Waterway Health Report Cards

An Australian Perspective

THE **AUSTRALIAN WATER PARTNERSHIP**

About the Authors

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The International WaterCentre, based in Brisbane, Australia, was founded with the vision of harnessing the diverse expertise of the world's leading water professionals, to educate and empower individuals, communities and organisations, to change the way people think about and address complex water management issues.

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Disclaimer

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Overview

Waterway health report cards are stakeholder-driven assessment and communication products that compare ecological, social, and/or economic information against predefined goals or objectives. Since their inception in Australia 20 years ago, waterway health report cards have grown in popularity due to their collaborative requirements, success in synthesizing complex information, and ease of communication to a broad audience. Over that time, it has become apparent that a report card is more than a regular summary document, but rather a process that can increase dialogue, form new partnerships, create jobs, foster research, support monitoring, inform management, and ultimately improve waterway health. Today, there are over 20 locations in Australia that have developed report cards and a significantly greater number internationally.

This knowledge product provides an overview of objectives, development, delivery and impact of waterway health report cards in Australia. This was achieved through review of existing report cards, online surveys, and follow-up interviews of report card practitioners and those involved in report card development and/or use in Australia.

It is intended that this product provides guidance to developing countries in the Indo-Pacific region, and beyond, on how waterway health report cards can assist them in their journey towards sustainable management of water resources and meeting the UN's Sustainable Development Goals.

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1 Introduction

1.1 Waterway health report cards: An Australian initiative

Waterway health report cards evaluate the health of aquatic systems based on a series of agreed values. Conventionally, waterway health has comprised the chemical, physical, and biological integrity of the waterway and surrounds. However, waterway health can also include the social, cultural and economic values that healthy waterways deliver to human society (Dennison *et al.*, 2007; Pascoe *et al.*, 2016, McIntosh *et al.*, 2019). Report cards can encompass all these categories of waterway health as well as the management and governance systems that enable maintenance or restoration of waterways and the human health and nutritional benefits of waterways.

Waterway health report cards have for many years now grown in popularity in Australia due in part to their collaborative requirements, success in synthesizing complex information, and ease of communication to a broad audience (Dennison *et al.*, 2007; Connolly *et al.,* 2013; Pascoe *et al.*, 2016, McIntosh *et al.*, 2019). Over that time, it has become apparent that the value of report cards lies in the *process* of developing report cards, as well as the product itself (Costanzo *et al.*, 2017).

The first "environmental" report card was released 20 years ago in south-east Queensland as part of the Brisbane River and Moreton Bay Wastewater Management Study (Abal *et al.* 2001). At the time, south-east Queensland was, and still is, one of the fastest growing regions in Australia and had a legacy of treating the river systems as drains. As a result, the waterways in the region were showing significant signs of degradation with excessive amounts of pollutants (toxicants, nutrients and sediments) from sewage treatment plant discharges and stormwater runoff from both urban and agricultural areas (Dennison and Abal, 1999). Combined with storage dams up-stream and dredging downstream, each of which dramatically changed flushing and flow regimes, the waterways of south-east Queensland were showing all the tell-tale signs of a neglected natural resource.

It is difficult to identify just when and why a change in attitude took place, but there was growing recognition in the early 1990s that Moreton Bay and its islands were 'special places.' This attitude reflected the attitude of the indigenous peoples of the region, who call the bay Quandamooka: the place of the creator spirit, Quandamooka (Martin & Mirraboopa, 2003). Together with inner city re-development and use of the Brisbane River as a rapid transport system, property prices adjacent to rivers began to rise and with it an increasing community awareness and expectation for clean water and for healthy waterways. Various management actions were being considered to address these impacts despite a lack of shared understanding about the causes, impacts and trends of the environmental status of the waterways. Resources had not been committed to build this understanding or trusting relationships amongst the community, government and researchers. At the most fundamental level, local communities didn't really have a sense of their place within the catchment. They didn't understand the connectivity between the waterways and where they lived.

In 1994, seven local councils together with the Queensland State Government bid for and were awarded matching funds from a Federal funding program to initiate an integrated study of Moreton Bay and three of its main estuaries. The objective was to develop an integrated strategy for improving water quality in the study region through multiple stages. With this came an awareness of the need for a state-of-the-art monitoring program to guide the effective management of the region's waterways. In particular, stakeholders required a program that would monitor and assess the effectiveness of the significant investments in environmental protection. The Ecosystem Health Monitoring Program (EHMP) was established in 2000, making it one of the first environmental monitoring and reporting programs in Australia. The EHMP was a comprehensive and scientifically robust waterway monitoring program

that provided a regional assessment of the health for each of South East Queensland's (SEQ) major catchments, river estuaries and Moreton Bay. With this monitoring, it became a high priority for robust data to be collected, synthesised and communicated to the community in an accessible form. As a result, the first Ecosystem Health Report Card was developed to communicate to communities, government and industry the results of scientific studies conducted throughout the region and to monitor the effectiveness of remedial investments made (e.g. sewage treatment plant upgrades).

The aims of the EHMP and Report Card were to:

1. Inspire action to improve waterway health

2. Identify priority areas for investment and support councils and other partners to identify and implement actions

3. Provide an assessment of the effectiveness of management actions and progress towards targets

4. Provide data relevant for researchers, managers and the wider community to contribute to greater waterway understanding

These aims helped to achieve the overall goal for waterway management in south-east Queensland, which was to enhance community quality of life by fostering stewardship to protect and restore waterway health. Publication of this report card continues to this day as the Healthy Land and Water Report Card, now improved and expanded to include new indicators, new regions and new partners.

Currently, there are over 20 locations in Australia that have developed report cards and a significantly greater number internationally (Figure 1). The process of developing report cards has also evolved over the past 20 years as new issues have arisen, new data have become available, and new platforms for presenting report card findings and recommendations have emerged (i.e. web-based report cards). This, combined with the refinements in how different groups develop and present report cards, has led to a diversity of approaches and advancements (Hallett *et al.,* 2016).
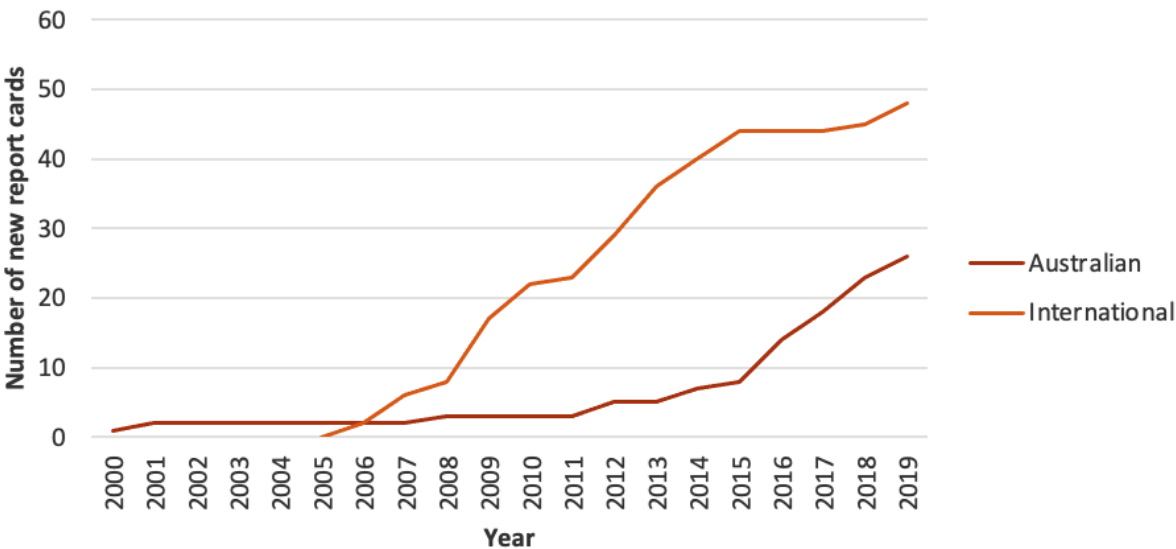
Figure 1. Cumulative production of new report cards in Australia and overseas since 2000

