbour usability) – 25 points (despite large fluctuations between years)
- Air and water quality (Harbour usability) – 12 points
- Harbour health (Harbour access) – 10 points
- Liveability and wellbeing – 6 points
- Access to the harbour (Harbour access) – 6 points
- Boat ramps and public spaces (Harbour access) – 5 points

While others have shown more modest improvement:

- Recreational activities (Harbour usability) – 1 point
- Barriers to access (Harbour access) – 2 points

There are 23 measures in the social component and, since the 2014 baseline, most (20) have improved their score compared to 2014. Some measures have even shown stronger increases of 10 points or more, notably:

- Oil spills (51 points)
- Marine safety incidents (30 points)
- Satisfaction with water quality (19 points)

- Harbour condition great (14 points)
- Happy to eat seafood (13 points)

Other measures have shown slower improvements of over 5 points:
- Harbour condition improved in last year (9 points)
- Water quality not affecting harbour use (9 points)
- Satisfaction with air quality (8 points)
- Optimism about future harbour health (7 points)
- Fair access to harbour (6 points)
- Access to public spaces (6 points)
- Increased liveability (5 points)
- Frequency of use (boat ramps and public spaces) (5 points)

One measure records no improvement:
- People's satisfaction with their last recreational trip (Harbour usability).

Only one measure has declined since 2014, suggesting increasing concern by Gladstone residents:

- The problem of marine debris (Barrier to access) – 3 points

Note: the 'Aesthetic value' measure (Liveability and wellbeing) was only added last year so it is too early to draw conclusions on its trend.

Table 10: Annual summary of the Social component scores and grades

Social		Group		Indicators	2019	2018	2017	2016	2015	2014	Measures	2019	2018	2017	2016	2015	2014	19/14
		Usability		Recreational activities	**0.71**	0.70	0.69	0.67	0.69	0.70	How satisfied last recreational trip	**0.74**	0.71	0.70	0.66	0.70	0.74	0
2019	**0.67**	**2019**	**0.64**								Quality of ramps and facilities	**0.67**	0.68	0.68	0.68	0.66	0.63	+4
2018	0.67	2018	0.63	Air & water quality	**0.58**	0.58	0.56	0.55	0.52	0.46	Water quality (WQ) satisfaction	**0.58**	0.61	0.58	0.56	0.51	0.39	+19
2017	0.66	2017	0.62								Air quality satisfaction	**0.48**	0.47	0.47	0.45	0.43	0.40	+8
2016	0.66	2016	0.66								WQ affects harbour use	**0.67**	0.66	0.64	0.65	0.61	0.58	+9
2015	0.64	2015	0.65	Safety for human use	**0.63**	0.61	0.60	0.76	0.72	0.38	Marine safety incidents	**0.54**	0.54	0.76	0.90	0.88	0.24	+30
2014	0.58	2014	0.60								Oil spills	**0.66**	0.56	0.38	0.88	0.82	0.15	+51
											Safety at night	**0.62**	0.65	0.64	0.63	0.60	0.58	+4
											Happy to eat seafood	**0.68**	0.67	0.64	0.60	0.57	0.55	+13

		Access		Access to harbour	**0.73**	0.72	0.72	0.69	0.68	0.67	Fair access to harbour	**0.73**	0.72	0.72	0.69	0.68	0.67	+6
		2019	**0.67**	Boat ramps+	**0.65**	0.66	0.65	0.64	0.62	0.60	Frequency of use	**0.51**	0.51	0.51	0.51	0.49	0.46	+5

Social	Group		Indicators	2019	2018	2017	2016	2015	2014	Measures	2019	2018	2017	2016	2015	2014	19/14
	2018	0.67	public spaces							Number of boat ramps	**0.69**	0.72	0.69	0.67	0.65	0.65	+4
	2017	0.66								Access to public spaces	**0.74**	0.75	0.72	0.72	0.70	0.68	+6
	2016	0.65	Harbour	**0.63**	0.63	0.63	0.62	0.58	0.53	Great condition	**0.68**	0.66	0.66	0.65	0.60	0.54	+14
	2015	0.62	health							Optimistic about future health	**0.63**	0.64	0.61	0.61	0.57	0.56	+7
	2014	0.61								Improved last 12 months	**0.59**	0.60	0.60	0.61	0.56	0.50	+9
			Barriers to access	**0.66**	0.65	0.65	0.65	0.61	0.64	Marine debris a problem	**0.48**	0.50	0.50	0.51	0.50	0.51	-3
										Marine debris affects access	**0.72**	0.72	0.72	0.71	0.67	0.70	+2
										Shipping reduced my use	**0.69**	0.67	0.70	0.69	0.60	0.63	+4
										Recreation boats reduced my use	**0.72**	0.67	0.67	0.66	0.64	0.69	+3
	Liveability wellbeing		Liveability & wellbeing	**0.70**	0.70	0.66	0.66	0.64	0.64	Makes living in Gladstone better	**0.76**	0.77	0.74	0.73	0.70	0.71	+5
	Scores same as indicator									Participate in community events	**0.56**	0.52	0.54	0.55	0.53	0.53	+3
										Aesthetic value	**0.73**	0.75	na	na	na	na	na

4.2 Cultural component: 'Sense of place' indicator group

A summary overview of the mean scores and standard deviations, as well as the distribution of the A-E grades is presented for the Cultural 'Sense of place') indicator group in Figure 22.
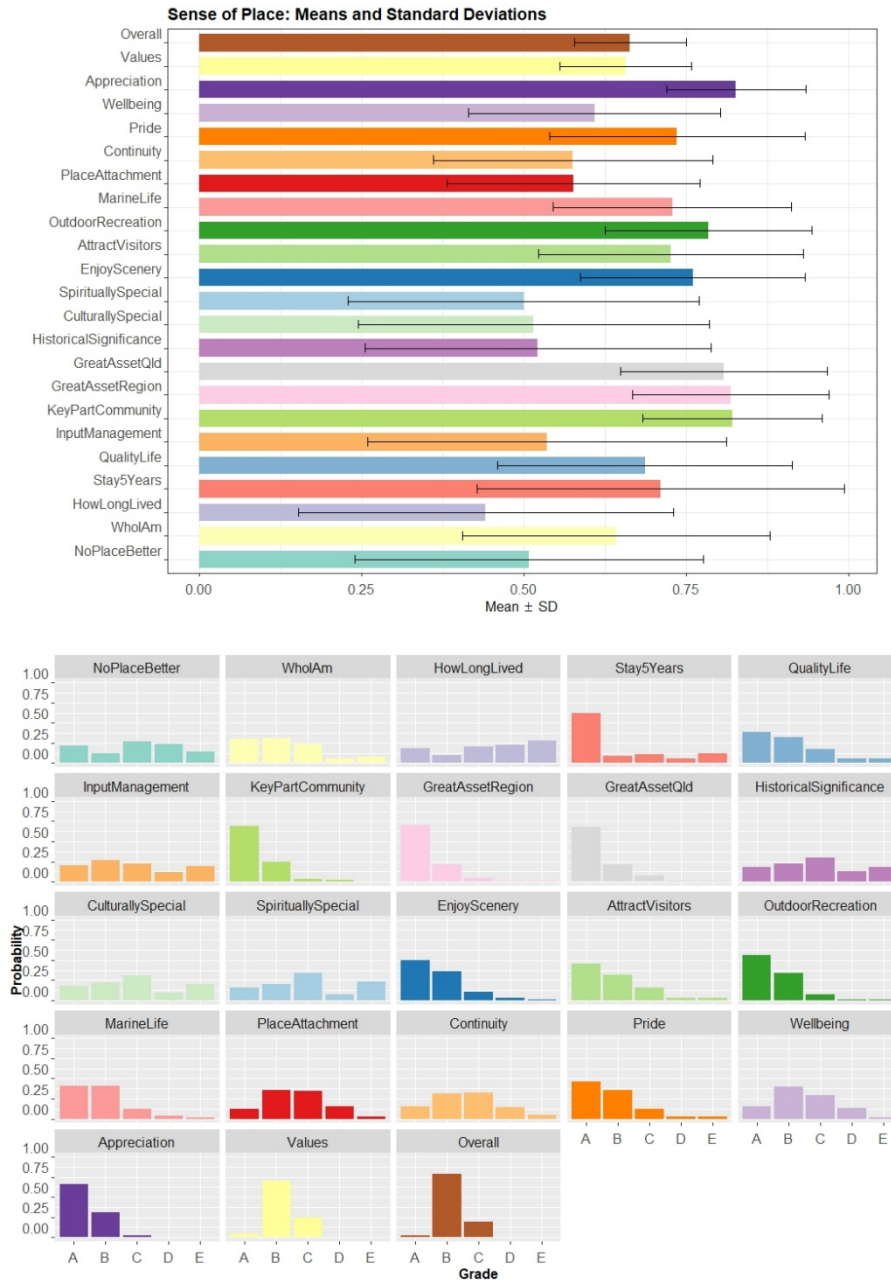
Figure 22: **'Sense of place'.** Mean scores, standard deviations and A-E grade distribution for the indicator group, indicators and measures

There has been little change in the score for the indicator group over time with a 2-point change from the 2014 baseline (Table 11). There are six indicators in this group with relatively small annual changes in indicator scores. The 'Pride in the region' and 'Well-being' indicators have recorded the largest improvements from the 2014 baseline (five and six points respectively), with the 2019 increase for 'Well-being' based on a 4-point score improvement for the measure 'Quality of life' and a 1-point increase in the measure 'Input into management'. All indicators have improved their score from the baseline, which is very encouraging.

Table 11: Annual summary of the 'Sense-of place' scores and grades

Group		Indicators	2019	2018	2017	2016	2015	2014	Measures	2019	2018	2017	2016	2015	2014	19/14
2019	**0.66**	**Place attachment**	0.58	0.56	0.57	0.59	0.55	0.55	No place better	0.51	0.51	0.51	0.56	0.49	0.49	+2
2018	0.65								Who I am	0.64	0.61	0.62	0.62	0.61	0.61	+3
2017	0.65	**Continuity**	0.58	0.53	0.54	0.59	0.57	0.57	How long lived in area	0.44	0.41	0.43	0.47	0.46	0.46	-2
2016	0.66								Plan to stay 5 years	0.71	0.65	0.64	0.71	0.68	0.68	+3
2015	0.65	**Pride in the region**	0.74	0.74	0.72	0.74	0.72	0.69	Proud living in Gladstone	0.74	0.74	0.72	0.74	0.69	0.69	+5
2014	0.64	**Well-being**	0.61	0.59	0.58	0.58	0.56	0.55	Quality of life	0.69	0.65	0.67	0.67	0.64	0.64	+5
									Input into management	0.54	0.53	0.50	0.49	0.46	0.46	+8
		Appreciation of the harbour	0.83	0.83	0.81	0.81	0.80	0.80	Key part of community	0.82	0.82	0.81	0.79	0.79	0.79	+3
									Great asset to region	0.82	0.82	0.80	0.80	0.79	0.79	+3
									Great asset to Queensland	0.81	0.81	0.79	0.80	0.81	0.81	0
		Values	0.66	0.65	0.66	0.66	0.64	0.64	Variety of marine life	0.73	0.73	0.71	0.71	0.64	0.64	+9
									Recreation opportunity	0.78	0.79	0.77	0.77	0.76	0.76	+2
									Affects visitors	0.73	0.73	0.71	0.72	0.67	0.67	+6
									Enjoy scenery and sights	0.76	0.77	0.76	0.75	0.75	0.75	+1
									Spiritually special places	0.50	0.47	0.52	0.53	0.52	0.52	-2
									Culturally special places	0.51	0.50	0.53	0.53	0.50	0.50	+1
									Historical significance	0.52	0.53	0.54	0.56	0.58	0.58	-6

There are 17 measures in this indicator group and since the 2014 baseline

- 5 have increased by 5 points or more. Notably
    - Variety of marine life (9 points)
    - Input into management (8 points)
    - Attract visitors (6 points)
- 6 have increased by 2-3 points
- 3 have increased by 0-1 points
- 3 have decreased by 2-6 points

4.3 Economic component

The overall grade for the Economic component is a B (score of 0.72) which is a slight decline from 0.74 in 2017 and 0.75 in 2014. The lower score is a result of increasing unemployment and declining socio-economic status ('Economic stimulus') associated with the end of the construction boom in Gladstone and a decline in the resources sector.

A summary overview of the mean scores and standard deviations, as well as the distribution of the A-E grades is presented for the Economic component in Figures 23-26.

4.3.1 Economic component summary figures
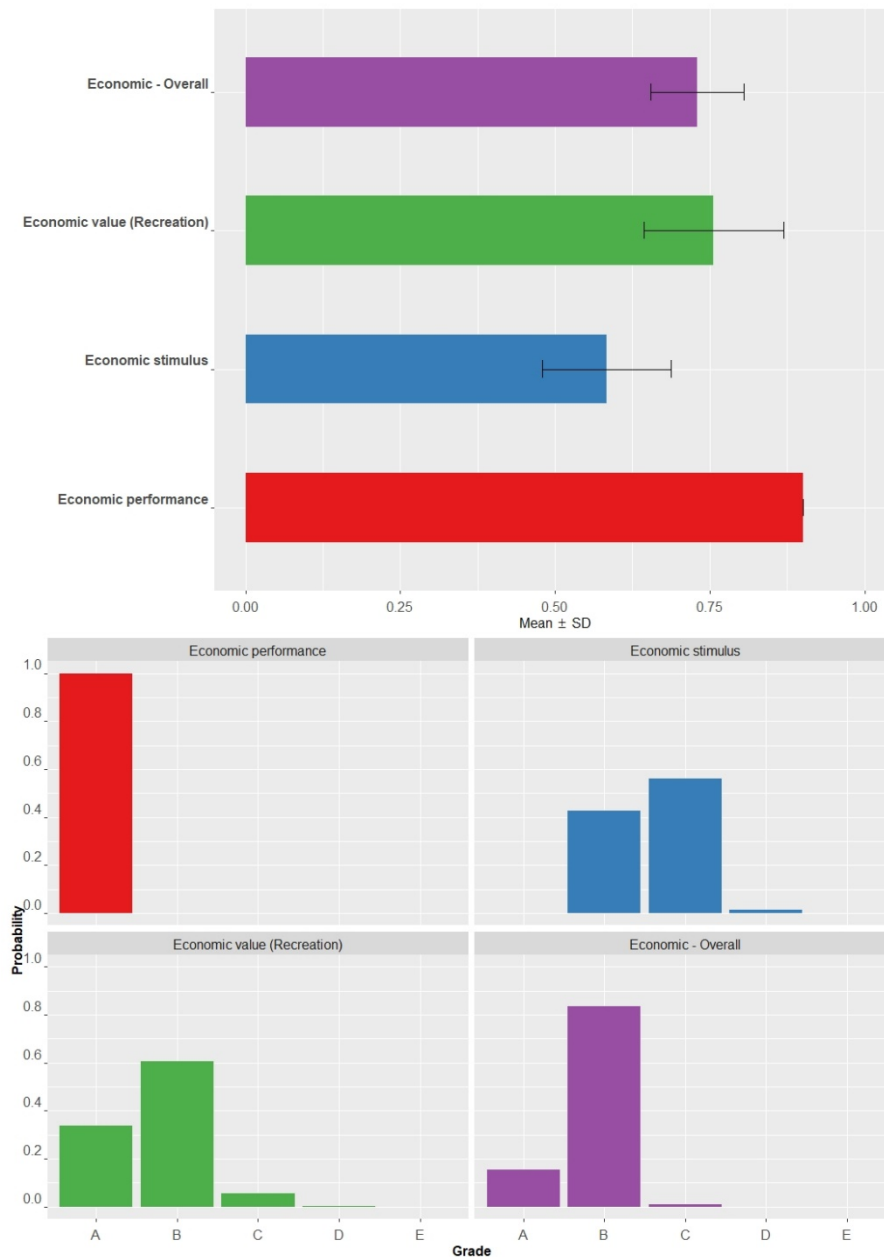
Figure 23: **Economic component**. Mean scores, standard deviations and A-E grade distribution for the component and indicator groups
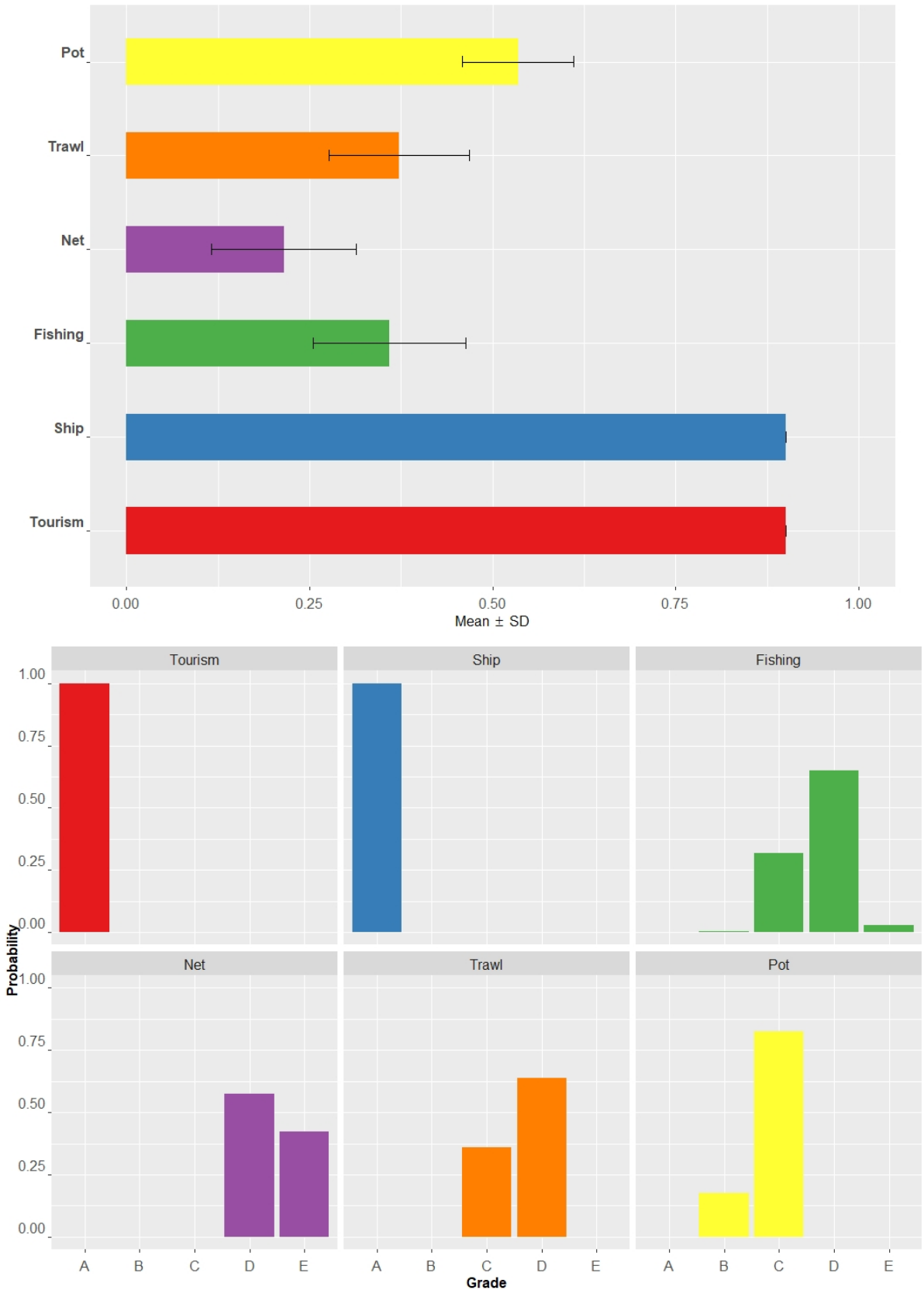
Figure 24: **Economic performance**. Mean scores, standard deviations and A-E grade distribution for the indicator group, indicator/measures and measures
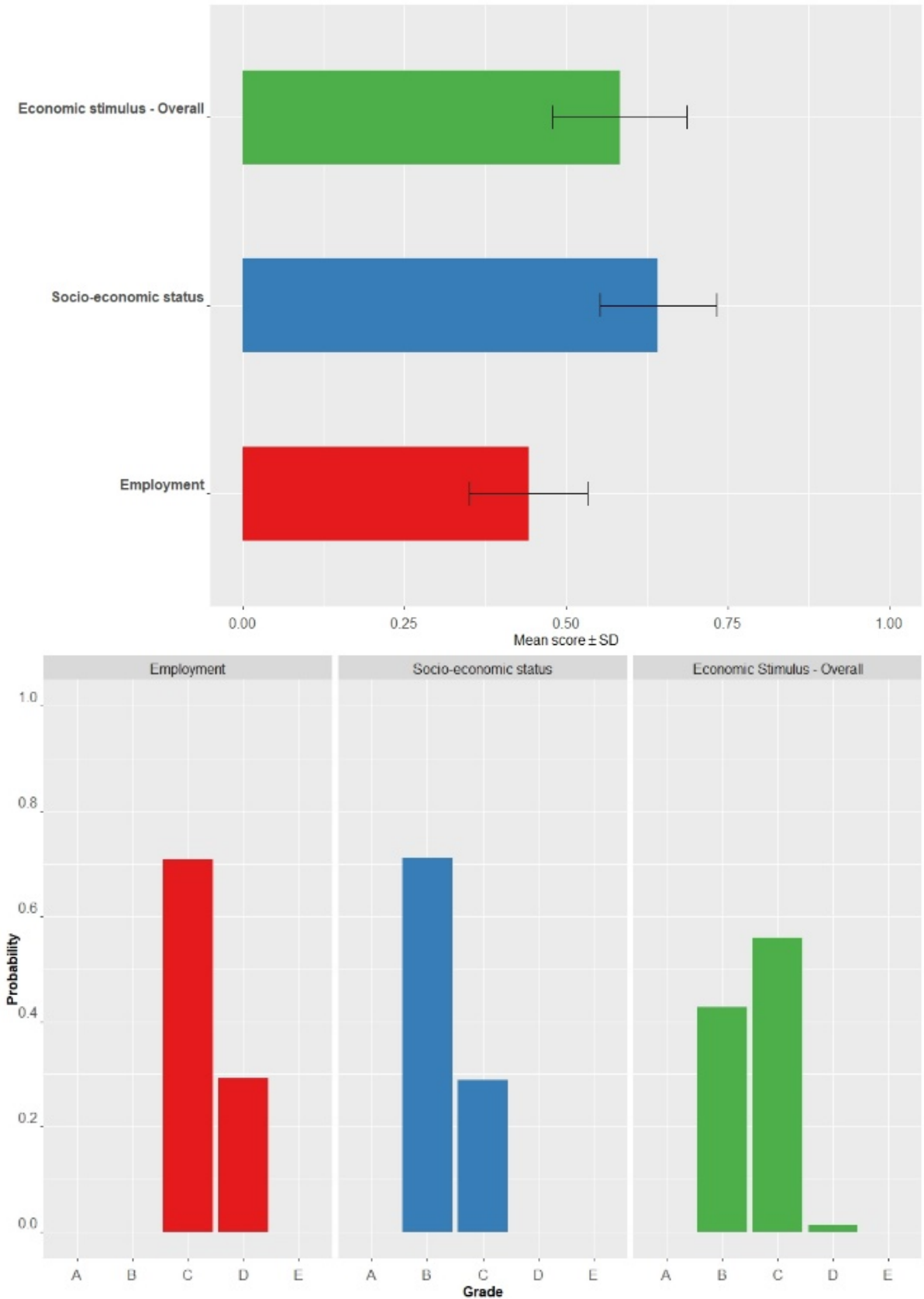
Figure 25: **Economic stimulus.** Mean scores, standard deviations and A-E grade distribution for the indicator group and indicator/measures
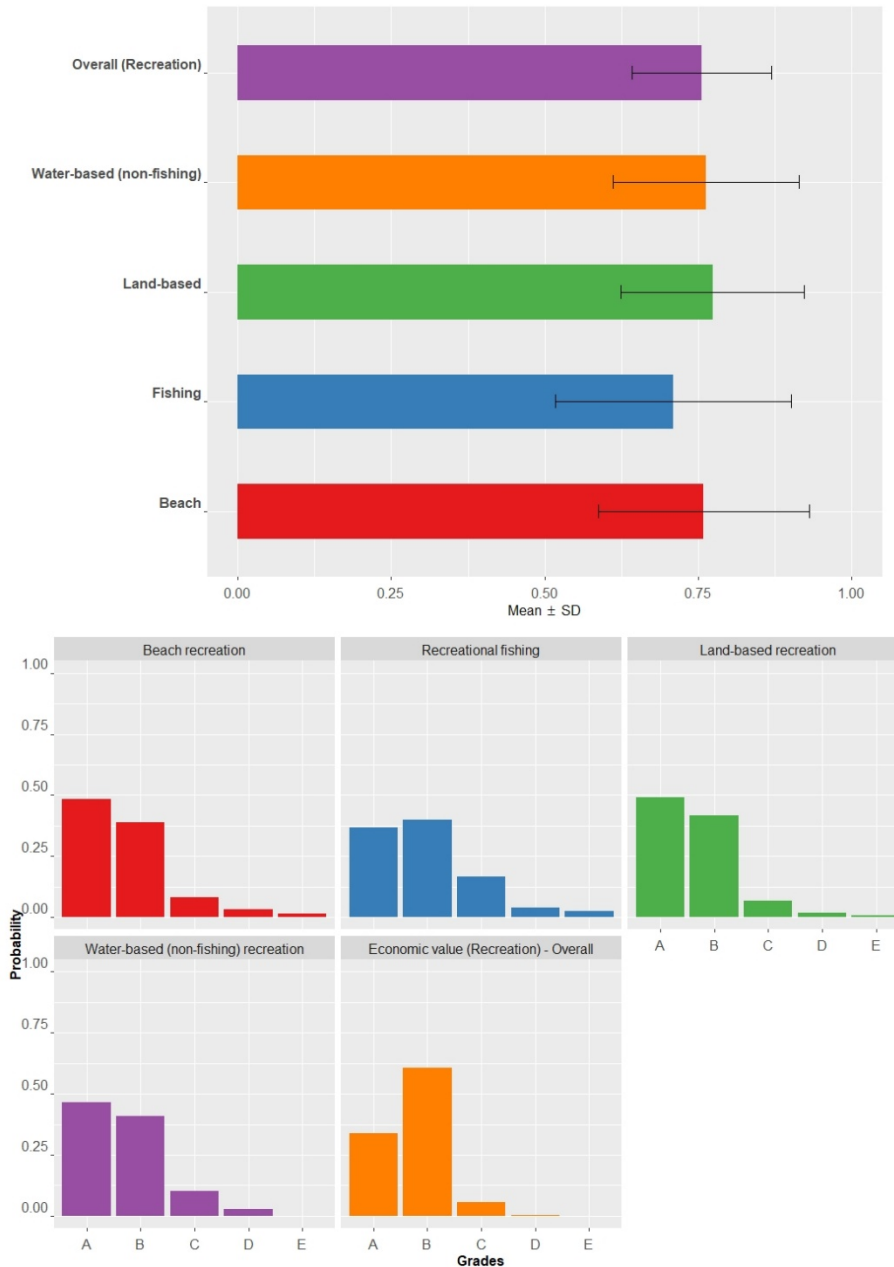
Figure 26: **Economic value (recreation).** A-E grade distribution for the overall indicator group and the indicators/measures

4.3.2 Economic component summary of scores for trend analysis

The score for the Economic component has only changed by two points from the 2014 baseline, but the trends for the three indicator groups are quite different (Table 12). 'Economic performance' has stabilised (approaching the full extent of its capacity) after continued improvement, 'Economic stimulus' remains low, and 'Economic value (recreation)' remains stable.

Since the 2014 baseline, the 'Tourism' indicator has recorded the strongest improvement (30 points) although there have been influential changes in secondary data sources. The 'Employment' and 'Socio-economic status' indicators have recorded significant declines of 28 points and 26 points respectively.

Table 12: Annual summary of the Economic component scores and grades

Economic		Group		Indicators	2019	2018	2017	2016	2015	2014	Measures	2019	2018	2017	2016	2015	2014	19/14
		Performance																
2019	**0.73**	**2019**	**0.90**	Shipping activity	**0.90**	0.90	0.90	0.87	0.82	0.83	Shipping	**0.90**	0.90	0.90	0.87	0.82	0.83	+7
2018	0.72	2018	0.90	Tourism	**0.90**	0.90	0.90	0.72	0.64	0.60	Expenditure	**0.90**	0.90	0.90	0.72	0.64	0.60	+30
2017	0.74	2017	0.90	Fishing	**0.36**	0.35	0.35	0.43	0.63	0.66	Net fisheries	**0.25**	0.25	0.30	0.34	0.30	na
2016	0.75	2016	0.87								Trawl fisheries	**0.29**	0.29	0.25	0.38	0.83	na
2015	0.77	2015	0.79								Pot fisheries	**0.64**	0.64	0.62	0.65	na	na
2014	0.75	2014	0.83														
		Stimulus																
		2019	**0.58**	Employment	**0.44**	0.44	0.53	0.62	0.64	0.72	Unemployment	**0.44**	0.44	0.53	0.62	0.64	0.72	-28
		2018	0.58	Socio-econ status	**0.64**	0.64	0.70	0.80	0.95	0.90	Index Econ Res	**0.64**	0.64	0.70	0.80	0.95	0.90	-26
		2017	0.67															
		2016	0.74															
		2015	0.82															
		2014	0.87															
		Value (Rec)																
		2019	**0.76**	Land recreation	**0.77**	0.76	0.76	0.76	0.73	0.76	Land rec	**0.77**	0.76	0.76	0.76	0.73	0.76	+1
		2018	0.74	Fishing rec	**0.71**	0.68	0.65	0.66	0.71	0.67	Fishing rec	**0.71**	0.68	0.65	0.66	0.71	0.67	+4
		2017	0.73	Beach rec	**0.76**	0.75	0.74	0.75	0.70	0.71	Beach rec	**0.76**	0.75	0.74	0.75	0.70	0.71	+5
		2016	0.73	Water rec	**0.76**	0.75	na	na	na	na	Water rec	**0.76**	0.75	na	na	na	na	na
		2015	0.72															
		2014	0.75															

5. Recommendations

Four recommendations are made in this report and briefly described below.

5.1 Recommendation 1: Update the weightings

The 'Community objective weightings' ('objectivedata.csv' data file) and 'Social scientist survey weighting information' ('SIdata.csv' data file) should be both updated next year through new surveys as these still rely on data that was collected in 2014 (Pascoe et al., 2014).

5.2 Recommendation 2: Update data envelopment analysis for 'Shipping activity'

The data envelopment analysis (DEA) used to produce the 'Shipping activity' scores should probably be revised next year as this score seems to have reached a plateau since 2017, which could be due to the frontier used to calculate this score. A frontier that progressively adjusts to export/import figures year after year could be a better option. Different options have been tested and submitted to the ISP.

5.3 Recommendation 3: Calculate new land-based recreation values

The 'Land-based recreation' indicator should be updated next year through the collection of new data in the CATI survey. This indicator still relies on a travel cost value calculated in 2014 (Pascoe et al., 2014) and should therefore be updated.

5.4 Recommendation 4: Improve CATI / Online survey ratio

8.7% of survey responses (38/439) were obtained through the Internet this year, saving survey costs, increasing the speed of data collection and matching the adoption of new technologies. A decision should be made on whether to target a larger proportion of responses collected next year through the Internet rather than using 'classic' CATI (landlines and mobile phones). Perhaps a 200-200 ratio of online and CATI responses could be an option.