1.2   What is a waterway health report card?

Waterway health report cards are stakeholder-driven assessment and communication products that compare ecological, social, cultural and/or economic information against predefined goals or objectives (Pascoe *et al*., 2016; McIntosh *et al*., 2019; Vargas-Nguyen *et al*., 2020). Similar to school report cards, environmental report cards provide performance-driven numeric grades or letters that reflect the environmental, social, cultural and/or economic health of a system on a regular (usually annual) basis. They effectively integrate and synthesise large, and often complex, sets of information into simple scores that can easily be communicated to decision makers and the general public (Costanzo *et al*., 2017) (Figure 2). With expanding digital connectivity around the world, report cards can reach large audiences and provide transparency and scientific information to help us make good decisions.
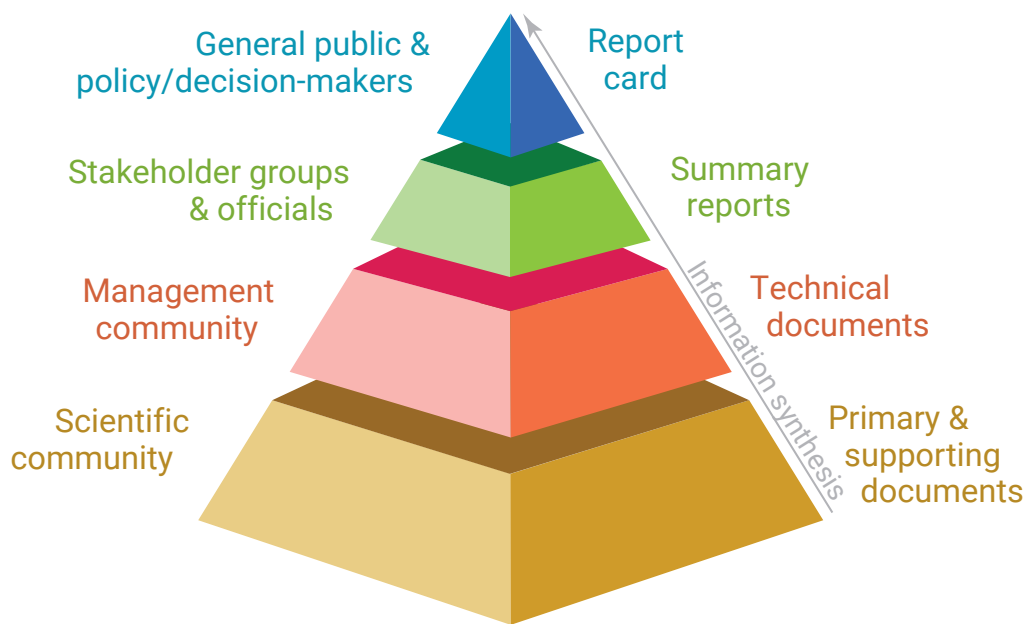
Figure 2. Information pyramid (adapted from Costanzo *et al*., 2017)

1.3   What is typically found in a report card?

Report cards can be quite diverse in their appearance, size and structure (Figure 3). Traditionally, report cards have been prepared for both hard-copy print, downloadable PDF format, and/or interactive online formats. However, there are elements that transcend most report cards prepared to date. These elements are outlined below.

Figure 3. Examples of waterway health report cards

Regional overview

Report cards typically include a regional overview that provides an indication of the social, environmental, cultural and economic influences of the region covered by the report card. Often in the form of a conceptual diagram (Figure 4), they can help readers understand how all these influences interact and may provide local, regional and global contexts. Conceptual diagrams enhance readers' understanding of local conditions and key geographic features important to the region.
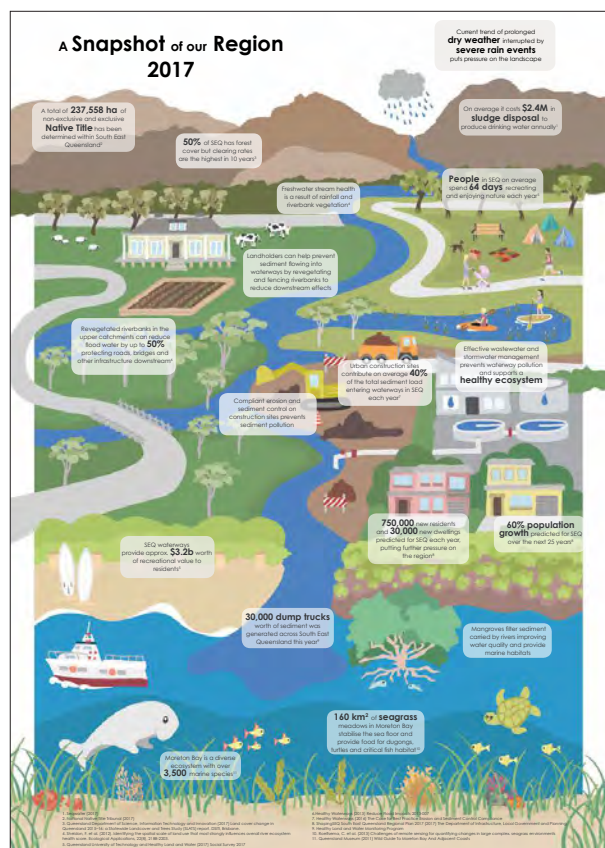
Figure 4. Regional overview provided in the South East Queensland Report Card 2017 (source: Healthy Land and Water)

Summary of regional values and threats to those values

Report cards typically include a section that summarises the key features and threats, identified through stakeholder engagement, in the region being assessed (Figure 5). Key values and threats to a region are often the foundation of a report card, from which indicators are chosen.

Figure 5. Regional values outlined in the Wet Tropics Report Card 2018 (source: Wet Tropics Waterways)

Indicators and thresholds for assessing values and threats

Key to any report card is the selection of indicators used to evaluate the health of the region. Report cards typically include a brief synopsis of the process by which the indicators were chosen, the source and dates of the data used, and thresholds against which monitoring data were compared (Figure 6). Some report cards have used graphic representations of the indicators as well. Often a supporting "methodology" document or more complete report is prepared to provide details on the justification for indicator selection, links to original data sources and detailed methodology on report card score and grade calculations. Methodology reports will also often include indicators that were considered but not included with justification why not (e.g. insufficient data availability).
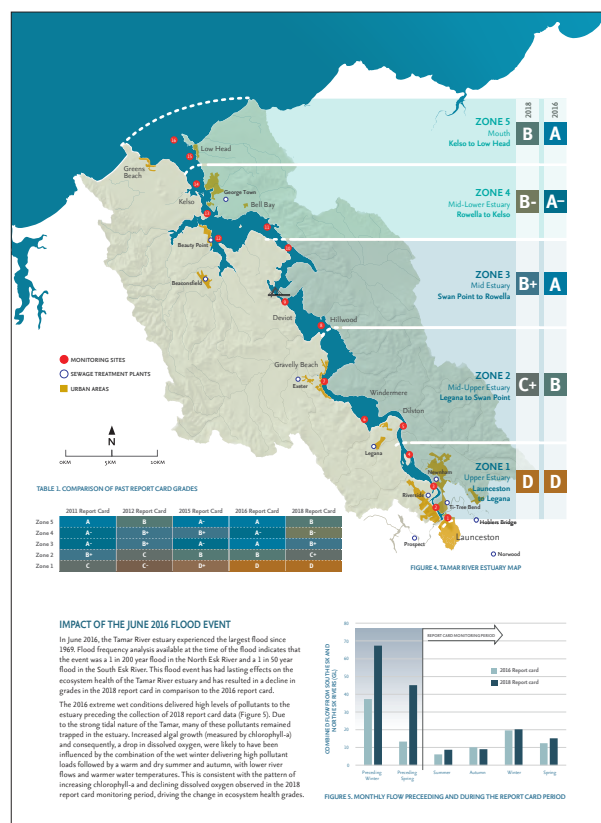
Figure 6. Regional grades included in the Tamar Estuary 2018 Report Card including historical grades (source: NRM North)