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Appendix A. Assessment criteria: indicators and aggregation levels

Component	Indicator groups	Indicators	Measures
SOCIAL	**Harbour usability**	Satisfaction with harbour recreational activities	-How satisfied with last trip -Quality of ramps and facilities
		Perceptions of air and water quality	-Water quality satisfaction -Air quality satisfaction -Water quality does not affect use of the harbour
		Perceptions of harbour safety for human usage	-Marine safety incidents -Oil spills -Safety at night -Happy to eat seafood
	Harbour access	Satisfaction with access to the harbour	-Fair access to harbour
		Satisfaction with boat ramps and public spaces	-Frequency of use -Number of boat ramps -Access to public spaces
		Perceptions of harbour health	-Great condition -Optimistic about future health -Improved over the last 12 months
		Perceptions of barriers to access	-Marine debris is a problem -Marine debris affects access -Shipping reduced my use -Recreational boats reduced my use
	Liveability and wellbeing	Contribution of harbour to liveability and wellbeing	-Makes living in Gladstone a better experience -Participate in community events -Aesthetic value

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Component	Indicator groups	Indicators	Measures

CULTURAL

Sense of place

- **Place attachment**
  - -No place better
  - -Who I am

- **Continuity**
  - -How long lived in Gladstone
  - -Plan to be a resident in the next 5 years

- **Pride in the region**
  - -Feel proud living in Gladstone

- **Well-being**
  - -Quality of life
  - -Input into management

- **Appreciation of the harbour**
  - -Key part of community
  - -Great asset to the region
  - -Great asset to Queensland

- **Values**
  - -Variety of marine life
  - -Opportunities for outdoor recreation
  - -Affects visitors to the region
  - -Enjoy scenery and sights
  - -Spiritually special places
  - -Culturally special places
  - -Historical significance

Cultural heritage

- **Physical condition**
  - -Intactness of sites features
  - -Extent of current disturbance
  - -Management of threats

- **Management strategies**
  - -Recording
  - -Cultural management
  - -Stakeholders
  - -Monitoring
  - -Access
  - -Cultural resources

Component	Indicator groups	Indicators	Measures
ECONOMIC	**Economic performance**	Shipping activity	Shipping activity productivity calculated from monthly shipping movements by cargo type
		Tourism	Expenditure on hotel accommodation and food
		Commercial fishing	-Productivity of net fisheries -Productivity of trawl fisheries -Productivity of pot fisheries
	Economic stimulus	Employment	Unemployment statistics for the Gladstone Local Government Area
		Socio-economic status	Index of economic resources derived from 2016 census and updated using CATI survey data
	Economic value (Recreation)	Land based recreation	Land based recreation satisfaction + economic value
		Recreational fishing	Recreational fishing satisfaction + economic value
		Beach recreation	Beach recreation satisfaction + economic value
		Water based recreation	Water based recreation satisfaction + economic value

Appendix B. Community survey

GHHP social, cultural and economic indicators survey questions

To be read to respondents:

Hello! My name is _____

We are calling you today to request your participation in a survey on the social and economic status of Gladstone Harbour. The project is funded by the Gladstone Healthy Harbour Partnership and is being run by CQUniversity. We would like to ask you about your use of the Harbour and your perceptions about the harbour quality. The information will be presented in a report card on the health of the harbour, along with other information about the environmental status. This will help managers to make better decisions about how the harbour is managed.

The survey will take about 15 mins to complete. Your participation is entirely voluntary, and you are free to not answer any questions that you would prefer not to. All of your responses will remain strictly confidential.

Would you be happy to participate in this survey? Do you have any questions at this stage?

Age and gender segmentation questions Q64 and Q65 here

Q1. Do you live in the Gladstone region? (*screening question*)

1	Yes
2	No ➔ *Terminate*

Q2. In what suburb, town, or locality of the Gladstone region do you live? _____

1	Barney Point
2	Beecher
3	Benaraby
4	Boyne Island
5	Calliope
6	Clinton
7	Gladstone
8	Glen Eden
9	Kin Kora
10	Kirkwood
11	New Auckland
12	South Gladstone
13	Sun Valley
14	Tannum Sands

15	Telina
16	Toolooa
17	West Gladstone
19	Wooderson
21	Wurdong Heights
99	Other (Specify) ➜ *Q2o. Other specify box*

Q3. How long have you lived in the Gladstone region?

Q3y. _____ (years) (0-99)

Q3m. _____ (months) (01-12)

Q4. Do you own a boat?

1	Yes
2	No

We will be asking you a number of questions about your use of Gladstone harbour and the surrounding areas. The area that we are interested in includes the coast and waters up to the Narrows, including Graham Creek, to the north, and extending south to Tannum Sands and Colosseum Bay. To the east it extends just past the east coast of Facing Island. We will call this the Gladstone Harbour area from now on.

Q5. When you think of the Gladstone Harbour area what are the first three words that come into your mind (exclude uninformative words e.g. the, it, like, well and plural words)

Q5a. _____

Q5b. _____

Q5c. _____

▪▪▪

In this section of the survey we are going to ask you some questions about how you use the Gladstone Harbour area for recreation. We are going to ask you about four different types of recreational activity. The first relates to your use of beaches, the second to other shore-based activity, the third to recreational fishing (both from land and from a boat) and the fourth to other (non-fishing) water-based recreation.

Q6a. In the previous 12 months, did you visit the Gladstone Harbour area at all?

1	Yes
2	No

(If Q6a=1 go to Q6b, else Q7)

Q6b. If yes: were any of these visits for recreation (not including visits where you paid a tour or ferry operator)?

1   Yes
2   No

Q7. In the previous 12 months, do you think you used the Gladstone harbour area for any recreation activity more or less often than the year before, or about the same?

1   More
2   Less
3   About the same

(Q7A, Q7B, Q7C: Removed in 2017)

Q8. In the previous 12 months, how frequently did you use a boat ramp in the Gladstone Harbour area?

01   Never (0)
02   4-7 times a week (150-300 times per year)
03   2-3 times a week (80-149 times per year)
04   About once a week (40-79 times per year)
05   About once every 2 weeks (20-39 times per year)
06   About once a month (7-19 times per year)
07   About 4-6 times a year (4-6 times per year)
08   3 times per year (3 times per year)
09   2 times per year (2 time per year)
10   About once a year (1 per year)

Q9. In the previous 12 months have you visited the following beaches in the Gladstone Harbour area?

	Yes	No
Q9A. Barney Point	1	2
Q9B. Spinnaker Park artificial beach	1	2
Q9C. Boyne Is	1	2
Q9D. Tannum Sands	1	2
Q9E. Other (please specify) ➔ *Q9eo. Other specify box*	1	2

(If any Q9a-Q9e=1 go to Q10, else go to Q13)

Q10. In the previous 12 months, how often have you visited a **beach** on the mainland in the Gladstone Harbour area? For example, Barney Point, Spinnaker Park artificial beach, Boyne Is, Tannum sands. Do not consider beaches further south than Tannum Sands.

01   Never (0)   *(➔ go to Q13)*

02   4-7 times a week (150-300 times per year)
03   2-3 times a week (80-149 times per year)
04   About once a week (40-79 times per year)
05   About once every 2 weeks (20-39 times per year)
06   About once a month (7-19 times per year)
07   About 4-6 times a year (4-6 times per year)
08   3 times per year (3 times per year)
09   2 times per year (2 time per year)
10   About once a year (1 per year)

(if Q10 any code 2-10 go to Q11b, else Q13)

Q11b. Thinking of the **last trip you made to a beach** in the Gladstone Harbour area, how satisfied were you overall with your experience? *On a scale for 1 to 10 where 1= very unsatisfied to 10= very satisfied.*

Very unsatisfied									Very satisfied
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q16. Thinking back to the **last time** you went to the beach in the Gladstone harbour area, how did you get to the beach from your home? i.e. What form of transport did you use? *(Multiple allowed)*

1   Walk
2   Bicycle
3   Motor vehicle
9   Other

Q17. Approximately how many kilometres is it from your home to the beach?
_____ kms (1-99)

Q18. Approximately how long did it take to get there (one way)

Q18h. _____ hrs (0-10)

Q18m. _____ mins (0-59)

Q19. How many people did you go with? Count only those, including yourself, in the same vehicle as you.

Q19a. No of adults (including yourself) _____ (1-99)

Q19c. No of children (16 yrs and under) _____ (0-99)

Q20. Approximately how long did your recreational activity last? (Use proportion if required e.g. 1.5 hours)

_____ hrs (0.1-72 hrs)

Q21a. Did you spend most of your time doing this activity or did other activities as well such as shopping or visiting friends?

1   Just the one activity ➔ *go to Q13*
2   More than one activity

(If Q21a=2 go to Q21b else Q13)

Q21b. Approximately as a percentage, what proportion of your time was spent doing the recreational activity. Please do not include travel time.

_____ % (1-100%)

(Q22, Q23K, Q23M, Q24L, Q24D: Removed in 2019)

Q13. In the last 12 months did you undertake any of the following other **shore-based activities** in the Gladstone Harbour area?

	Yes	No
Q13a. Walking	1	2
Q13b. Cycling	1	2
Q13c. Running	1	2
Q13d. Picnicking or barbecuing	1	2
Q13e. Removed for 2017 survey		
Q13f. Relaxing by the water	1	2
Q13g. Sporting events	1	2
Q13h. Community events	1	2
Q13i. Other (specify) ➔ **Q13io.** *Other specify box*	1	2

(If any Q13a-Q13i=1 go to Q14, else go to Q12)

Q14. In the last year, how often have you done **other shore-based recreation** in the Gladstone Harbour area?

01   Never (0)   (➔ *go to Q12*)
02   4-7 times a week (150-300 times per year)
03   2-3 times a week (80-149 times per year)
04   About once a week (40-79 times per year)
05   About once every 2 weeks (20-39 times per year)

06   About once a month (7-19 times per year)
07   About 4-6 times a year (4-6 times per year)
08   3 times per year (3 times per year)
09   2 times per year (2 time per year)
10   About once a year (1 per year)

(Q15: Removed in 2016)

(if Q14 any code 2-10 go to Q15b, else Q12)

Q15b. Thinking of the **last shore-based recreation trip** you made in the Gladstone Harbour area, how satisfied were you overall with your experience? *On a scale for 1 to 10 where 1= very unsatisfied to 10= very satisfied.*

Very unsatisfied									Very satisfied
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

• •

We would now like you to think about any **water-based activity** you may have undertaken in the Gladstone harbour and surrounding area in the last year, **but not counting fishing trips (where fishing was the primary purpose)**. We are interested in trips for boating, water-sports, swimming, etc. We ask about fishing trips next.

We do not want you to include trips on the ferry or commercial boat cruises or other activities where you paid a commercial operator. We are also only interested in trips where you spend the majority of the trip in the Gladstone Harbour area. We are not interested in trips where you travelled through the harbour to get to somewhere else.

Q12. In the last 12 months, did you undertake any of the following water-based activities in the Gladstone Harbour area?

	Yes	No
Q12a. Motorised boating –general boat recreation	1	2
Q12b. Motorised water sports (e.g., water skiing, jet-skiing)	1	2
Q12c. Non-motorised water sports (e.g. Kayaking, kite surfing, paddle boarding, rowing, windsurfing)	1	2
Q12d. Sailing	1	2
Q12e. Swimming (but not from a beach)	1	2
Q12f. Scuba or snorkelling	1	2

Q12g. Other(specify) ➔ *Q12go. Other specify box*	1	2

(If any Q12a-Q12g=1 go to Q12A1, else go to Q11)

Q12A1. How often have you done-**water-based recreation** in the Gladstone Harbour area?

01   Never (0)   (➔ *go to Q11*)
02   4-7 times a week (150-300 times per year)
03   2-3 times a week (80-149 times per year)
04   About once a week (40-79 times per year)
05   About once every 2 weeks (20-39 times per year)
06   About once a month (7-19 times per year)
07   About 4-6 times a year (4-6 times per year)
08   3 times per year (3 times per year)
09   2 times per year (2 time per year)
10   About once a year (1 per year)

(if Q12A1 any code 2-10 go to Q12B1, else Q11)

Q12B1. Thinking of the last **water-based recreation trip (not recreational fishing)** to the Gladstone Harbour area, how satisfied were you overall with your experience? *On a scale for 1 to 10 where 1= very unsatisfied to 10= very satisfied.*

Very unsatisfied									Very satisfied
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

▪▪

We would now like you to think about any recreational fishing trips you may have undertaken in the Gladstone harbour and surrounding area in the last year. We do not want you to include commercial trips where you paid a commercial operator. We are also only interested in trips where you spend the majority of the trip in the Gladstone Harbour area. We are not interested in trips where you travelled through the harbour to get to somewhere else.

Q11. In the last 12 months, did you undertake any **recreational fishing** trips, either shore-based or boat based, in the Gladstone Harbour?

1   Yes
2   No ➔ *go to Q26*

(if Q11=1 go to Q11a, else go to Q26)

Q11a. How often have you been **recreational fishing** in the Gladstone Harbour area?

01   Never (0)   (➔ *go to Q26*)

02   4-7 times a week (150-300 times per year)
03   2-3 times a week (80-149 times per year)
04   About once a week (40-79 times per year)
05   About once every 2 weeks (20-39 times per year)
06   About once a month (7-19 times per year)
07   About 4-6 times a year (4-6 times per year)
08   3 times per year (3 times per year)
09   2 times per year (2 time per year)
10   About once a year (1 per year)
(if Q11a any code 2-10 go to Q25 else Q26)

Q25. Thinking of the last recreational fishing trip to the Gladstone Harbour area, how satisfied were you overall with your experience? *On a scale for 1 to 10 where 1= very unsatisfied to 10= very satisfied.*

Very unsatisfied				Very slightly unsatisfied	Very slightly satisfied				Very satisfied
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

We are now going to ask you a few questions about the recreational facilities around the Gladstone harbour area.

Do you agree or disagree with the following statements on a scale from 1 to 10 with 1=strongly disagree to 10=strongly agree.
(Rotate Q26 to Q32 (Q31 last in block))

	Strongly Disagree									Strongly Agree	NA/DK
	1	2	3	4	5	6	7	8	9	10	99
Q26. I am satisfied with the level of access to public spaces around Gladstone Harbour											
Q27. I am satisfied with the number of boat ramps available in the Gladstone Harbour area											

	Strongly Disagree							Strongly Agree	NA/DK
Q28. I am satisfied with the quality of boat ramps, available in the Gladstone Harbour area									
Q28a. I am satisfied with facilities associated with boat ramps in the Gladstone Harbour area									
Q29. I have fair access to Gladstone Harbour compared to other users of the harbour									
Q30. There are other places that are better than the Gladstone Harbour area for the recreational activities that I do									
Q32. The amount of recreational boating activity in Gladstone Harbour has reduced my use of the area									
Q31. The amount of commercial shipping in Gladstone Harbour has reduced my use of the area									

▪▪▪

We are now going to ask you some more general questions about your impression of the Gladstone harbour area.

Do you agree or disagree with the following statements on a scale from 1 to 10 with 1=strongly disagree to 10=strongly agree.

(Rotate Q33 to Q46)

With 1=strongly disagree to 10=strongly agree	Strongly Disagree									Strongly Agree	NA/DK
	1	2	3	4	5	6	7	8	9	10	99
Q33. The Gladstone Harbour area is not in great condition											
Q34. I feel optimistic about the future health of Gladstone Harbour											
Q35. The health of the harbour has improved in the past 12 months											
Q36. Marine debris and litter is not a problem in Gladstone Harbour											
Q37. The amount of marine debris and litter in Gladstone Harbour affects my access to the area											
Q40. I think water quality in Gladstone Harbour is in good condition											
Q41. I think air quality in Gladstone Harbour is in good condition											
Q42. The water quality in Gladstone Harbour has not affected how often I use the area in the last 12 months											
Q43. I would be happy to eat seafood caught in the Gladstone Harbour area											
Q44. I feel safe being in the Gladstone Harbour area at night											
Q45. Gladstone Harbour makes living in Gladstone a better experience											
Q45a. I enjoy going to the harbour because it is beautiful to look at											

With 1=strongly disagree to 10=strongly agree	Strongly Disagree								Strongly Agree	NA/DK
Q45b. I enjoy going to the harbour because of its natural beauty										
Q46. I rarely participate in community events in the Gladstone Harbour area										

(NOTE: Q45a and Q45b added in 2017. Q38 and Q39 slots have never been used: See 2014 questionnaire)

We are now going to ask you some questions about your general perceptions on how the harbour is managed and how important it is to you.

Do you agree or disagree with the following statements (1-10)?

(Rotate Q47 to Q54)

With 1=strongly disagree to 10=strongly agree	Strongly Disagree								Strongly Agree	NA/DK
Q47. I feel able to have input into the management of the Gladstone Harbour if I choose to										
Q50. I feel proud that I live in the Gladstone community										
Q51. The Gladstone Harbour area is part of who I am										
Q52. The Gladstone Harbour area improves my quality of life										
Q53. I do not plan to be a resident of this region in the next 5 years										
Q54. The Gladstone Harbour is a key part of the Gladstone community										

(Note: Q48 and Q49: removed in 2017)

We are now going to ask you questions about what you value about Gladstone harbour. Do you agree or disagree with the following statements (1-10)?

(Rotate Q55 to Q63)

With 1=strongly disagree to 10=strongly agree	Disagree									Agree	NA/DK
	1	2	3	4	5	6	7	8	9	10	
Q55. I value the Gladstone Harbour area because it supports a variety of marine life											
Q56. I value the Gladstone Harbour area because it provides opportunities for outdoor recreation											
Q57. I value the Gladstone Harbour area because it attracts visitors to the region											
Q58. The Gladstone Harbour area is a great asset for the economy of this region											
Q59. The Gladstone Harbour area is a great asset for the economy of Queensland											
Q60. I value the Gladstone Harbour area because I enjoy the scenery and sights											
Q61. I value the Gladstone Harbour area because there are spiritually special places											
Q62. I value the Gladstone Harbour area because there are culturally special places											
Q63. I value the Gladstone Harbour area because it has historical significance that matters to me											

ECONOMIC AND DEMOGRAPHIC

We are now going to ask some questions about you and your household. This is to help us compare your responses with other studies in the area and also other respondents.

(Q64 and Q65 Online placement)

Q64. What is your age?

18-24	25-34	35-44	45-54	55-64	65+
☐	☐	☐	☐	☐	☐

Q65. Are you male ☐   female ☐   prefer not to say ☐ *(Added 2019)*

Q66. Do you identify as a Traditional Owner of the area?

1   Yes
2   No

Q67A. What is the highest level of education you have obtained?

1   Year 11 or below
2   Year 12
3   Certificate (III or IV)/ Trade certificate
4   Diploma Level or Advanced Diploma
5   Bachelor degree
6   Graduate Certificate or Graduate Diploma
7   Postgraduate degree (Masters or PhD)
9   Other (please specify) ➜ *Q67ao. Other specify box*

Q67. What is your approximate household income (before tax)?

code	1	2	3	4	5	6	8	9
weekly	≤$499	$500 - $999	$1000 - $1499	$1500 - $1999	$2000 - $2499	$2500 - $3499	≥$3500	Refused/Prefer not to say
Annual	≤$25,999	$26,000- $51,999	$52,000- $77,999	$78,000- $103,999	$104,000- $129,999	$130,000- $181,999	≥$182,000	

(Note: Category 7: removed in 2017 survey (merged with code 6))

Q68. How many adults (>18 years old) live in your household?   [   ]

Q69. How many children 15 years and over (but under 18) live in your household? [   ]

Q70. How many children younger than 15 years old live in your household?   [   ]

Q71. Is any adult in the household unemployed? (exclude stay at home mums/dads not actively seeking work, or retirees)

1   Yes
2   No

Q72. Is any adult in the household self-employed?

1   Yes

2   No

Q73. Is your home:

1   Owned with a mortgage? ➔ *go to Q73a*
2   Owned without a mortgage? ➔ *go to Q74*
3   Rented? ➔ *go to Q73b*

Q73a. (I*f Q73=1),* Is your mortgage repayment greater than $2800/month?

1   Yes
2   No

Q73b. *(If Q73=3),* Is your rent payment greater than $215/week?

1   Yes
2   No

Q74. Does your household have a car?

1   Yes
2   No

Q75. How many bedrooms does your house have?

1   1
2   2
3   3
4   4
5   5
6   6
7   7
8   8
9   9+

(Final questions: and then thank them for their participation)

Q76. This survey will be conducted on an annual basis to collect information for the Gladstone harbour report card. Would you be willing to be contacted again next year to answer some more questions about the Gladstone harbour.

1   Yes – Email

2   Yes – No email

3   No

With 1=not aware, 2=somewhat not aware, 3=neutral, 4=somewhat aware, 5=aware	Not aware				Aware	No Answer
	1	2	3	4	5	6
Q77A. Please indicate how aware you are of Gladstone Healthy Harbour Partnership (GHHP)?						
Q78A. Please indicate how aware you are that there is a monitoring program and report card to assess the health of the Gladstone Harbour each year?						

That is the end of the survey.

Combined results from the surveys will help ensure the opinions of the people living in the Gladstone area are considered in the management of the harbour. You will be able to access the final report online at the end of the year on http://ghhp.org.au.

If you wish to receive further information about the survey, I can give you the contact details for the project leader, Dr Jeremy De Valck from CQUniversity, who can forward further details to you. Would you like these? (if yes then provide email j.devalck@cqu.edu.au)

Thank you for your participation!

Appendix C. CATI survey results for social and cultural measures

C1 Social component

Three social indicator groups were measured with information collected in the CATI survey; Harbour usability, Harbour access and, Liveability and wellbeing. Most responses to the survey questions were based on a 10-point scale denoting either a level of satisfaction (1=Very unsatisfied to 10=Very satisfied) or a level of agreement (1=Strongly disagree to 10=Strongly agree). The survey results are outlined for each of these indicator groups in turn below.

C1.1 Harbour usability

Harbour usability was assessed across three indicators; Satisfaction with harbour recreational activities (questions Q11b, Q15b, Q25, Q12b1, Q28 and Q28a), Perceptions of air and water quality (Q40, Q41 and Q42), and Perceptions of harbour safety (Q44 and Q43 plus data from Marine Safety Queensland). Analyses of each CATI derived indicators are presented below.

C1.1.1 Satisfaction with harbour recreational activities

The level of satisfaction (1=Very unsatisfied to 10=Very satisfied) with recreational activities was relatively high with mean rating levels of 8.23, 8.40, 7.70 and 8.29 for beach, other land-based, fishing and other water-based recreation respectively (Figure C1.1).
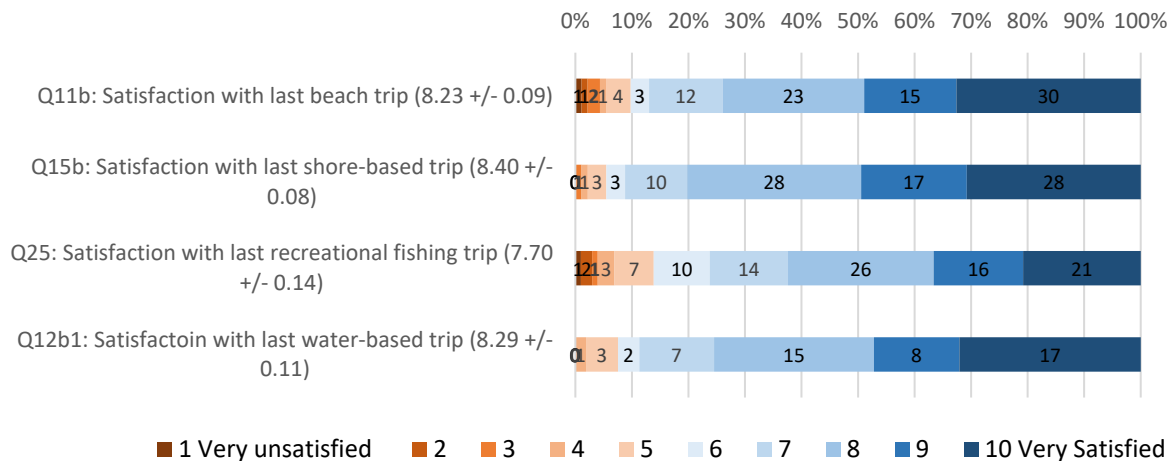
Figure C1.1: Satisfaction with last beach, shore-based, fishing and water-based recreational trip

Satisfaction with the quality of boat ramps in the harbour area was high (mean 7.51, SE 0.10) while satisfaction with the facilities offered at the boat ramps was slightly lower (mean 7.22, SE 0.11), see Figure C1.2.
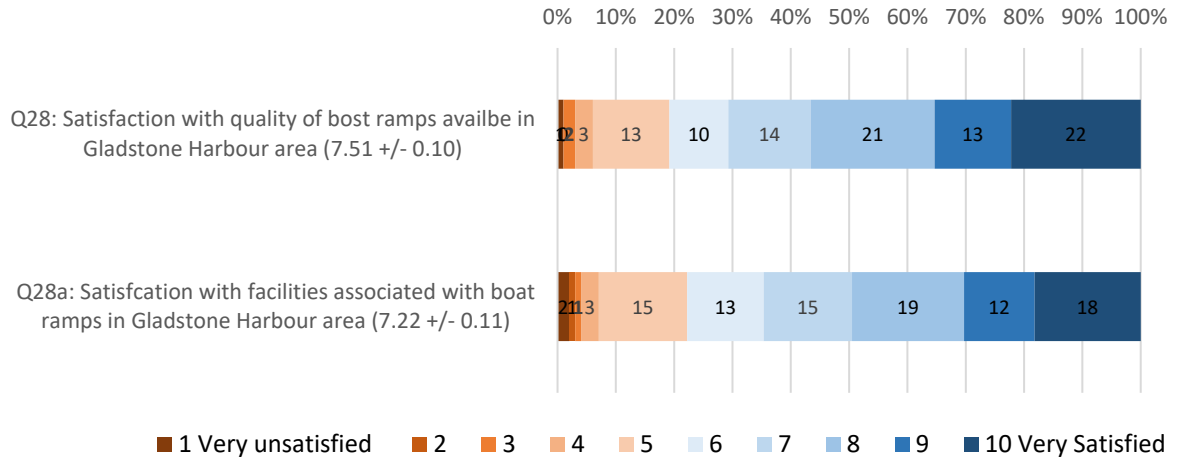
Figure C1.2: Satisfaction with the quality of boat ramps and the facilities

C1.1.2 Perceptions of air and water quality

Opinions of air and water quality were assessed via three CATI questions "I think water quality in Gladstone Harbour is in good condition", "I think air quality in Gladstone Harbour is in good condition" and "The water quality in Gladstone Harbour has not affected how often I use the area in the last 12 months". All three questions were answered on a scale from 1=Strongly Disagree to 10=Strongly Agree with higher scores indicates higher endorsement of air/water quality.

While water quality does not appear to have affected use of the harbour in the past 12 months for most respondents (mean 7.26, SE 0.14), overall agreement that water quality is in good condition was more moderate (mean 6.28, SE 0.12). Opinions of air quality were lower (mean 5.22, SE 0.13). The distribution of responses across the three questions is presented in Figure C1.3.
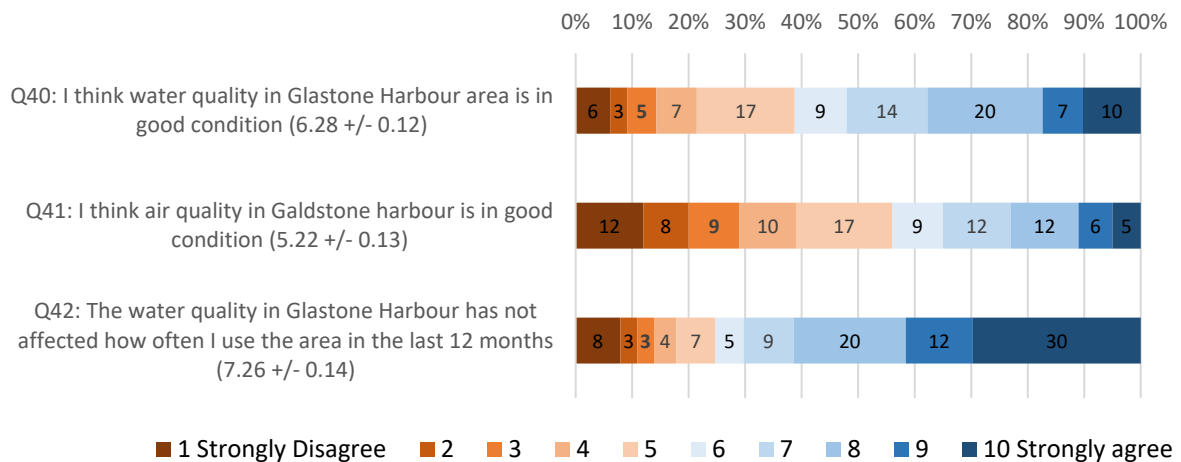
Figure C1.3: Opinions of air and water quality and the effect on usage

C1.1.3 Perceptions of harbour safety for human usage

The distribution of responses to two CATI questions 'I feel safe being in the Gladstone Harbour area at night' and 'I would be happy to eat seafood caught in the Gladstone Harbour area' are reasonably positive with details presented in Figure C1.4.
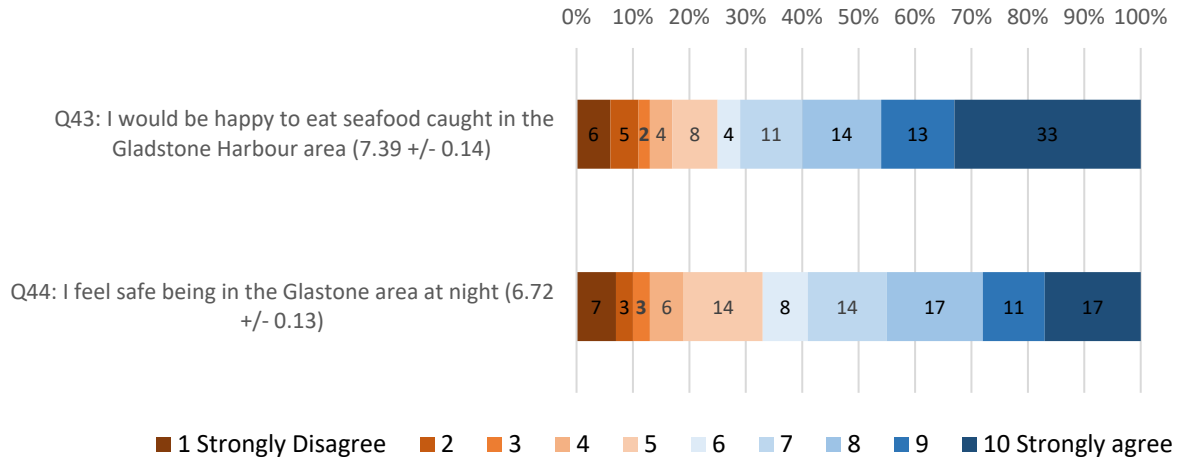
Figure C1.4: Endorsement of feeling safe and eating seafood caught in the Gladstone Harbour area

C1.2 Harbour access

Harbour access was assessed across four indicators; Satisfaction with access to the harbour (Q29), Satisfaction with boat ramps and public spaces (Q8, Q26 and Q27), Perceptions of harbour health (questions 33, 34 and 35) and Perceptions of barriers to access (Q31, Q32, Q36 and Q37). Details are presented below.