Report card scores and/or grades

Report cards use a grading scheme and representation that is easy to understand. Grades in Australia are typically alphabetical, but numeric grades have been used in other countries. Inclusion of these grades on a map enables readers to understand the spatial area covered by the report card, and also how grades vary amongst zones across the report card region (Figure 7). Grades provide a clear communication of the results of the indicators across categories. Stoplight colours (red, yellow, green) are commonly used that reflect the health of the indicator. For example, the use of red connotes the need to 'stop', consider that something is seriously wrong, and that some major intervention is required. Conversely, the use of green indicates that it is OK to 'go', that the status is very good, and it is acceptable to continue with current activities. Different terms have been used depending on the local norms and expectations.
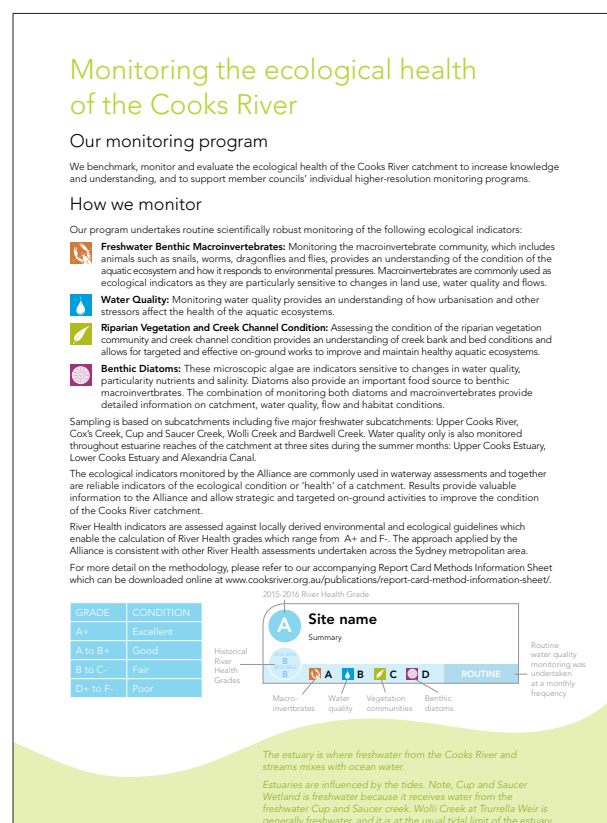
Figure 7. Report card methods and indicators outlined in the Cooks River Report Card 2016–2017 (source: Cooks River Alliance)

Summary of findings and recommendations

An important conclusion to a report card is describing what the grades mean, outlining key findings (supported by data), and recommending actions that could be implemented to improve waterway health—which will be reflected in future report cards (Figure 8).

Figure 8. List of partners acknowledged at the end of the Fitzroy Basin Report Card 2017–18 (source: Fitzroy Partnership for River Health)

Acknowledgements

Many report cards have a section acknowledging those that participated in the process, reflecting the collaborative nature of report cards (Figure 9). Some also include a group photo from, for example, the stakeholder workshop. Providing acknowledgement has the added benefit giving ownership of the product to those that were involved in the process.

Figure 9. Key recommendations included in the Tamar Estuary 2018 Report Card including contact details for more information (source: NRM North)

1.4 Resources and activities that support waterway health report cards

Australian report cards highlight the range of resources and activities that can be used to support and promote report cards and provide opportunities for end-users to find more information related to methodologies, data sources and historical results. These include websites (Figure 10), report card launch events (Figure 11), movies/videos online (Figure 12), and podcast series (Figure 13).
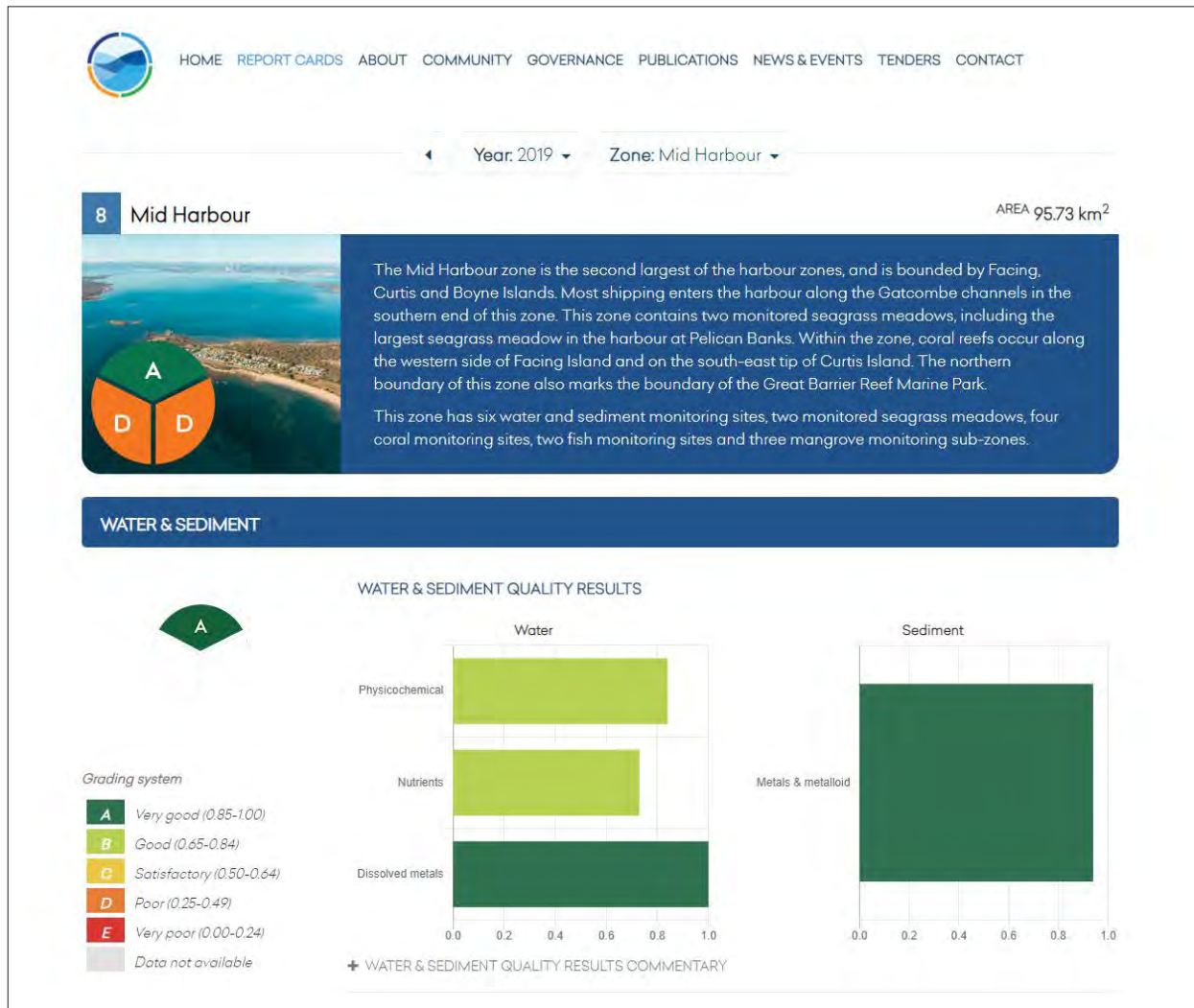
Figure 10. Interactive website for the Gladstone Harbour Report Card (source: Gladstone Harbour).

Figure 11. Report card release events, L: Healthy Land and Water releases the South East Queensland Report Card; R: Fitzroy Partnership for River Health release the Fitzroy Basin Report Card (source: Healthy Land and Water; and Fitzroy Partnership for River Health)

Figure 12. Short movie showcasing the release of the Townsville Dry Tropics Healthy Waters report Card (source: Dry Tropics Healthy Waters)

Figure 13. Podcast series linked to the Wet Tropics Report Card (source: Wet Tropics Report Card).