C1.2.1 Satisfaction with access to the harbour

Respondents indicated high levels of agreement with the statement 'I have fair access to Gladstone Harbour' (mean 7.95, SE 0.10) (Figure C1.5).
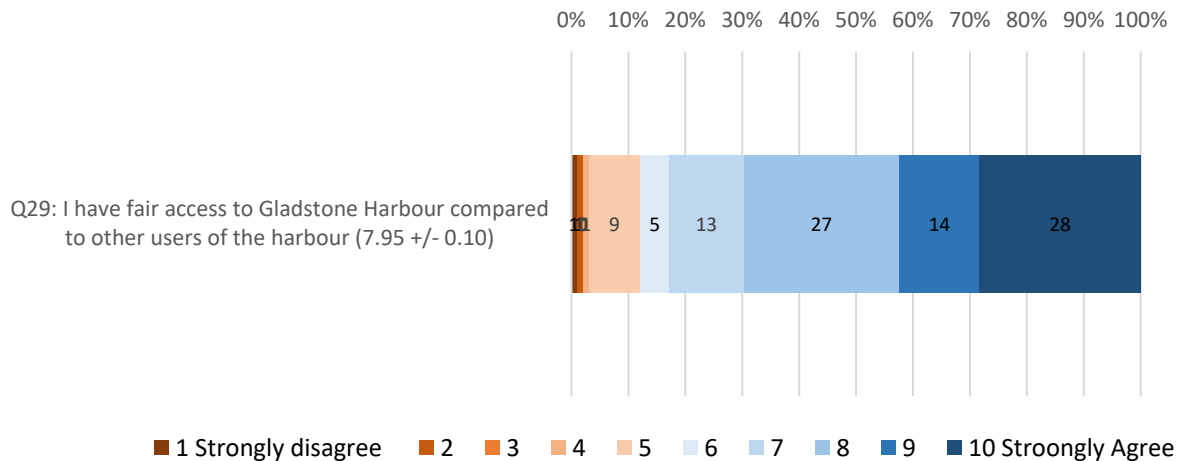
Figure C1.5: Perceptions of fair access to Gladstone Harbour

C1.2.2 Satisfaction with boat ramps and public spaces

Frequency of boat ramp use in the past 12 months (Q8) is presented in Figure C1.6. Most respondents had never used a boat ramp (49%), but the average use by the 60% who had used the ramps was 4 to 6 times a year. Across the full sample, the average use was about one per week.
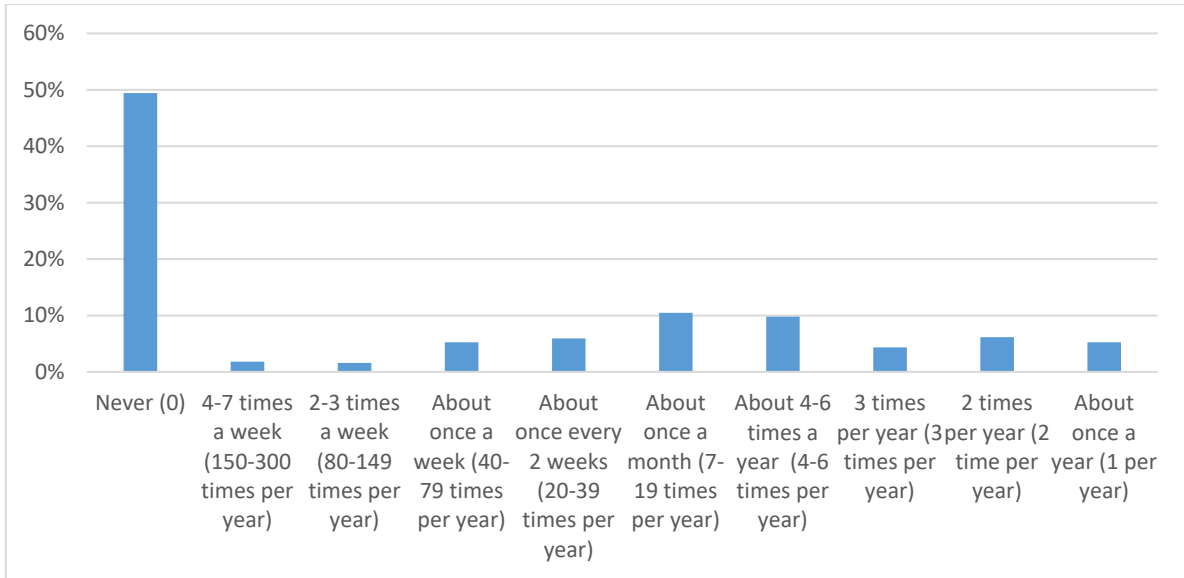
Figure C1.6: Frequency of boat ramp use in the past 12 months

Respondents were also asked about their satisfaction with the number of boat ramps available and the level of access to public spaces around the harbour. Overall satisfaction ratings for both questions were high with most respondents falling in the 'agree' to 'strongly agree' categories (Figure C1.7).
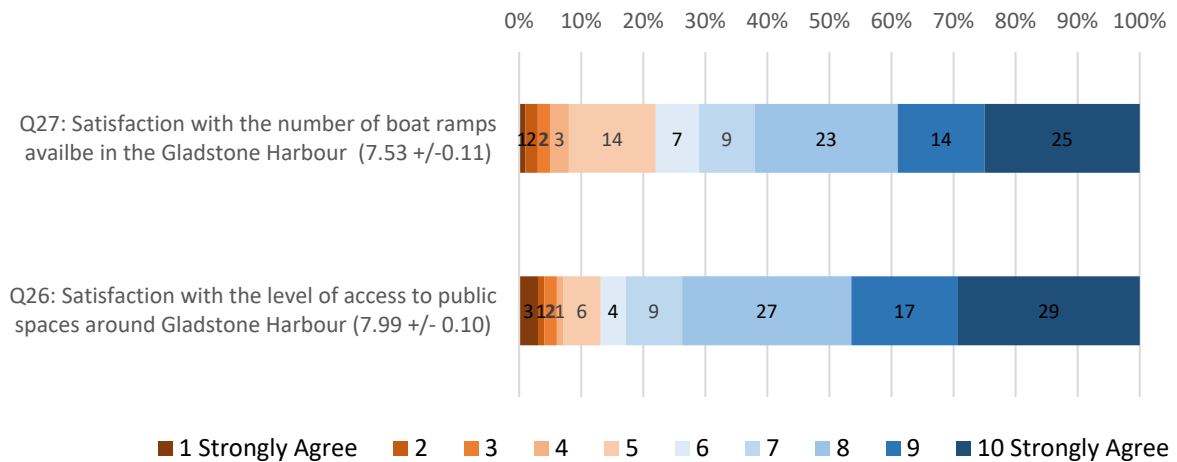

Figure C1.7: Satisfaction with number of ramps and access to public spaces

C1.2.3 Perceptions of harbour health

In order to facilitate analyses and ease of reporting CATI question Q33 'The Gladstone Harbour area is not in great condition' was re-coded so that ratings could be compared across the three measures in this indicator. The wording of question 33 has been presented as 'The Gladstone Harbour area is in great condition' in line with the re-coding, indicating a positive perception of harbour health. Respondents indicated overall impressions of the Gladstone Harbour area condition (mean 6.44, SE 0.12), their level of optimism for the future health of the harbour (mean 6.84, SE 0.12) and whether they thought the health of the harbour had improved over the past 12 months (mean 6.40, SE 0.11).

Across all three questions, responses were skewed to the positive end of the scale as can be seen in Figure C1.8.
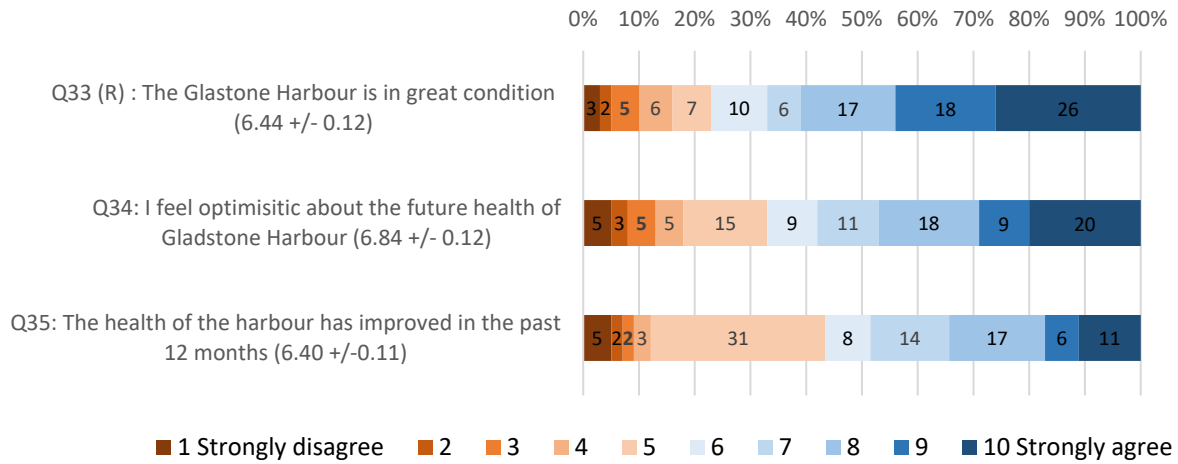

Figure C1.8: Perceptions of harbour condition, future health and improvements over last 12 months

C1.2.4 Perceptions of barriers to access

In order to facilitate analyses and ease of reporting CATI question Q36 'Marine debris and litter is not a problem in Gladstone Harbour' was re-coded so that ratings could be compared across the four measures in this indicator. Figure C1.9 presents the overall pattern of responses to the four measures. Note that the wording of question Q36 has been presented as 'Marine debris and litter is a problem in Gladstone Harbour' in this figure. For this group a rating of 1 (on the 10-point response scale) indicates strong disagreement with the statement and highlights that debris, shipping and recreational boats are not impacting on access to the harbour. The strong skew seen (towards disagree) is particularly apparent for the last three questions. There is a more even distribution of responses in relation to the problem of marine debris.
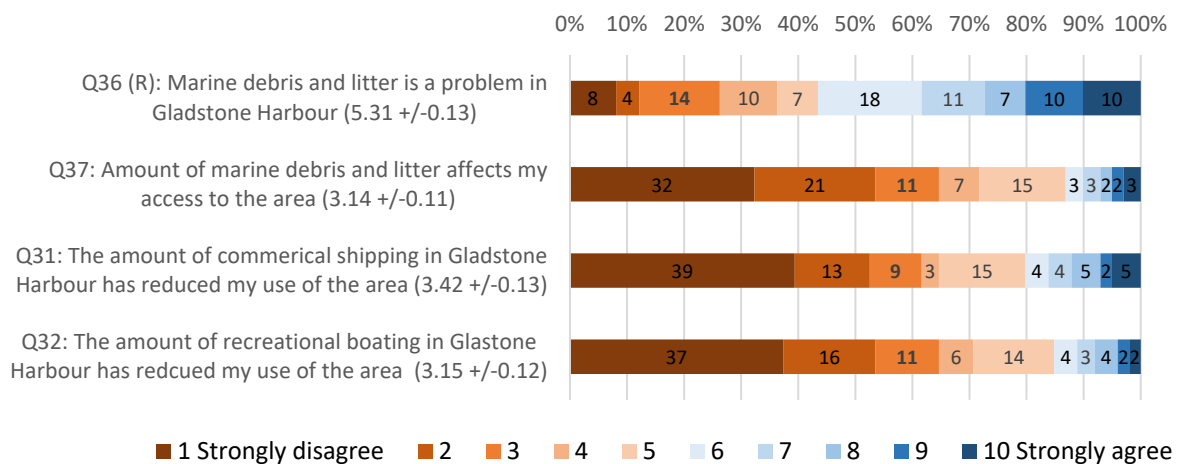

Figure C1.9: Opinions regarding marine debris, levels of shipping and recreational boating

C1.3 Liveability and wellbeing

'Liveability and wellbeing' were assessed through one indicator (Contribution of harbour to liveability and wellbeing) and four measures (CATI questions Q45, Q45a, Q45b and Q46). For the

first time in 2018 two new measures were introduced to account for the natural beauty and aesthetic value of the harbour. Analyses of these are presented below.

C1.3.1 Contribution of harbour to liveability and wellbeing

In order to facilitate analyses and ease of reporting question Q46 'I rarely participate in community events in the Gladstone Harbour area' was re-coded so that ratings could be compared across the four measures in this indicator. The wording of question Q46 has been presented as 'I regularly participate in community events in the Gladstone Harbour area' to reflect the recoding. Figure C1.10 presents the overall pattern of responses. For all questions a higher number indicates greater engagement with, and appreciation of, harbour-related activities. As is apparent in the figure, respondents showed a relatively high endorsement of the contribution of the harbour to liveability and wellbeing but participation in community events returns a lower rating score.
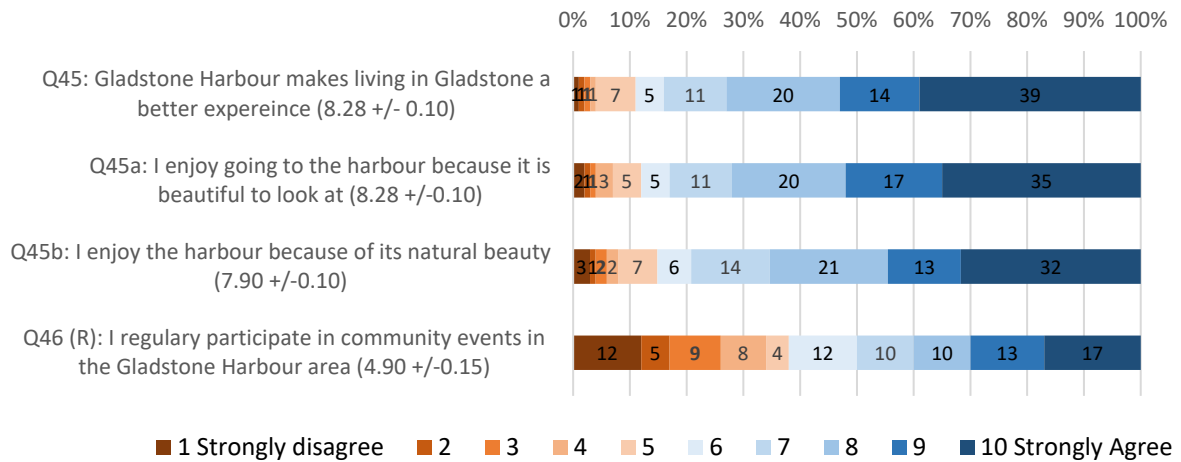

Figure C1.10: Liveability and participation in community events

C2 Cultural component: Sense of place indicator group

Only one indicator group, 'Sense of place', is assessed in this project for the cultural component. The six indicators in this group are all assessed via CATI questions.

- Place attachment (questions Q30 and Q51)
- Continuity (Q3 and Q53)
- Pride in the region (Q50)
- Well-being (Q52 and Q47)
- Appreciation of the Harbour (Q54, Q58 and Q59)
- Values (Q55, Q56, Q57, Q60, Q61, Q62 and Q63)

Analyses of each of these indicators follows.

Sensitivity testing (Independent Samples T-Test at the 5% level) was conducted to determine whether respondents who identified as being a Traditional Owner had significantly different scores from the rest of the sample.

The sample included 38 respondents (8.7%) who identified as being a Traditional Owner of the area. This is higher than the population of 3.5% of Indigenous people in the region, but lower than the proportion recorded in previous years (e.g., 10% in 2018 and 13.5% in 2017). No significant differences could be found this year for any of the above questions.

C2.1 Place attachment

In order to facilitate analyses and ease of reporting CATI question Q30 'There are other places that are better than the Gladstone Harbour area for the recreational activities that I do' was re-coded so that ratings could be more easily compared across the two measures in this indicator. Figure C2.1 presents the overall pattern of responses to these questions. Note that the wording of question 30 has been presented as 'There is no place better than the Gladstone Harbour area for the recreational activities that I do' to reflect the recoding. For both questions, a higher score indicates greater engagement with, and appreciation of, the harbour-related activities.

The pattern of responses is relatively evenly distributed across the scale for both measures, with a slightly higher level of respondent agreement that the harbour is part of their identity.

There was no significant difference between respondents who identified as Traditional Owners (N=38) and those who did not for that 'no better place' (Q30) with a p-value of 0.11. There also was no significant difference (p=0.70) in the mean scores for 'part of who they are' Q51.
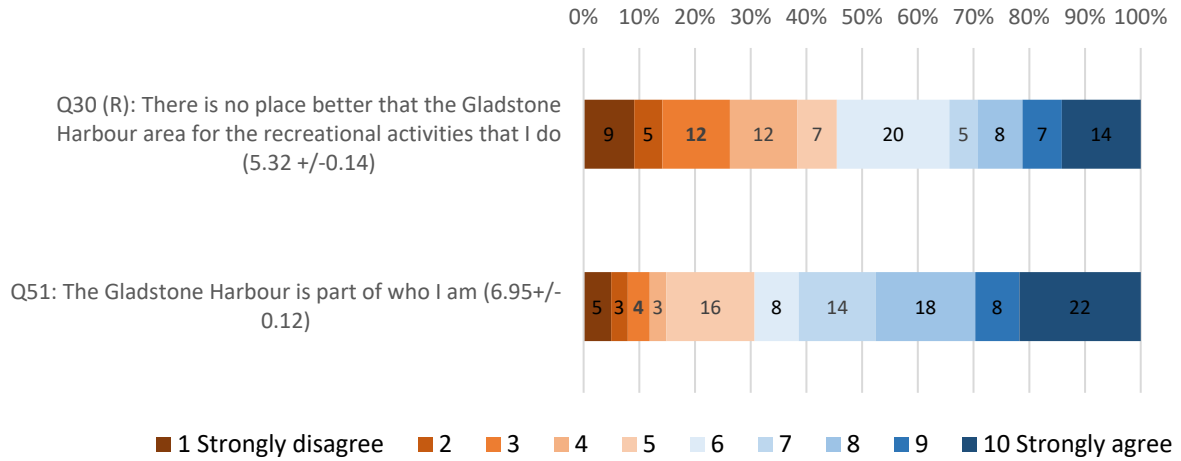
Figure C2.1: Measures of Place attachment

C2.2 Continuity

Two measures were applied for this indicator: the length of time people had lived in the area and whether they planned to stay for the next five years. Time spent living in the Gladstone Harbour region ranged from less than a year (minimum 3 months) through to 74 years (average 20 years). Given the range of values, time spent in the area was categorised into 10-year bands (<1 to 9 years; 10-19 years etc) and the relative frequency of each category is presented in Figure C2.2. As can be seen below the largest proportion of respondents (25%) fell in the <1 to 9 years and 10-19 year cohorts.
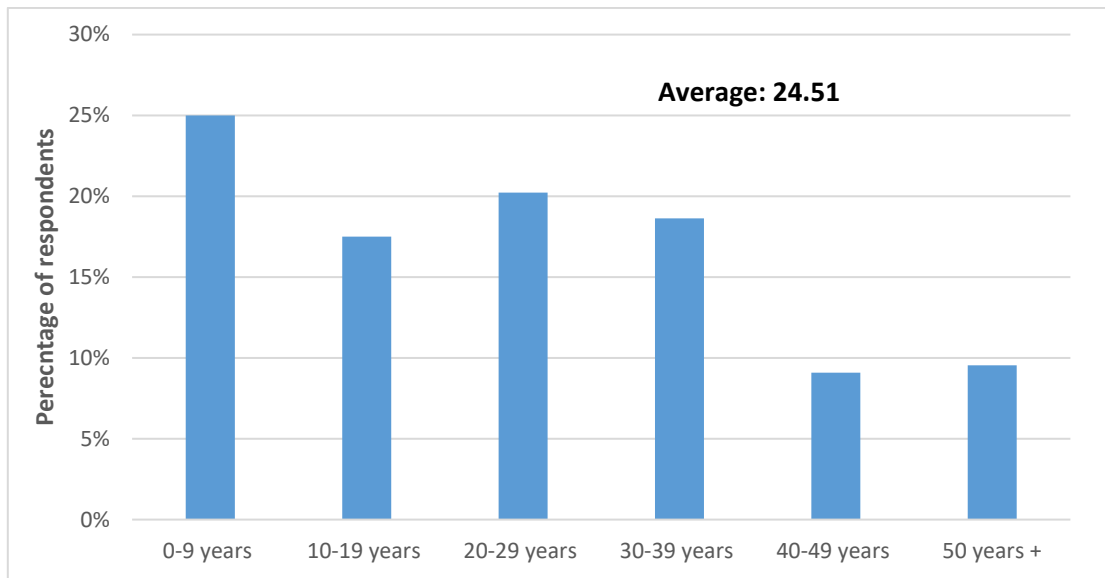

Figure C2.2: Time spent living in the Gladstone Harbour area

In order to facilitate analyses and ease of reporting CATI question Q53 'I do not plan to be a resident of this region in the next 5 years' was re-coded to facilitate interpretation – thus a higher average indicates greater intention to remain in the area for the immediate future. Figure C2.3 presents the overall pattern of responses to the question. Note that the wording of question 53 has been presented as 'I do plan to be a resident of this region in the next 5 years' to reflect the recoding.

There was not a significant difference (p=0.34) in the intention to remain in the area between Traditional Owners and the rest of the sample.

Q53 (R): I plan to be a resident of this region in the next 5 years (6.82 +/-0.15)

9 | 3 | 3 | 3 | 3 | 8 | 2 | 7 | 12 | 51

■ 1 Strongly disagree ■ 2 ■ 3 ■ 4 ■ 5 ■ 6 ■ 7 ■ 8 ■ 9 ■ 10 Strongly agree
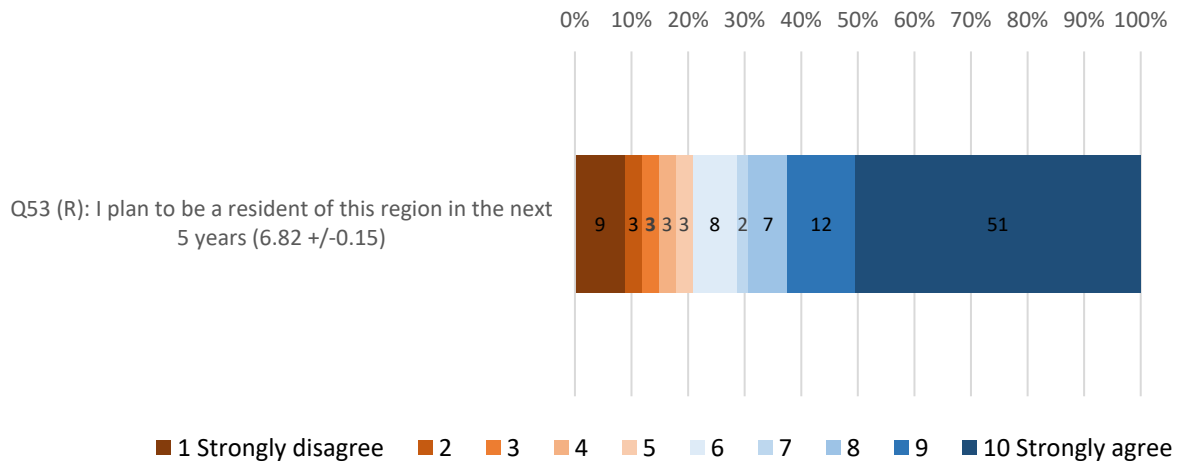
Figure C2.3: Intention to remain in the Gladstone Harbour area for the next 5 years

C2.3 Pride in the region

The distribution of responses to the 'Pride in the region' question 'I feel proud that I live in the Gladstone community' is presented in Figure C2.4, and there is a strong skew towards 'Strongly agree' with a high average endorsement (mean 7.97; SE 0.10).

There was no significant difference (p=0.904) between Traditional Owners and the rest of the sample.

Q50: I feel proud that I live in the Glastone community (7.97 +/-0.10)

2 | 2 | 2 | 2 | 7 | 5 | 14 | 21 | 14 | 32

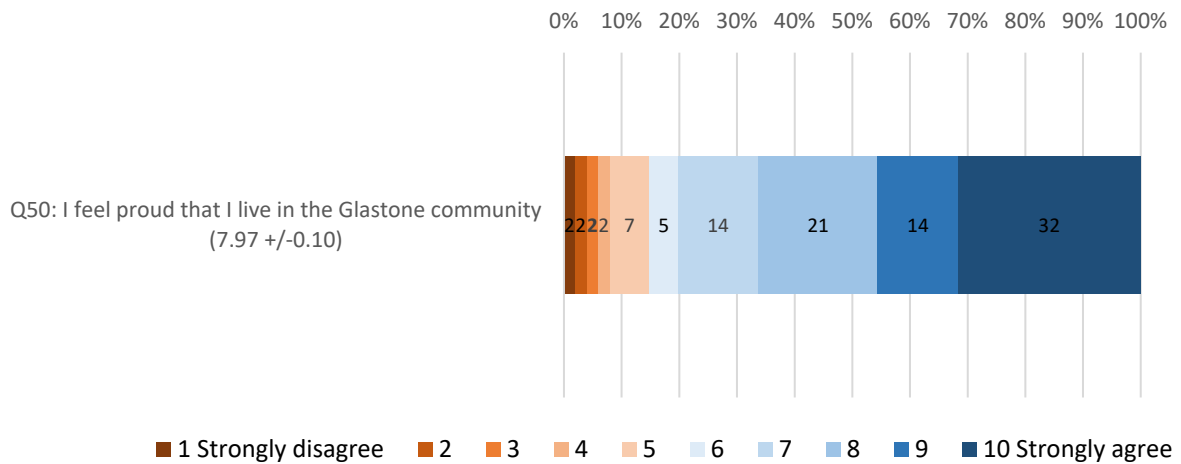■ 1 Strongly disagree ■ 2 ■ 3 ■ 4 ■ 5 ■ 6 ■ 7 ■ 8 ■ 9 ■ 10 Strongly agree

Figure C2.4: Measure of Pride in the region

C2.4 Well-being

Well-being was evaluated via two CATI questions. Responses toward the first (The Gladstone Harbour area improves my quality of life) were skewed towards the strongly agree end of the

93

response scale (Figure C2.5) with a mean score of 7.46 highlighting the positive effect of the area on respondent quality of life

Responses to the second question (I feel able to have input into the management of the Gladstone Harbour if I choose to) are relatively evenly distributed across the scale with the average response in the middle (5.81).

There was no significant difference between Traditional Owners and the rest of the sample in responses to either question (p=0.566 and p=0.163 respectively).
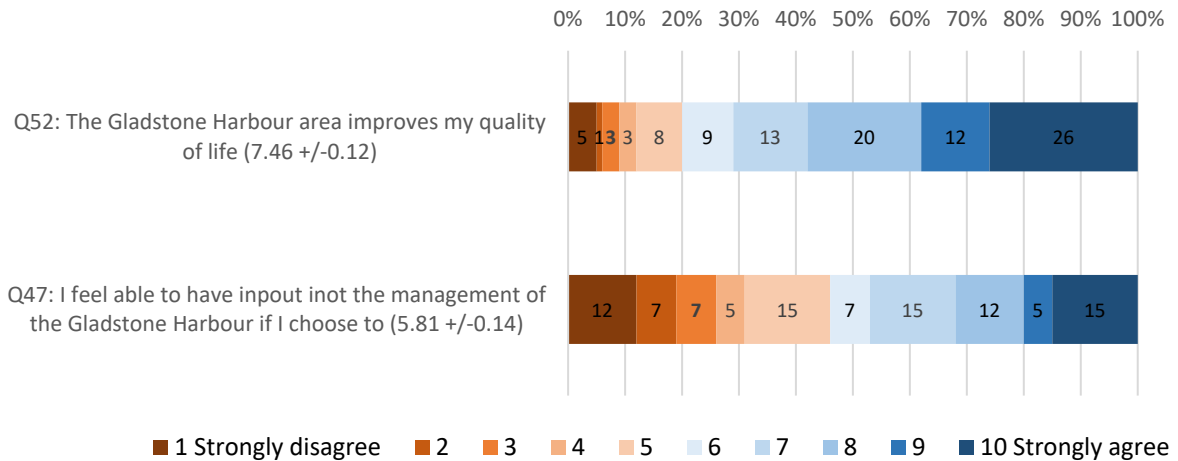

Figure C2.5: Measures of Well-being

C2.5 Appreciation of the Harbour

Three CATI questions examined respondents' appreciation of the Gladstone Harbour area (questions Q54, Q58 and Q59). As can be seen in Figure C2.6, responses to all three were strongly positive with respondents highlighting that the harbour area is a key part of the Gladstone community (mean 8.93), that it is a great asset to the local regional economy (8.87) and a great asset to the State economy (8.78).

Traditional Owners had no significantly different scores for the importance of harbour as a local asset (Q58) (p=0.193), nor for the other two questions (p=0.469 [Q54]; p=0.259 [Q59]).
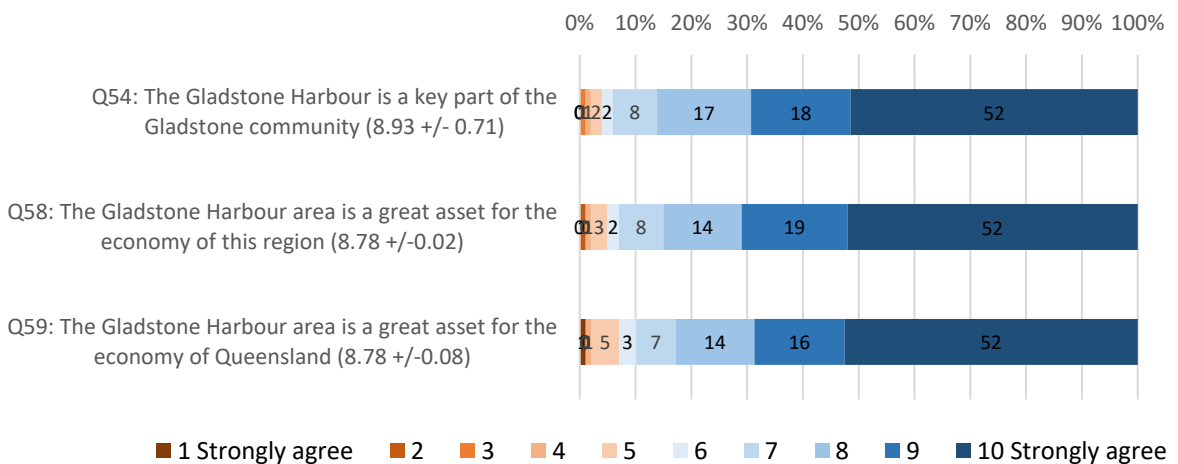

Figure C2.6: Measures of Appreciation of the Harbour

C2.6 Values

Respondents were asked to indicate how strongly they agree with seven statements regarding the value of different aspects of the Gladstone Harbour area, as can be seen in Figure C2.7 the first four (supports variety of marine life [mean 7.87]; opportunities for outdoor recreation [mean 8.52]; attracts visitors to the region [7.86]; scenery and sights [8.26]) were supported strongly. Respondents particularly endorsed the value of CATI question Q56 'opportunities for outdoor recreation' and CATI question Q60 'scenery and sights'. Responses toward the last three questions were less positive with much lower average agreement (spiritually special places [5.49]; culturally special places [5.61] and historical significance [5.72]).