2 Australian perspectives on waterway health report cards

As waterway health report cards are an Australian innovation, there is no better starting point than Australia to review the diversity of report card objectives, approaches, outcomes, lessons learned and expertise built in developing report cards over the past 20 years. This section captures responses from a diversity of people from around Australia that have had experience in the report card development process. The findings may assist people in developing new report cards in the future.

2.1 Information collection

Information used in this knowledge product was sourced through a combination of an online survey and follow-up interviews with selected survey respondents. Both activities were approved under the Griffith University Human Research Ethics review process (GU Ref No: 2019/918). Survey questions were also reviewed by an independent gender equity and social inclusion expert.

2.1.1 Survey

A survey comprising 35 questions was prepared using the online survey platform Survey Monkey (www.surveymonkey.com), and directly emailed to 100 potential respondents whose identities were sourced from the National Report Card Network. The Network is an informal group of waterway health practitioners and specialists involved in producing report cards on waterway, estuary, harbour, reef and marine health across Australia. A link was also posted and promoted through the online professional network LinkedIn. The survey remained open for a period of three weeks.

A total of 36 people participated in the survey. Eighty percent of survey participants were comprised of government, academic and non-profit organisations (Table 1), and over half of all surveyed were participants in the process of report card development (Table 2). The majority of respondents referred to report cards located in Queensland which reflects the number and activity of report cards in Australia (Table 3).

Table 1. Survey participants work background

How would you best describe your work?	Response
Government	44%
Academic	19%
Non-profit	17%
Other	8%
Industry	6%
NGO	6%

Table 2. Survey participants role in report card development

What was your role in the process? (select all that apply)	Response
Participant	55%
Convener/ organiser	36%
Other	32%
Observer	7%
Media	0%

Table 3. Location of report cards (by Australian State) that survey respondents referred to when answering survey questions.

State	Number of participants	% of participants
Queensland	25	69%
New South Wales	3	8%
South Australia	2	6%
Victoria	1	3%
Multiple states	5	14%
Total	**36**	**100%**

2.1.2 Interviews

As part of their responses to the online survey, respondents were asked if they would be available to provide more detailed information through follow-up interviews. Of the 36 respondents, 24 indicated that they would be available to do this. Of those, respondents who provided information on barriers, challenges, benefits or impacts of report cards were selected for interview. Thus, interview participants were selected through a two-stage process: 1) self-selection through voluntary participation in the survey and self-identification within that survey, and 2) targeted selection based on survey responses. In this way, sixteen people were selected for interview.

Those potential interview participants were contacted by email to arrange interview times. Of the sixteen people selected for interview, four were unavailable during the interview period so were not interviewed. Interviews were conducted by telephone (n = 11) or face-to-face (n = 1). Prior to interview, each participant was informed of the study objectives and their rights in accordance with the Griffith University Research Ethics Manual and the National Statement on Ethical Conduct in Human Research. Each participant was also advised that the information that they provided could be used in the present project report and that they would have the opportunity to review and approve that information prior to report release.

Interviews followed a semi-structured format with a mixture of general questions regarding the challenges of implementing report cards, barriers to successful implementation, and the benefits and impacts of report cards and specific questions requesting more detail on each individual's survey responses. Open questions were used to obtain rich information and to avoid limiting the scope of the responses. Interviews were conducted in November 2019 and January 2020. Each interview was conducted by the same member of the research team (JMK) and notes were recorded using pen and paper and later transcribed onto computer files. Interview duration averaged 25 minutes (range 15–35 mins).

2.2 Responses

This section summarises and discusses the responses to survey questions and follow-up interviews related to report cards developed in Australia.

2.2.1 Objectives of waterway health report cards

The most common objective of waterway health report cards identified in the survey was "*to generate information and knowledge about the status of a waterway*". This was followed by "*advocacy and awareness-raising*", "*broaden stakeholder knowledge*" and "*influence policy and decision-making*" (Table 4). These findings support anecdotal evidence that waterway health report cards can be powerful

instruments to describe ecosystem status, increase public awareness, and inform and influence decisionmakers to take action to improve or maintain the health of a river basin.

Interestingly, only 58 per cent of survey participants responded that report cards "*improve health*" of waterways or "*influence behaviour change*". This may be a reflection of the difficulty in correlating report card outputs and recommendations to behaviour change or waterway health (which can take in the order of decades to show improvement). However, demand for report cards has continued to grow, highlighting the importance placed on better understanding waterway values and threats to those values so that more informed decisions and actions can be made.

It is clear that more can be done to include objectives that address issues faced by Indigenous Peoples, women and socially vulnerable sectors of society.

Table 4. Objectives of a report card

What were/are the objectives of a report card?	Response
To generate information and knowledge about the status of the waterway	95%
Advocacy and awareness raising	75%
Broaden stakeholder knowledge about their potential to influence ecological, economic and social health	75%
Influence policy and decision making	70%
Influence funding and resource allocation	67%
Identify real or potential ecological, economic or social impacts	64%
Improve health of the region	58%
Influence behaviour change	58%
Ensure indigenous peoples have meaningful consultation, information gathering and negotiations	20%
Other	20%
Address the specific barriers that some sectors of society (women, socially vulnerable groups, and indigenous peoples) face when accessing information	11%

2.2.2 Approaches used to develop report cards

The process of developing report cards has evolved over time, but the foundation of stakeholder engagement and clear communication has remained a consistent focus. Stakeholder engagement in Australian report cards has been conducted primarily through face-to-face workshops, consultation via email, one-on-one meetings and a report card release event, amongst other means (Table 5). Ongoing engagement throughout these processes is recommended to maintain momentum, obtain peer review, develop relationships and empower ownership of the report card by the participants.

Table 5. How were people engaged in developing this report card?

How were people engaged in developing this report card? (select all that apply)	Response
Workshop(s)	91%
E-mail	73%
One-on-one meetings	70%
Report Card release event	67%
Telephone	49%
Other	28%
Webinars	12%

2.2.3 Participants involved in making report cards

Over half of the report cards developed in Australia included stakeholder representatives from government, university/academia, non-profit organisations, the private sector and women, and over a quarter also included non-profit (other), Indigenous Peoples, and the general public (Table 6). More work can be done to include socially vulnerable groups and underrepresented populations. A likely reason for the low level of involvement of people from socially vulnerable groups is that the majority of report cards in Australia have focused on ecological health, with the move to include social and economic health in report cards being fairly recent. This may see the inclusion of underrepresented populations increasing over time.

Table 6. Stakeholders involved in making a report card

Who was involved in making this report card?	Response
Government	94%
University/academia	79%
Non-profit environmental	74%
Private sector	68%
Women	56%
Non-profit, other	32%
Indigenous Peoples	29%
General public	26%
Other	21%
Civil Society	18%
Socially vulnerable groups and underrepresented populations	12%

2.2.4 Indicators assessed by report cards

Report cards are flexible in how and what they measure, as indicator selection often depends on initial scope and data availability. The vast majority of Australian report cards referred to in the survey focused on water quality, water quantity and ecological indicators (Table 7). Less than half of respondents answered that report cards they were involved in, included social and/or cultural, economic or governance/management indicators. "Other" indicators included those referring to stewardship in the context of adoption and implementation of best management practices of major industries.

Table 7. Type of indicators used in report cards

What types of indicators were included in this report card?	Response
Water Quality and Quantity (e.g. flow, flooding, storage capacity, nutrients, toxicants)	94%
Ecological (e.g. species richness, habitat status, chlorophyll-a concentration)	89%
Social and/or cultural (e.g. quality parks, access to waterways, access to clean drinking water, human health and nutrition, knowledge, condition and protection of indigenous cultural heritage sites, specific environmental needs of Indigenous Peoples)	42%
Economic (e.g. revenue, income, and specific needs of women, SVGs and Indigenous Peoples)	31%
Governance/Management (e.g. regulations, illegal activities, stakeholder consultations)	31%
Other	14%

2.2.5 Data required to make a report card

Report cards typically use a mixture of pre-existing and new data sets available for the study region, and it is rare that a report card is based solely on newly collected data (Costanzo *et al.*, 2017). This was supported in the present study in which over 50 per cent of responses indicated Australian report cards used a combination of new and existing data, a third used only pre-existing data and less than 10 per cent were comprised solely of newly collected data (Table 8). Report cards can be effective tools at identifying data gaps, often resulting in new data being collected for the initial report card or proposed for following report cards.