Those who identified as a Traditional Owner of the area showed significantly higher endorsement of the last two measures:

- Q61 'spiritually special places' (p=0.008)
- Q62 'culturally special places' (p=0.0082)

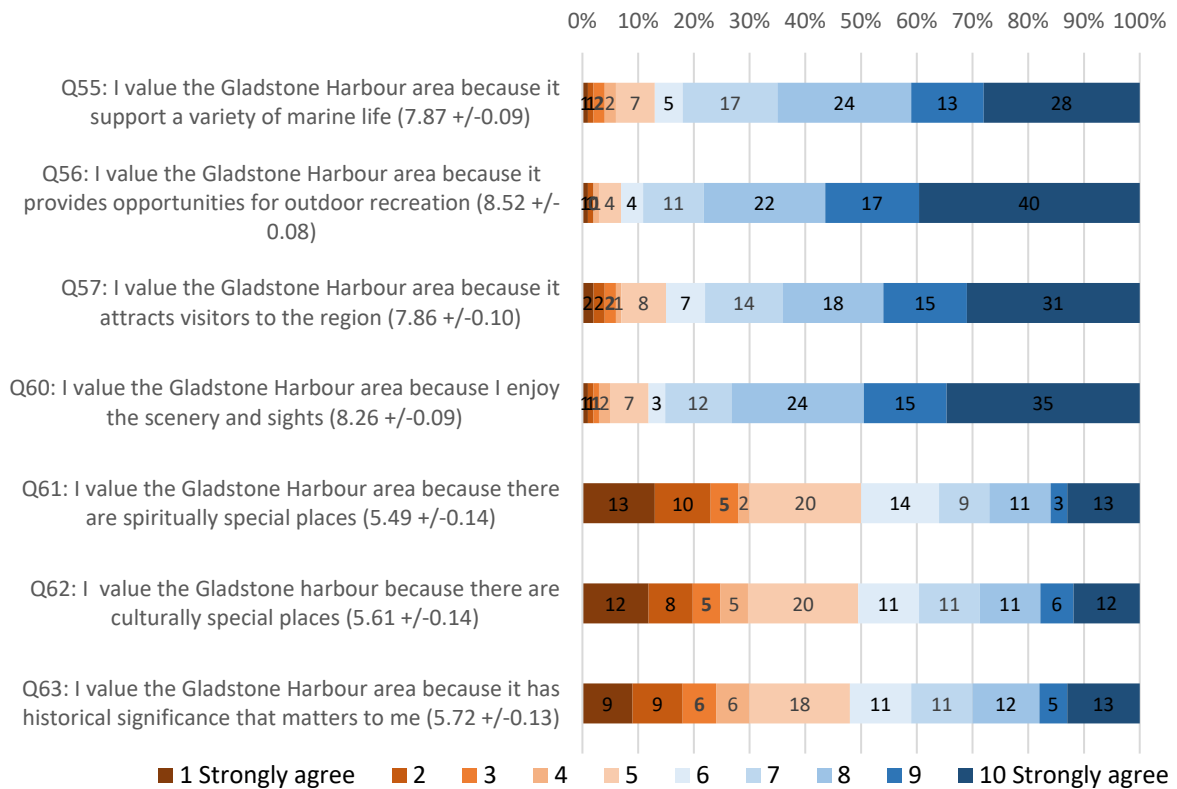However not for Q63 'historical significance' (6.95 vs 5.57, p=0.23)

Figure C2.7: Measures of Values

Appendix D: Full details of recreation activity and valuation updates

A section of the CATI survey is designed to collect information about recreational activity. The results are applied to estimate the scores and grades for the 'Economic (recreational) value' indicator group. Four types of recreational activity (beach, land-based, fishing and water-based recreation) are applied as separate indicators. Updated information about recreational activity and the valuation estimates for the four recreation indicators is presented in the first two sections below. In 2019, details about beach and land-based recreation were collected in the CATI survey to provide supplementary data and update the 2014 valuation with details and results presented in the third section below. The value for recreational fishing which was calculated (but not adopted) in 2018 with a mix of 2015 and 2018 was also included in the report cards this year.

D1 Summary of beach, land-based and fishing recreational activity

A total of 401 responses were collected in the 2019 Gladstone CATI survey, and an additional 38 responses of the same survey were collected online. Nearly all respondents (97.9%) have visited the Gladstone Harbour area in the last 12 months (an increase of almost 5% from last year), and 414 respondents (94.3%) have visited the harbour for recreational purposes (an 8.3% increase from last year).

Most respondents (67.7%) indicated that their recreational use of the harbour had not changed in the last 12 months, 17.5% reported increased use (19% in 2018), and 14.8% reported decreased use (13% in 2018).

Just above a third of respondents (34.9%) indicated that they owned a boat (30.3% in 2018) but there has been little change in use of boat ramps in the last 12 months or since the 2014 baseline.

- 2019: 222 (50.6%) respondents have used a boat ramp for an average of 26 times (average of 13 times for the whole sample)

- 2018: 162 (40%) respondents had used a boat ramp for an average of 22 times (average of 9 times for the whole sample)

- 2014: 156 (39%) respondents had used a boat ramp in the past year; an average of 20 times (average of 8 times for the whole sample)

Beach and land-based recreational activities are much more prevalent than recreational fishing and other water-based recreation. Ninety-two per cent of respondents have participated in beach recreation and 93% in land-based recreation, while 45% have participated in recreational fishing and 54% in other water-based recreation. In the past 12 months there has been an increase in land-based, fishing and water recreation (88%, 41% and 47% in 2018 respectively), with a slight decline in beach recreation (93% in 2018).

D1.1 Trip frequencies, popular beaches and recreational activities

Details of trip frequencies for the different activities are provided in Table D1. In 2019 there has been some change in participation frequency for certain activities. As mentioned above, participation rates have increased for land-based, fishing and water recreation but declined by 1% for beach recreation. A series of T-test was, however, conducted on users and full samples to assess whether significant differences in participation frequency happened since 2018, and no statistically significant differences were observed. Recreation figures can therefore be deemed very stable.

Table D1: Recreational activity and frequency of participation

Response category	# trips/yr	Beach recreation		Land recreation		Recreational fishing		Water recreation	
		#	%	#	%	#	%	#	%
4-7 times a week	225	28	6.4%	22	5.0%	3	0.7%	4	0.9%
2-3 times a week	115	25	5.7%	36	8.2%	10	2.3%	8	1.8%
About once a week	60	59	13.4%	50	11.4%	14	3.2%	17	3.9%
About 1 every 2 weeks	30	56	12.8%	66	15.0%	19	4.3%	24	5.5%
About once a month	13	111	25.3%	108	24.6%	38	8.7%	52	11.8%
About 4-6 times a year	5	71	16.2%	68	15.5%	56	12.8%	45	10.3%
3 times per year	3	28	6.4%	22	5.0%	15	3.4%	26	5.9%
2 times per year	2	17	3.9%	20	4.6%	29	6.6%	30	6.8%
About once a year	1	11	2.5%	11	2.5%	14	3.2%	24	5.5%
Never	*0*	*33*	*7.5%*	*36*	*8.2%*	*241*	*54.9%*	*209*	*47.6%*
Total		**439**	**100**	**439**	**100**	**439**	**100**	**439**	**100**
2019 Avg trips per year (users)		**40.2 (N=406)**		**38.95 (N=403)**		**20.73 (N=198)**		**19.59 (N=230)**	
2018 Avg trips per year (users)		39.35 (N=371)		42.97 (N=351)		24.49 (N=164)		20.01 (N=189)	
2019 Avg trips per year (full sample)		**37.18 (N=439)**		**36.29 (N=439)**		**9.4 (N=439)**		**10.53 (N=439)**	
2018 Avg trips per year (full sample)		36.49 (N=400)		37.71 (N=400)		10.04 (N=400)		9.45 (N=400)	

Other general warm-up questions indicated that Tannum Sands, Boyne Island and Spinnaker Park artificial beach were the most popular beaches to visit (Figure D1.1), with little change in the last 12 months. Tannum Sands remains the most commonly visited beach.
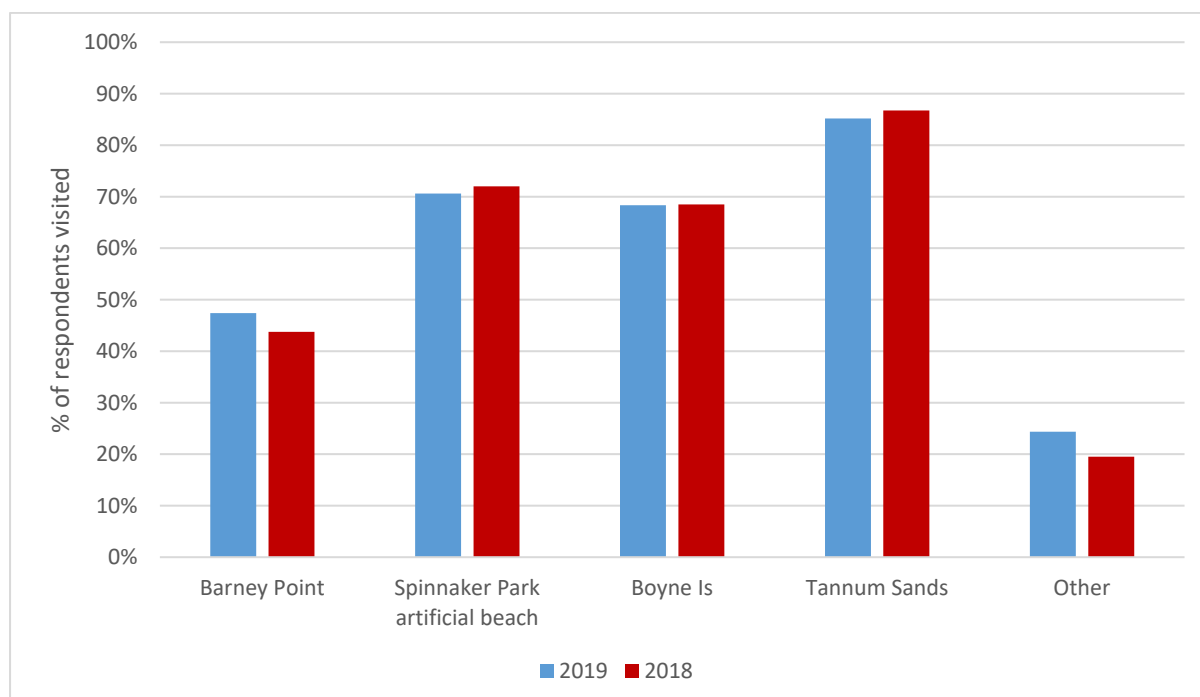

Figure D1.1: The most popular beaches visited by surveyed Gladstone residents

Walking, picnicking and relaxing were the most popular land-based recreational activities with some increase in all activities apart from cycling and participation in sporting events (Figure D1.2).
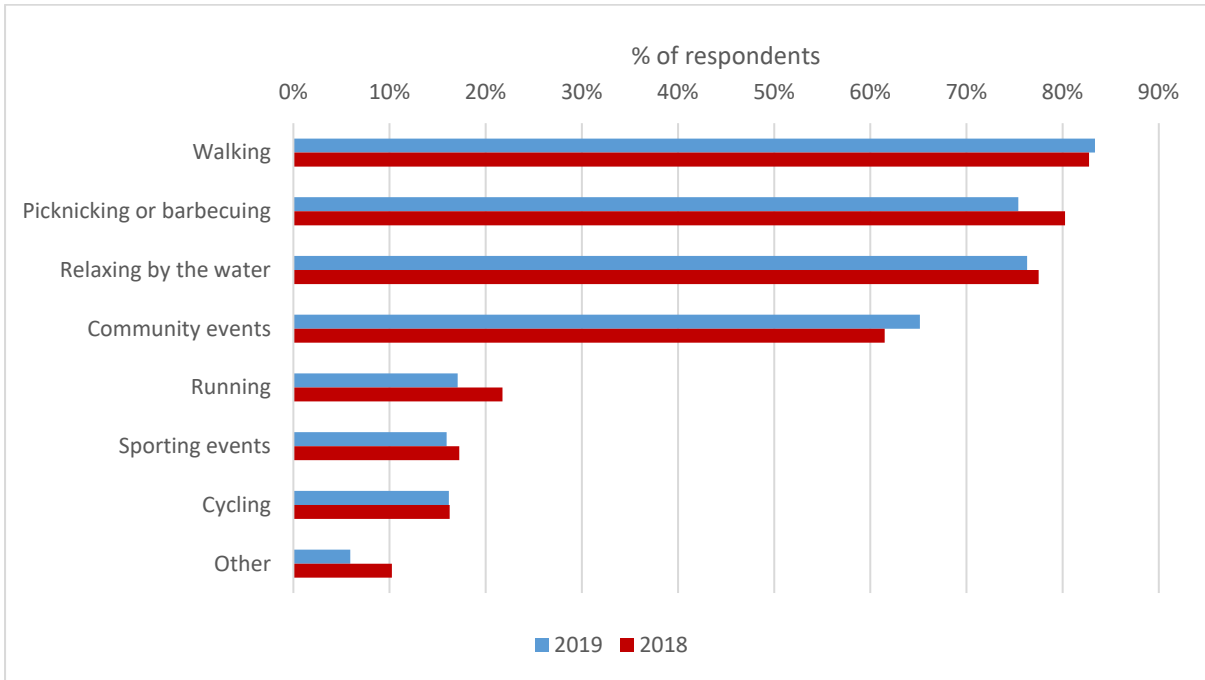

Figure D1.2: Popular land-based activities

General boating, swimming and non-motorised water sport were the most popular water-based recreational activities in 2019, despite a notable decrease in swimming compared to last year (Figure D1.3).
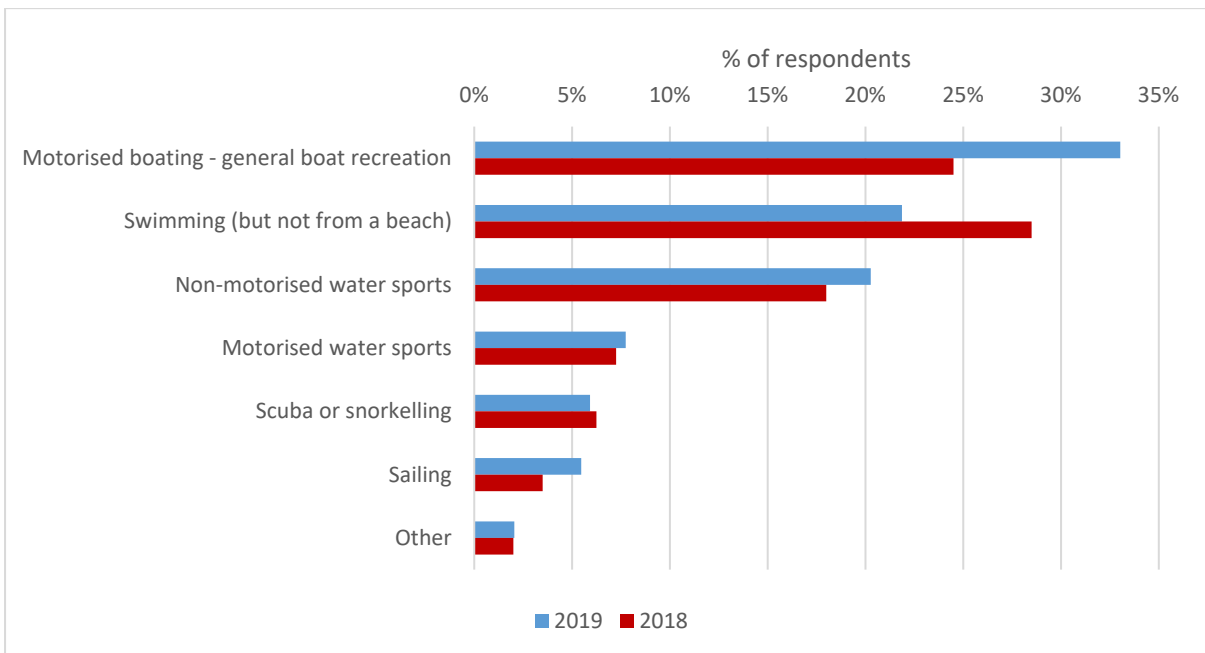

Figure D1.3: Popular water-based activities

D1.2 Satisfaction scores for beach, land-based and fishing recreation

Respondents were also asked to indicate their level of satisfaction with the four different types of recreational activity (on a scale from 1 = very unsatisfied to 10 = very satisfied). The satisfaction ratings for the activities, as well as a comparison with 2017 ratings are presented in Figure D1.4.