Table 8. New vs. existing data required for making the first report card

How much new data needed to be collected in order to complete the first version of this report card?	Response
Used a mix of pre-existing data and had to collect new data	58%
Used only pre-existing data	33%
Had to collect all new data	9%

2.2.6 Specialised expertise required to make a report card

Report cards are underpinned by scientific data (Figure 2). Analysis and interpretation of these often-diverse datasets for inclusion in report cards requires input and guidance from subject specialists. Survey responses identified report cards in Australia to have engaged between 5–100 specialists in the development of report cards, with a median of 20 specialists engaged (Table 9). The number of specialists engaged is dependent on the diversity of data included in the report card and the geographic extent of the report card, but also often how contentious or sensitive the data being used is. Greater acceptance of the data and findings by experts provides reassurance and credibility to those preparing the report card and end-users.

Table 9. Number of specialists required to make the first version of a report card (based on 28 responses)

How much specialised expertise (e.g. hydrologist, biologist, anthropologist, indigenous person, social scientist, economists) was required to create the first version of this report card?	Number of specialists
Maximum	100
Median	20
Minimum	5

2.2.7 Use of report cards

The intent of report cards is to synthesise a diverse set of information into easily understandable grades that can reach and inform a wide audience (Connolly *et al.*, 2013). The survey reflected this intent with over 50 per cent of respondents stating that the "users" of report cards are the general public, researchers and scientists, resource managers and non-profit organisations (Table 10). Approximately half of survey respondents indicated that media, politicians and planners use report cards.

For the research community, report cards may lead to new insights through multi-disciplinary data analyses that may reveal patterns not immediately apparent, help design conceptual frameworks to integrate scientific understanding and ecological and socio-economic values, and enable development of scaled approaches that allow for comparison in time and space. By providing timely and relevant status updates, report cards have the added benefit of accelerating management and community response times.

For resource managers and non-profit organisations, report cards may provide both accountability and focus by measuring the success of restoration efforts or identifying impaired regions or issues of concern that require resource attention. These elements may catalyse improvements in environmental, social and economic health through improved public awareness, peer pressure between communities, and more informed decision makers.

Table 10. Users of report cards

Who are the users of this report card? (select all that apply)	Response
General public	74%
Researchers & scientists	74%
Resource managers	68%
Non-profit organisations	53%
Media	47%
Politicians	47%
Planners	47%
Businesses and private sector	41%
Advocacy groups	35%
Indigenous groups	21%
Other	18%
Don't know	3%

Survey respondents observed report cards being discussed in a range of community settings as well as in established media outlets. The majority of instances (>70 per cent) were through direct communications with people through conversations, community meetings and scientific forums (Table 11). This was followed by media outlets (newspaper, TV and radio) (50–70 per cent). Almost half the respondents observed report cards being discussed in political discussions (47 per cent).

Table 11. Mechanisms for discussion of report cards

Where have you observed the use of this report card in discussions of issues in your region? (select all that apply)	Response
Conversations with friends or colleagues	81%
Community meetings	78%
Scientific forums	72%
Newspaper	69%
TV	59%
Radio	50%
Political discussions	47%
Other	16%
None	6%

2.2.8 Time taken to make a report card

There was a wide variability in completion times ranging from 2 months to 4 years, with the median timeframe for developing the initial version of a report card being 18 months (Table 12). Timeframes will vary based on the scope and size of a report card, but ample time should be given for proper stakeholder consultation and feedback. Conversely, extended timeframes run the risk of the resultant report card being "out-of-date" once published and losing momentum with stakeholders consulted at the beginning.

Subsequent "repeat" report cards are typically produced on a much shorter timeframe as indicators, methodology, and report card format are pre-determined.

Table 12. Time taken to make a report card

How long did it take to finish the first version of the report card?	Months
Maximum	48
Median	18
Minimum	2

2.2.9 Cost of making a report card

Survey responses show a wide range of costs associated with developing the first version of a report card in Australia ranging from $20,000 to $1,000,000 AUD, with a median cost of $300,000 AUD (Table 13). Cost is driven primarily by salaries of staff and consultants used to engage stakeholders and conduct data analysis, costs associated with stakeholder workshops, new data collection, development of new indicators, and design and layout of the report card. Costs typically decrease considerably for subsequent "repeat" report cards.

Table 13. Cost to make a report card (based on 11 survey responses)

How much did it cost to make the first version of the report card?	AUD (,000)
Maximum	$1000
Median	$300
Minimum	$20

2.2.10 Outcomes resulting from report cards

The top three survey responses on how report cards were used (chosen by over 80 per cent of survey participants), related to educating and engaging the public, and raising awareness of issues in the region (Table 14). This reflects one of the primary objectives of report cards: to synthesise and communicate complex information to the public. Most respondents indicated that report cards were used to inform or modify management or modify monitoring programs (59 per cent each), while fewer than half of respondents indicated that report cards were used to inform or modify policy, influence dialogue, or influence societal behaviour (Table 14).

Table 14. Use of report cards

How has this report card been used? (select all that apply)	Response
Educate the public	91%
Raise awareness of issues	91%
Increase public engagement in the region	82%
Inform or modify management	59%
Modify monitoring programs	59%
Inform or modify policy	44%
Influence dialogue	44%
Inform civil society behaviour	21%
Other	3%
Don't know	0%

The data in Table 14 was reflected in survey responses to questions with Lickert-scale options on how strongly respondents agree or disagree with statements pertaining to report card effectiveness (Figure 18). Survey respondents were more confident in the role that report cards play in increasing public and political awareness, than the role report cards play in changing stakeholder behaviour and the overall health of the report card region. This reflects the objectives of report cards outlined in Section 2.2.1 and suggests that report cards are effective awareness/education/engagement tools.

Interview respondents provided some specific examples of the actual benefits that report cards have delivered (Box 1).

Box 1: Benefits of report cards

Mandate for action

The first environmental report card for Moreton Bay and its major tributary rivers was released in 1998 (Abal *et al.*, 2001). This report card described how sewage-derived nutrient enrichment drove poor water quality and adverse ecosystem responses in western Moreton Bay.

"Jim Soorley (then Lord Mayor of Brisbane) was able to stand up in front of the public and point to this report card to justify expenditure of AUD $20 million on upgrading sewage treatment plants to remove nitrogen. The report card gave the lord mayor the mandate to spend that money."

– Mark Pascoe, International WaterCentre

Focusing of management activity

The Murray-Darling Basin Authority Report Card reports on the monitoring and assessment of the Murray-Darling Basin Plan and identifies elements of that plan that are at risk of being delayed or failing to be delivered.

"The report card gives us a really good communication tool to 'shine a light' on areas that need management attention."

– Gill Whiting, Murray-Darling Basin Authority

Improved understanding amongst stakeholders

The Water Storage Condition Assessment is an internal report card within the Queensland bulk water supply authority (Seqwater) that reports on water quality over time for a range of applications including drinking water, recreation and ecosystem health.

"Information reported through this report card has led to a change in the business mentality within Seqwater. It has improved our understanding of the impact of catchment condition on water quality in storages. The report card has now led to a greater focus on catchment protection."

– Dr Andrew Watkinson, Seqwater

There was uncertainty about the influence of report cards on behaviour change, which may reflect a lack of measurement of behavioural parameters. There was also uncertainty and a lack of consensus over whether report cards had improved the overall health of the report card regions (Figure 18). Possible reasons for this include:

1. a lack of effective management action in response to report card findings (Box 2);

2. time delay between management action and an environmental response; or

3. changes in pressures (e.g. population growth, climate change, global economic issues) that act to reduce the effectiveness of management actions (Box 3).