Overall, respondents reported high levels of satisfaction with mean scores of 8.23, 8.4, 7.7 and 8.29 for beach, land-based, fishing and water-based recreation. There was no statistically significant change from 2018 in mean rating scores for beach and water-based recreational activities. Land-based recreation and recreational fishing both scored significantly higher than in 2018.
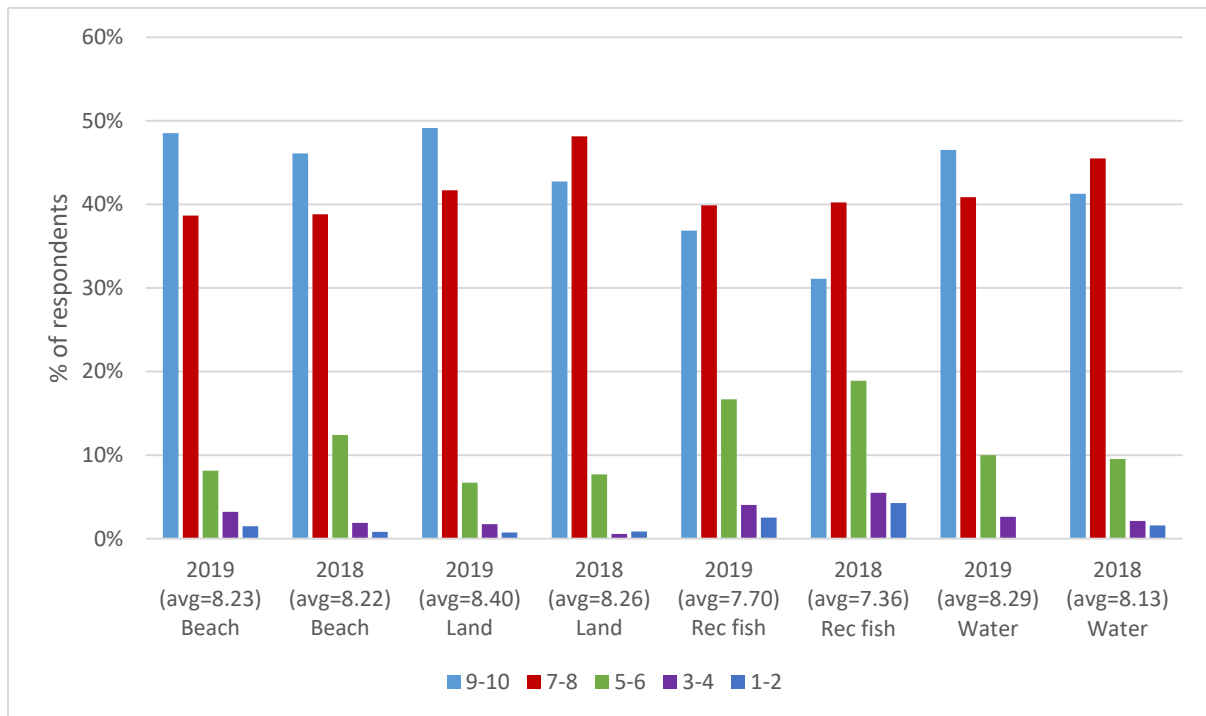

Figure D1.4: Satisfaction ratings for recreational activity

D2 Summary of beach, land-based, fishing and water-based recreation value estimates

Although the value of a recreational trip for each of the four recreational activities had already been estimated in previous report cards, beach recreation values dated back from 2014 (Pascoe et al., 2014) and needed to be updated this year. Land-based recreation values also date back from 2014, but these values were not updated this year to keep the survey short and prevent confusion from respondents. It is recommended to update these values in 2020. An updated value for recreational fishing was calculated in 2018 but not included in the report cards; it has now been added as well. The total annual value of recreational activity was updated by adjusting activity frequency rates (collected in the 2019 CATI survey) and extrapolating the information to the Gladstone population. Details of the current trip frequency rates are provided in Table D.

To extrapolate the values from the sample to the population of Gladstone, information was applied from the Australian Bureau of Statistics (ABS). Two assumptions were made. First, to extrapolate the total trip value, it was assumed that the information provided by the survey respondent represented details of a household trip. While this may have been true for most situations, it would not have been true in all cases. It was estimated that there were 24,223 households in Gladstone, based on an average household size of 2.6 persons (ABS 2016 Census) and a population of 62,979 in 2019 (ABS

Cat#3218.0 Regional Population Growth – March 2019). Second, to extrapolate the value of a trip per adult to the Gladstone population only adults between 18 and 80 years were given consideration. It was estimated there were 45,345 adults in this age group assuming the proportion of adults (18-80) was 72% of the population (the same as in the ABS 2016 Census). This extrapolation assumed that information on trip frequency supplied by the respondent, applied to all adults in the group, which would not have been true in all cases of recreation activity.

The results are summarised in Table D2 with an increase in the annual value for beach recreation and a slight decrease for all three other recreational activities (which might have to do with the adjustment made to the total Gladstone population figures from ABS this year) and an overall increase in total economic value of 3.7% ($142.6M vs $137.5M) compared with the previous year. Last year, the Gladstone population used for these calculations was of 63,052, which is slightly higher than the number from ABS for that same period: 62,800 (ABS Cat#3218.0 Regional Population Growth – March 2019). In 2019, the 2018 population value for the Gladstone Local Government Area was applied: 62,979 residents.

The average annual value of recreational trips for 2019 is:

- $44.5 million for beach recreation ($35 million in 2018)
- $49 million for land-based recreation ($51 million in 2018)
- $26.6 million for recreational fishing ($31.2 million in 2018)
- $21.6 million for water-based recreation ($20.2 million in 2018)

Table D2: Summary of updated recreation value estimates

	Beach recreation	Land-based recreation	Recreational fishing	Water-based recreation
Household value method				
Trip value (95% confidence intervals [CIs])	$54 ($37 - $95)	$61[1] ($48 - $85)	$121[2] ($75-$271)	$95 ($44-$435)
***Full sample*: Avg # trips/yr**	37.18 *(2018=36.49)*	36.29 *(2018=37.71)*	9.4 *(2018=10.04)*	10.53 *(2018=9.45)*
Annual value per trip *(full sample)*	$2,008 ($1,375-$3,533)	$2,214 ($1,741-$3,085)	$1,137 ($705-$2,548)	$1,000 ($463-$4,581)
Gladstone: Annual value of recreation trips	*$48.6 million ($33.3M - $85.6M)*	*$53.6 million ($42.1M - $74.8M)*	*$27.5 million ($17M - $61.8M)*	*$24.2 million ($11.2M - $111M)*
Adult value method				
Trip value/ adult (CIs)	$24 ($16 - $43)	$27 ($20 - $42)[1]	$52 ($32-$116)[2]	$41 ($19-$191)[3]
Mean annual value per adult *(full sample)*	$892 ($594- $1,599)	$980 ($725 - $1,525)	$489 ($300 - $1,091)	$432 ($200 - $2,012)
Gladstone: Annual value of recreation trips	*$40.4 million ($26.9M - $72.6M)*	*$44.4 million ($32.8M - $69.2M)*	*$25.6 million ($14.5M - $57.4M)*	*$19 million ($9M - $87M)*

Average value				
2019 Gladstone: Avg Annual value of recreation trips (CIs)	**$44.5 million** **($29.9M - $79.1M)**	**$49 million** **($37M - $72M)**	**$26.6 million** **($15.7M - $60M)**	**$21.6 million** **($10M - $99M)**
% total economic value	*31%*	*35%*	*19%*	*15%*
2018 Gladstone: Avg Annual value of recreation trips (CIs)[4]	$35 million ($22M - $85M)	$51.1 million ($39M - $75M)	$31.2 million ($16M - $510M)	$20.2 million ($9M - $93M)

[1] Estimate from the 2014 report card; [2] Estimate from a mixture of the 2015 and 2018 report cards, based on 2.341 adults per household; [3] Estimate from the 2017 report card

D3 Updated valuation for beach recreation

The economic value of a beach recreation trip was initially estimated in 2014 at $40 per trip with the 95% confidence intervals ranging from $26 to $105 (Pascoe et al., 2014). Back then, two different model configurations were applied, 'stated recreation' and 'adjusted recreation'. This was done because discrepancies were observed between trip frequencies that respondents stated for their most frequent recreational activity and frequency details provided for questions related to each specific activity. As a consequence, the $40/trip value for beach recreation was calculated as a compromise between the value calculated for the 'stated model' ($35.01 [$26-$53]) and the 'adjusted model' ($45.4 [$29-$105]) (see Pascoe et al., 2014, Section 3.4.4, p.55-64 for further details).

Data heterogeneity can make it difficult to estimate statistically significant travel cost valuation models. In the initial 2014 report (Pascoe et al., 2014), no model could be estimated for boat-based fishing recreation with the 51 responses, nor for other water-based recreation (N=11), although a robust model for beach recreation was estimated with 53 responses as there was much less heterogeneity in the data. A land-based recreation model was also estimated in 2014, based on 261 survey responses. Some data cleaning and adjustments (e.g. removing outliers) is generally needed to improve model fit.

In 2019, details about beach recreation were collected in the CATI survey to update the 2014 valuation with details outlined below.

D3.1 Travel cost valuation method

The same valuation methodology (Travel Cost Method) and data calculation details used previously to estimate the value of recreational activities, were repeated in 2018. Full details have been outlined in Pascoe et al. (2014) and Cannard et al. (2015) and are not repeated here. A negative binomial, count data model was applied in the valuation assuming an underlying relationship between participation frequency and travel cost, with trip frequency decreasing as cost increases. Once the travel cost of each trip is established, the total travel cost and other explanatory variables become a function of trip frequency in the travel cost model.

Some details were updated for the recreational trip cases collected previously in 2014 and 2015:

1. Transport costs for travel to the harbour were applied at a rate of $0.765 in 2014 and 2015. They were updated to $0.66 for the 2018 valuation based on ABS changes in car related expenses. This year, we used the latest (2018) ABS estimates for car running costs: $0.68/km

(Source: https://www.ato.gov.au/Individuals/Income-and-deductions/Deductions-you-can-claim/Vehicle-and-travel-expenses/Car-expenses/). This rate was applied to all visits for which respondents had stated that they used a motorised vehicle. Walking and cycling were given a $0/km as in previous years.

2. The same hourly wage rate as last year was used to account for travel time: $36.20 per hour[8].

As in previous years:

- The cost of travel time was included for each adult in the travel group at the rate of one third of the Queensland average hourly earnings ($36.20 per hour in 2016): $12.07.
- Multi-destination and multi-purpose trips were accounted for by estimating the proportion of the total trip time (excluding travel time) spent on the recreational activity.
- The final travel cost estimate comprised of four components: travel vehicle cost, travel time cost and the proportion of time spent at the site.

$$TC_i = \big((\text{distance} * vc_i) + (\text{time} * [12.07 * \#\text{adults}])\big) * Rec\%Trip$$

where *TC_i* is the travel cost for a travel party (travelling in the same vehicle); *distance* is the two-way distance travelled to the site; *time* is the two-way time to travel to the site; *vc_i* is the vehicle cost per kilometre for travel method *i* (walk, bicycle=0; other vehicles = 0.66); and Rec%Trip is the proportion of the trip spent on recreation. Note: This formula is slightly different from the one applied last year (Windle et al., 2018) as it does not contain a component about boat (fuel) costs, which are indeed irrelevant to calculate beach recreation this year.

D3.2 Beach recreation valuation

Details about beach recreation were collected in 2014 (N=51) and 2019 (N=233). The beach recreation values calculated in 2014 have been used in all report cards since then and needed to be updated in 2019 as recommended in Pascoe et al. (2014). The distribution of travel frequency and travel cost (the two principal variables in a travel cost model) is outlined in Figure D3 (right) below. The original dataset contained one outlier that needed to be removed to make the model converge (Figure D3, left).
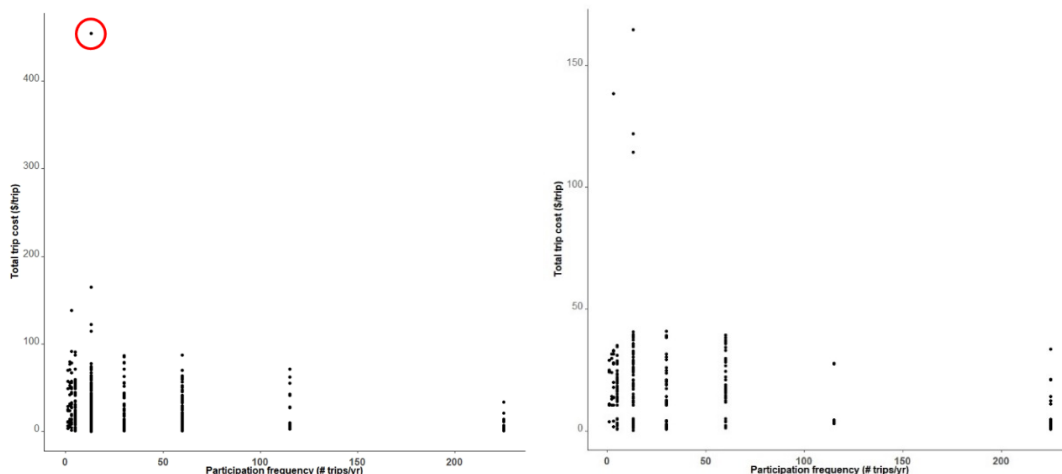

Figure D3: Relationship between participation frequency and travel cost

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The treatment of outliers can have a significant impact on the final value estimates and while the process of removal can be very subjective, generally in the literature few if any details are provided about their identification or removal. One outlier was present in the original dataset and had a trip cost of $454/household largely driven by a suspicious return travel time of 20h to cover 20km (2-way home-beach distance) thirteen times a year. The Negative Binomial model would not converge when this value was present but converged as soon as it was removed.

The data were analysed, and models were generated using the R statistical software (version 3.6.0). For data exploration purposes, a Poisson regression model was applied first (Table D3). A Poisson regression relies on the assumption that the response variable (Y) follows a Poisson distribution, i.e. a distribution whose mean and variance are equal. An overdispersion test was run to see whether this assumption held but demonstrated the presence of overdispersion. A Negative Binomial regression model needed to be applied instead to relax the Poisson assumptions.

Table D3: Full sample travel cost (Poisson) model

Variable	Description	Coefficient		Std Error	z-value
Constant		4.3884	***	0.0151	290.61
Travel cost	Total cost of trip per group	-0.0368	***	0.0009	-41.79
Model statistics					
Sample size		233			
Residual deviance		13,573	(231 degrees of freedom)		
AIC		14,688			
Overdispersion test – Poisson		76.3714	***		6.46

The final travel cost model (N=233) is presented in Table D4.

Table D4: Full sample travel cost (Negative Binomial) model

Variable	Description	Coefficient		Std Error
Constant		4.0967	***	0.1114
Travel cost	Total cost of trip per group	-0.0186	***	0.0041
Theta	*Dispersion factor*	0.7457	***	0.0615
Model statistics				
Sample size		233		
Log Likelihood		-2,195		
AIC		2,201		
McFadden Rsrd		0.011		
Chi sqrd		25.105	***	

*** significant at the 1% level

The model is significant (high Chi square value) and converges adequately. However, the McFadden R square is very small (0.011), indicating that the model is not strong. Different tests and data manipulations were attempted but the effect on the R^2 was limited. There is a high degree of heterogeneity in the data that makes it hard to reach the desired distribution. The *Theta* value is highly significant, indicating there was significant overdispersion and supporting the application of a Negative Binomial model. As expected, travel costs were a significantly negative influence on trip frequency (the dependent variable).

The mean economic value (consumer surplus) of a recreational fishing trip was estimated at **$53.73 per trip** ($-1/\beta_{\text{travel cost}}$), with the 95% confidence intervals (**$37.49 to $94.75**). On average there were **2.258 adults** per group trip which provides an economic value of **$23.91 per adult/trip.** Further data

analysis might be needed to test for the possible influence of socio-demographic variables and to further investigate the heterogeneity issue present in the data. These could not be done at this stage due to time constraints.

Pascoe et al. 2014 recommended recreational trip values be recalculated every five years to account for temporal changes in trip values. The intention of collecting beach recreation data in 2019 was to update the 2014 value for that type of activity.

Recommendation

It is recommended that the value of land-based recreation currently applied in report card analysis ($61) be updated in 2020. See Recommendation 3 (Section 5.3).