Such situations can see report card grades remain stable over long periods of time despite remedial actions. Report cards are generally regarded as effective communication tools that generate multiple benefits through their processes and the knowledge that they generate and promulgate (Table 14, Figure 14). However, the lack of consensus over whether they do improve the overall health of the report card regions suggests that this is an area that requires further attention.
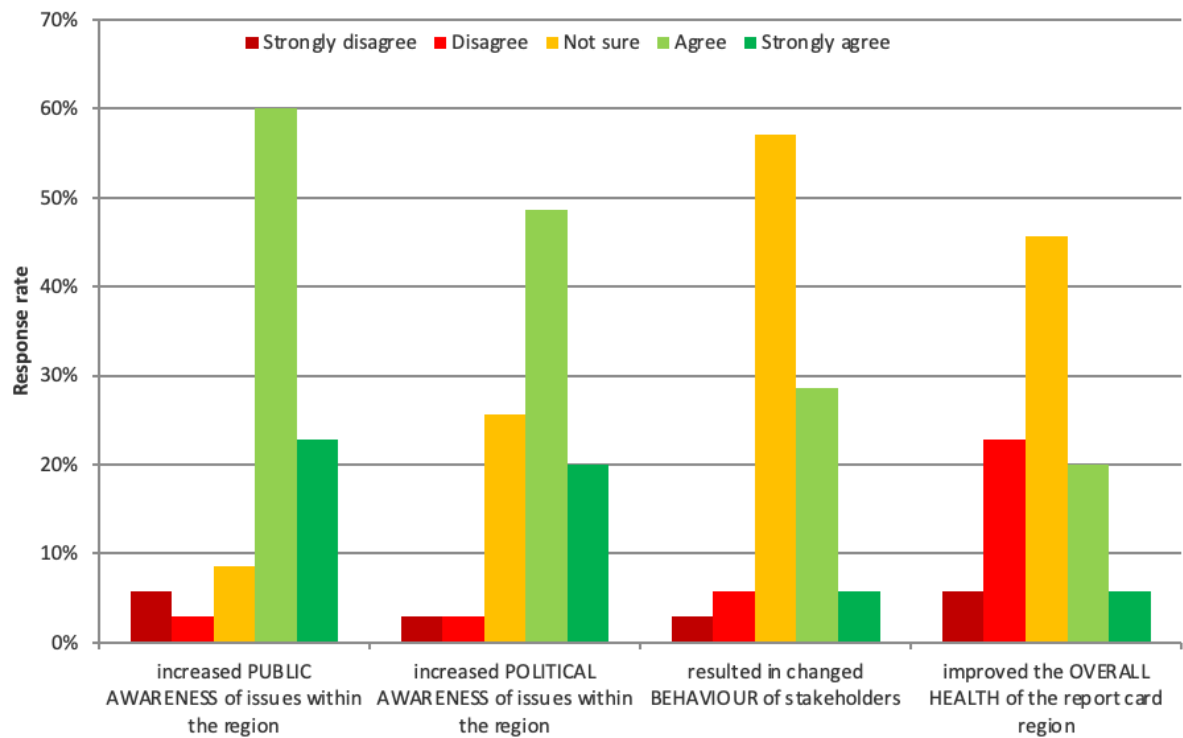
Figure 14. Level of agreement/disagreement with statements about report card effectiveness

> **Box 2: Lack of appropriate management response may lead to a report card failing to improve overall aquatic health**
>
> *"We have totally and utterly fallen short of the level of investment needed to achieve the positive environmental outcomes that are required. Too little has been directed towards solving pervasive problems that have been identified through report cards. There is a missing link between report cards and management responses."*
>
> – Diane Tarte, Chair, Dry Tropics Report Card Partnership

> **Box 3: Report cards may deliver benefits by maintaining health in the face of increased external pressure**
>
> *"In Wallis Lake, report card scores have held firm despite increased pressure from changes in land use."*
>
> – Peter Scanes, NSW Department of Planning, Industry & Environment

A number of other report card benefits not quantified in earlier survey questions were also elicited from the survey (Table 15).

Table 15. Specific report card benefits identified through survey questions

What is the most surprising and/or important change you've seen as a result of this report card?	
• Increased funding	• Positive influence on government funding
• Employment of staff	• High level of community interest and pride
• Change in business mentality	• New report cards starting in adjacent regions
• Improved confidence in results	• Useful when applying for rehabilitation funding
• Better trust between stakeholders	• Better knowledge about biodiversity in the region
• Changed land management practices	• Collection of new data to better understand poor grades
• Recognition of alternate perspectives	• Knowledge of what information is available and who has it
• Increased conversations amongst groups	
• Impact to national regulatory framework	

2.2.11 Barriers encountered making report cards

Implementation of report cards can face numerous barriers that need to be considered and appropriately managed for the report card to be accepted by stakeholders. Those barriers span difficulties encountered at the onset of the report card process (e.g. overcoming resistance), during the production of the report card (e.g. insufficient data, insufficient resources), or after the report card is released (e.g. maintaining momentum). In addition, the challenges of incorporating climate change, overcoming transboundary issues, establishing agreed baselines and grade thresholds or dealing with external factors or influences can be barriers as well.

The top three challenges in developing the first version of a report card in Australia were identified as data availability, insufficient human resources, and insufficient financial resources (Figure 15). There were also issues with stakeholder disagreement, reluctance to participate, and pessimism regarding the process.
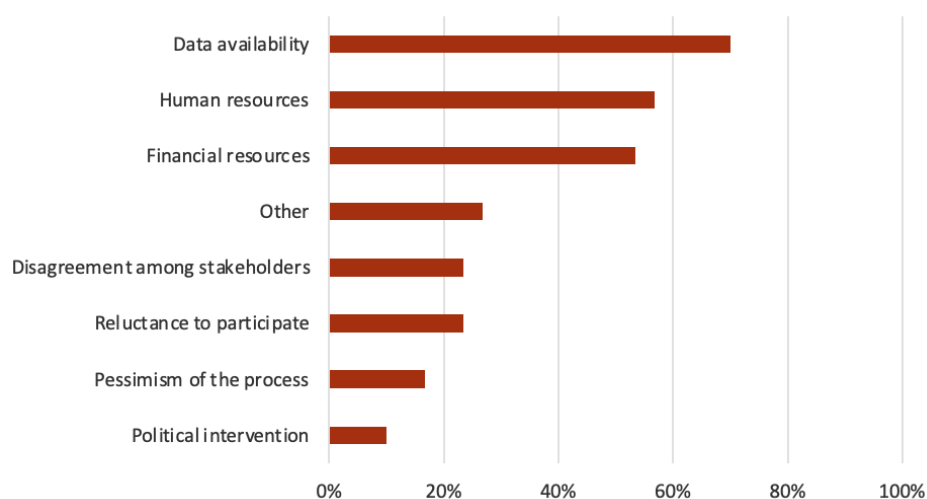
Figure 15. What were some of the challenges and/or barriers to creating the first version of this report card?

Other barriers mentioned in survey responses included oversimplification of the science, time-lag between collection of data and production of the report card, poor Quality Assurance or Quality Control of data sets, and using datasets that were not fit-for-purpose (Box 4). While the final report card can, and should, appear simple, achieving this simplicity requires adequate resourcing to ensure that report card grades reflect actual health (McIntosh *et al.*, 2019).

In many cases, acceptance of the report card concept has developed over time as stakeholders have either seen the benefits of the report card or found that their initial concerns had not eventuated. This has often occurred without the need for targeted strategies (Box 4).

Box 4: Barriers may break down over time

Oversimplification

Some of the scientists involved in collection and analysis of data for the Murray-Darling Basin Authority Report Card expressed concern that combining multiple complex results into a single grade oversimplified complex environmental issues. Waterway managers were also concerned that good report grades might be used by politicians as an excuse to not fund appropriate management actions.

"These concerns have been overcome to some extent as those stakeholders now see the value of the process [of generating the report card] *and the benefits of the report card as a communication tool."*

– Gill Whiting, Murray Darling Basin Authority

Reluctance to participate

Prior to the instigation of Gladstone Harbour Report Card, an industry-based monitoring program, the Port Curtis Integrated Monitoring Program (PCIMP) conducted monitoring of water and sediment quality parameters and accumulation of toxicants in oysters in the harbour. Some PCIMP partners expressed a lack of support for the new report card, some of which duplicated some aspects of the PCIMP Report Card but with different benchmarks and objectives.

"There is now improved trust between PCIMP and the Gladstone Healthy Harbour Partnership and the two bodies now collaborate in many areas … such as research to understand water quality assessments and nutrient loads."

– Prof John Rolfe, Central Queensland University & Gladstone Healthy Harbour Partnership

2.2.12 Would you recommend other regions to use a report card?

Responses to the final survey question provided testament to the popularity of report cards as 33 of 35 respondents said that they would recommend that other regions use a report card, with only one respondent replying "no" and one respondent replying "not sure" (Figure 16).
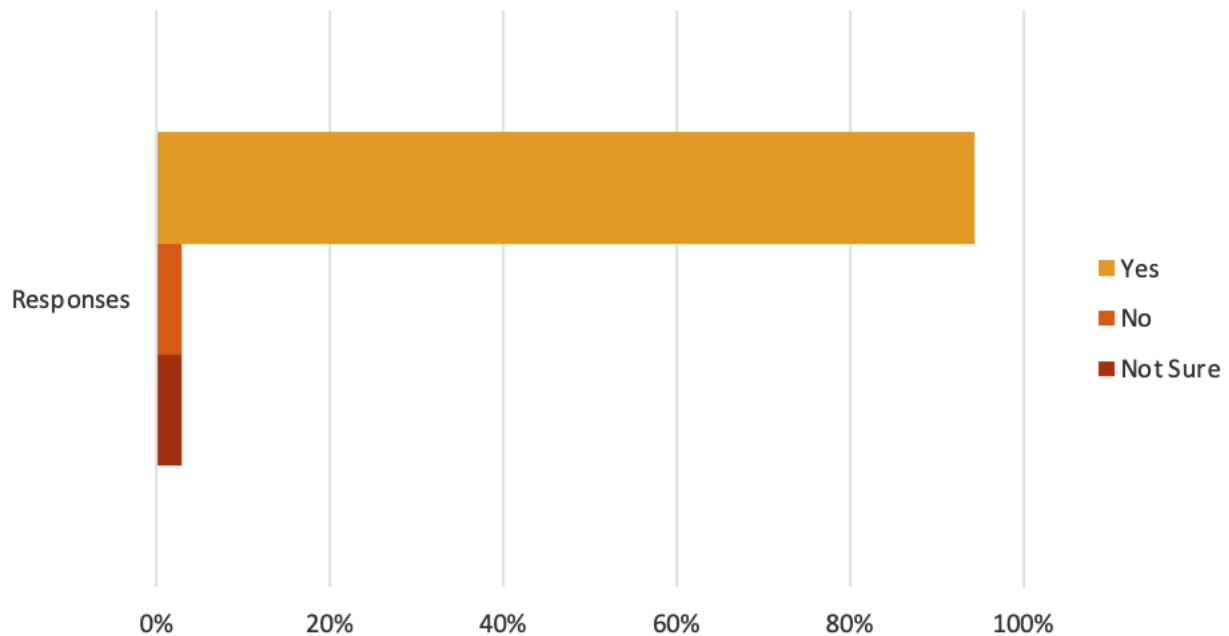

Figure 16. Would you recommend to other regions that they use a report card?

3 Report card theory of change

The Australian experience with waterway health report cards, captured in this report, demonstrates the central role that report cards play in increasing dialogue, forming new partnerships, creating jobs, fostering research, supporting monitoring, informing management, and ultimately improving waterway health (Connolly *et al*., 2013; Costanzo, *et al.* 2017). Report cards can therefore be seen to be more than just end products, but rather catalysts that generate change through a series of steps (Figure 17).

In summary, the Australian experience has shown that developing a report card facilitates interaction amongst people, governments, and industries; who each have different agendas, perspectives, and levels of awareness. This interaction has the objective of creating a shared vision of what the future will be, and what is needed to get there. The report card then clearly communicates progress towards that vison to influence behaviour and increase capacity to implement recommended actions to improve or at least maintain the health of a system.
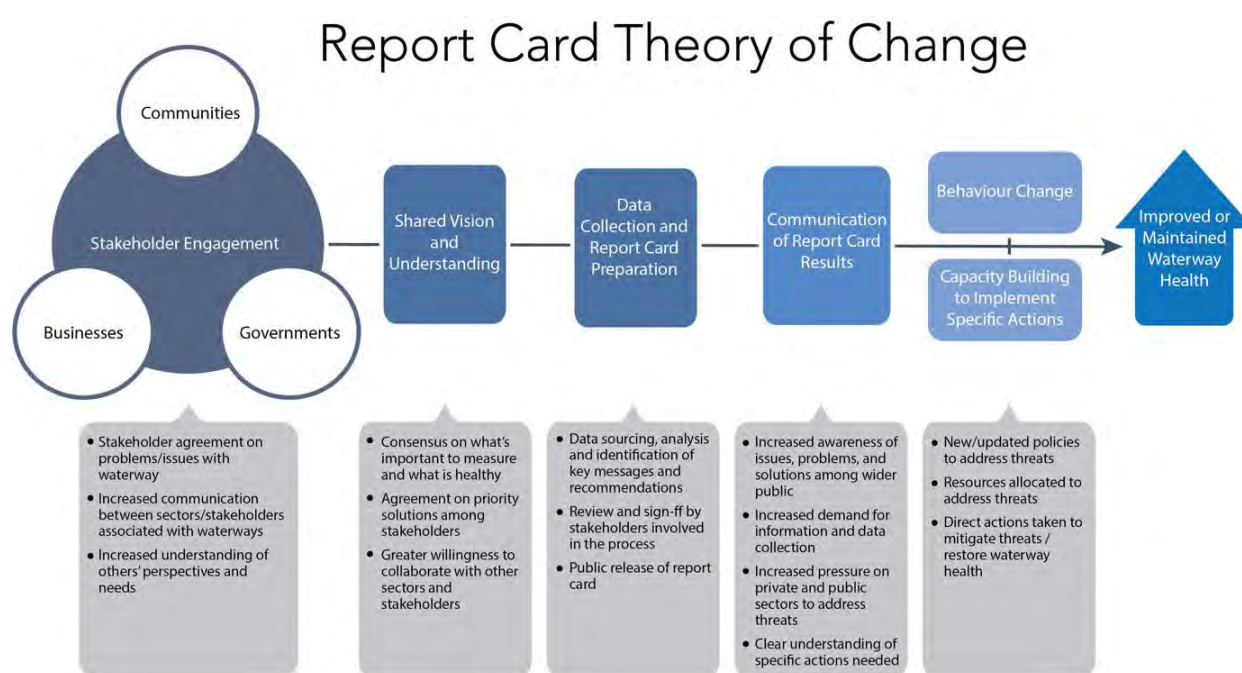
Figure 17. Report Card Theory of Change (adapted from the Healthy Rivers for All Initiative – a partnership between the University of Maryland Center for Environmental Science and WWF-US)

4 Interested in starting the report card journey?

This section provides a brief overview of the process of developing a waterway health report card, a timeline of typical activities and milestones, and a list of expertise and resources that can assist those interested in pursuing a report card in their region. More in-depth details are freely available via the 'Practitioner's Guide to Developing River Basin Report Cards' (Costanzo et al., 2017). This publication includes guidance for completing the first four phases of the report card theory of change (through to completion of the first report card) outlined in Figure 21 and briefly summarised in Box 5.

Box 5: Summary of activities required to develop a report card (Costanzo et al., 2017)

Making a report card

Report card development is essentially a five-step process (Figure 18). This process has evolved organically over time as report cards have been developed in Australia and around the world. Continued innovation and adaptation of these steps is encouraged.

1 What is the big picture?

IDENTIFYING WATERWAY VALUES AND THREATS

2 What do we measure?

CHOOSING INDICATORS

3 What is healthy?

DEFINING THRESHOLDS FOR INDICATORS

4 How does it add up?

CALCULATING SCORES AND DETERMINING GRADES

5 What is the story?

COMMUNICATING RESULTS

Figure 18. Five steps involved in making a report card

1. The first step in developing a report card is to engage stakeholders to define and describe the waterway so as to reach a shared understanding of the current situation within that waterway. This helps define the values within the waterway that are to be protected and/or restored, as well as to define the threats that degrade those values or impede their restoration. A group consensus on these values and threats forms the foundation for all remaining phases of the report card process.

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2. The next step is the selection and development of appropriate indicators to provide a picture of the status of the system. System health can include indicators from a range of categories (Figure 19). The more categories and indicators used, the more comprehensive and balanced the report card's statement of health will be. Category and indicator selection should be driven by local stakeholders with technical guidance from scientists with relevant expertise. Several indicators should be selected within each category of system health to provide a balanced picture of health and improve the chance of detecting system changes.


Figure 19. Indicator categories of waterway health to be considered

3. Once indicators have been selected, the next task is to set specific goals, limits, or standards that represent change in the condition of each indicator. These thresholds manifest an agreed upon value or range that, when crossed, indicate a waterway health indicator is moving away from the desired state and towards an undesirable endpoint. Importantly, they can set a level at which the indicator can be considered to have passed or failed an acceptable standard.

4. Each indicator then needs to be standardised against a common scale (usually 0–100). This enables indicators to be "rolled-up" or combined to provide an overall score for each indicator category, geographic sub-region or the entire study region. This standardisation overcomes challenges associated with comparing indicators with different measurement scales and units. Sometimes this conversion is straight-forward; sometimes it can be challenging. Therefore, a key requirement is presenting a transparent and defendable standardisation approach.

5. Report card results and recommendations should then be communicated to stakeholders, including community members and appropriate management and government authorities. This communication has traditionally comprised a printed brochure format (the 'report card') with accompanying website and detailed technical report. These report card products can be publicised through various media such as newspapers, podcasts, and radio and television interviews (see Section 1.4).

4.1 Timeline of report card preparation, development and delivery activities

As a 'rule of thumb' for how long a first report card takes to complete (a question often asked); it generally takes about 18 months after funding and commitments are finalised (Figure 20). Some take less time and some take more (Table 12), but it is wise to plan for at least a year to complete the process.
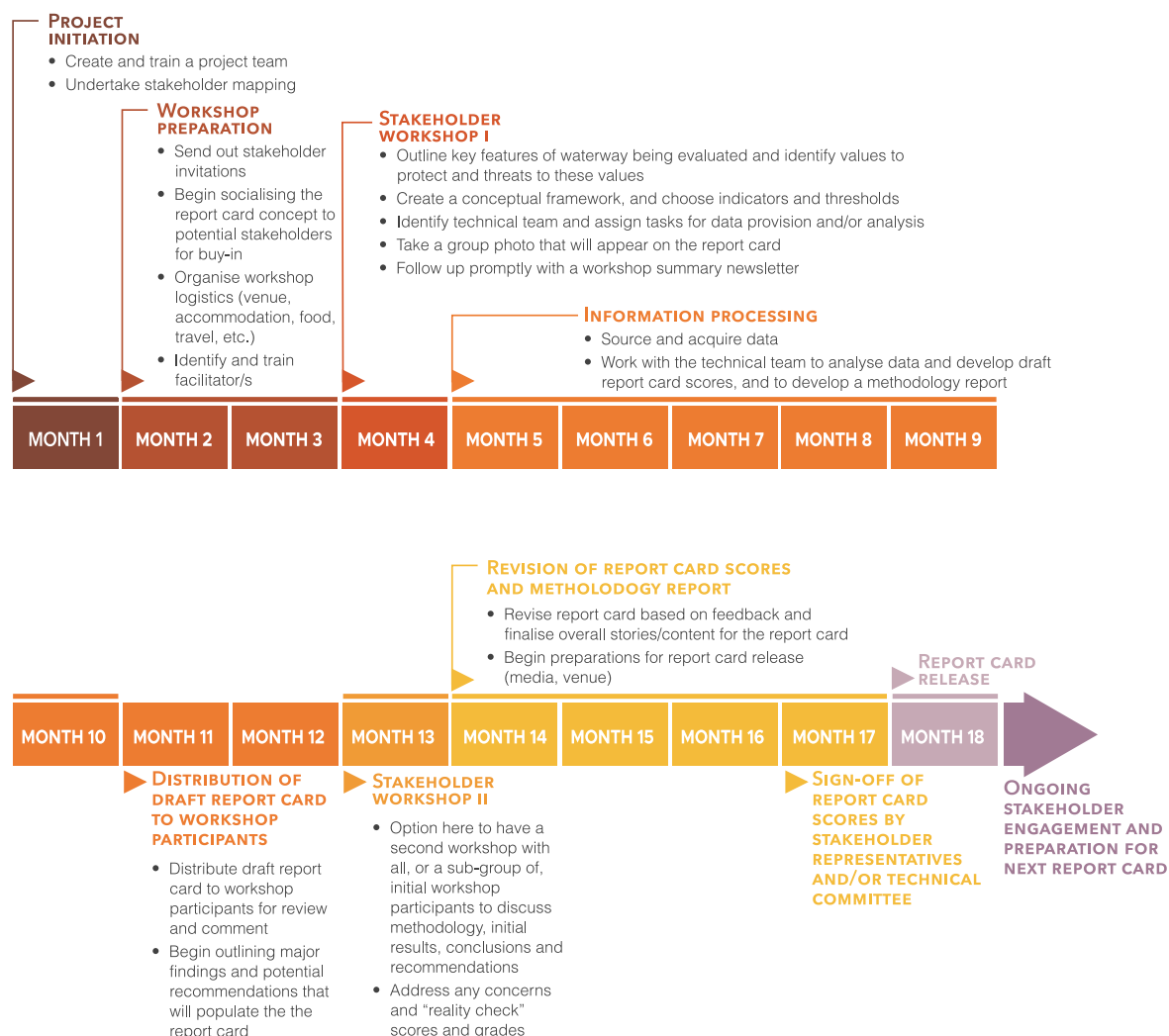
Figure 20. A recommended process for creating a waterway health report card, with indicative timing. On average, it takes about 18 months to complete this process (adapted from Costanzo *et al.,* 2017).

4.2   Expertise in Australia

A wealth of experience in developing and implementing report cards can be found within Australian Government and academic institutions, as well as non-government and not-for-profit organisations.

• International WaterCentre (https://watercentre.org)

• Australian Water Partnership (https://waterpartnership.org.au)

• Australian Rivers Institute (https://www.griffith.edu.au/australian-rivers-institute)

• Healthy Land and Water (https://hlw.org.au)

• Australian National Report Card Network (https://waterwayhealth.org.au)

4.3   Expertise internationally

• Integration and Application Network, University of Maryland Center for Environmental Science (https://ian.umces.edu)

4.4   Resources available

A diversity of information on report card development methods, tools, videos, forums and courses can be sourced through the below links:

• Practitioners Guide to Developing River Basin Report Cards (https://ian.umces.edu/pdfs/ian_report_562.pdf)

• Integration and Application Network (https://ian.umces.edu)

• EcoHealth Report Cards (https://ecoreportcard.org)

• International Report Card Network (https://www.linkedin.com/groups/13773786)

• Evolution of report cards (https://youtu.be/uyYdurI5xZ8)

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The Australian Water Partnership is an Australian Government international cooperation initiative helping developing countries in the Indo-Pacific region, and beyond, work towards the sustainable management of their water resources.