Summary— Follow-up of *Managing water quality in Great Barrier Reef catchments*

Report 16: 2017–18

Queensland Audit Office
Better public services

Contents

Audit objective and scope

In this follow-up audit, we examined whether departments have effectively implemented the recommendations we made in *Managing water quality in Great Barrier Reef catchments* (Report 20: 2014–15). We have also assessed whether the actions taken have addressed the underlying issues that led to our recommendations in that report.

The audit scope included three departments:

- the Department of Environment and Science, which includes the Office of the Great Barrier Reef
- the Department of Agriculture and Fisheries
- the Department of Natural Resources, Mines and Energy.

Glossary

Term	Definitions
Best Management Practice program	A program designed to educate producers of the highest standards in a number of areas of farming and to assist them to reach these levels.
Broadscale land	Extensive area of land.
Catchment	A natural drainage area that collects water and rainfall.
Crown-of-thorns starfish	A marine invertebrate native to Indo-Pacific waters that feeds on coral.
Diffuse source pollution	Pollution that may be attributed to a variety of sources.
Dissolved inorganic nitrogen	Nitrogen incorporated into liquid from a non-organic source, for example, fertiliser.
Dissolved organic nitrogen	Nitrogen incorporated into liquid from an organic source, for example, decomposing leaves.
Ecological processes	Describe the cycling of water, the cycling of nutrients, the flow of energy, and biological diversity.
Ecosystem	A community of living organisms in conjunction with the nonliving components of their environment, interacting together.
Environmental Protection Act 1994 (Qld)	Act with the objective to protect Queensland's environment while allowing for ecologically sustainable development.
Environmental values	Derived from the framework within the *Environmental Protection (Water) Policy 2009*.
Extension and education programs	Programs aimed at developing producers' awareness and understanding (education) of the needs and benefits of changing practices, and assisting them (extension) to best apply that knowledge and understanding.
Great Barrier Reef Catchment Load Monitoring Program	A monitoring program designed to capture changes in water quality for each of the catchments as part of the overall Paddock to Reef Integrated Monitoring, Modelling and Reporting Program.
Great Barrier Reef Science Taskforce	A taskforce established in May 2015 by the Queensland Government to provide advice on how to achieve water quality targets and priorities for investing $90 million over five years.
Gullies	Occurs when run-off is concentrated and the strong flows carve a gully. This progressively widens or deepens when subsoils are more susceptible to erosion.
Management practice change	The change in agricultural actions by landholders.

Term	Definitions
Nitrogen	A nutrient required for plant growth, also found in several agricultural fertilisers.
Nutrients	A substance that provides nourishment essential for growth and life.
Particulate nutrients	Nutrients in solid form, for example, fertiliser pellets.
Pollutant load	The amount of stress placed upon an ecosystem by pollution, physical or chemical, released into it by man-made or natural means.
Producer	Refers to agricultural producers inclusive of cane and grazing industries.
Queensland Land Use Mapping Program	Land Use Mapping project undertaken by the Department of Environment and Science as part of the Australian Land Use Mapping Program.
Reef catchments	Unless specified otherwise, refers collectively to all catchments that drain into the Great Barrier Reef Marine Park.
Reef Long-Term Sustainability Plan	Provides the principal structure for the management of the reef between 2015 and 2050.
Riparian vegetation	Vegetation in the area between land and a river or stream.
Run-off	The draining away of water (inclusive of substances within) from the surface of an area of land.
Scalds	A form of erosion that occurs when wind and water remove the top soil; a crust can then occur, limiting water infiltration.
Sediment	Particulate matter in water (affects seagrass).
Statewide Landcover and Trees Study	A program run by the Department of Environment and Science monitoring the loss of extent of vegetation throughout Queensland in line with the *Vegetation Management Act (1999)*.
Stream bank erosion	Occurs when vegetation on river banks is removed. It is the subsequent erosion of the stream bank and bed.
Sub-catchments	A division of a catchment.
Queensland Reef Water Quality Program	Queensland Government's five-year program of actions from 2017–2022 to implement the Great Barrier Reef Water Science Taskforce's recommendations.

Key facts

Climate change is the single biggest threat to the Great Barrier Reef.

Source: Reef 2050 Water Quality Improvement Plan

The reef's estimated value as an iconic global asset is $56 billion.

Source: Reef 2050 Water Quality Improvement Plan

Improving water quality flowing from land to the Great Barrier Reef is a critical contributor to the reef's health

Increases in pollutant loads from agricultural run-off contribute to inshore reef degradation.

Source: 2017 Scientific Consensus Statement

It contributes $6.4 billion annually to the Australian economy through tourism, recreation, commercial fishing, scientific research and reef management.

Source: Reef 2050 Water Quality Improvement Plan

It is Earth's largest coral reef system. It stretches 2 300 kilometres down the Queensland coast.

Source: Great Barrier Reef Water Science Taskforce

Summary of audit findings

Please note this is a summary of the audit findings. More information is in the following chapters.

Report 20: 2014–15

On 10 June 2015, we tabled *Managing water quality in Great Barrier Reef catchments* (Report 20: 2014–15) in the Queensland Parliament.

In our report, we examined the Queensland Government's contributions to improving the quality of water entering the Great Barrier Reef (the reef) from adjacent catchments, specifically agricultural run-off.

We found the Queensland Government did not have a cohesive program to support its achievement of the goal (to 'halt and reverse the decline in water quality entering the reef') it set out in its Reef Water Quality Protection Plans in 2003 and 2009. This goal was changed in Reef Water Quality Protection Plan 2013 to 'ensure that by 2020 the quality of water entering the reef from broadscale land use does not have a detrimental impact on its health and resilience'. We concluded that Queensland's response lacked urgency and purpose. It was characterised by disparate projects with no central authority and no clear accountability for their delivery or achievement. The fragmented program response and unclear governance arrangements meant there was no strong accountability for program expenditures.

We also found that land management programs to improve agricultural practices in the sugarcane and grazing industries were not achieving the changes needed to realise the Reef Water Quality Protection Plan's goal within established timelines. The state had not achieved the right balance between industry-led voluntary approaches and regulatory enforcement of land management practices.

In addition, the limited number of water quality monitoring sites across the catchments restricted government departments' ability to verify modelled outputs against measured results. (Modelled outputs estimate average annual loads of key pollutants for each catchment draining to the reef, while measured results track long-term trends in water quality entering the reef from high-priority catchments.)

This provided uncertainty and variability (low levels of confidence) in modelled results indicating the quality of water entering the reef was improving. Public reporting on progress did not make this lack of confidence in the modelled results clear, potentially inferring the results were actual measured outcomes.

In our original report we made five recommendations, all of which were accepted by the departments.

Progress made by departments

In December 2017, we set out to establish whether departments have effectively implemented the recommendations we made in Report 20: 2014–15.

We found the departments have made significant efforts to address the recommendations. They have fully implemented four and partially implemented one.

Figure A shows our assessment of the implementation status of each recommendation.

Figure A
Implementation status of recommendations made in Report 20: 2014–15

	Recommendation made in original audit	QAO 2018 assessment of status
1	That the newly formed Office of the Great Barrier Reef be provided with sufficient and appropriate management and administrative authority so that it can be properly made responsible and held accountable for Queensland's reef management strategies and programs.	Recommendation fully implemented
2	That the design and implementation of the suite of programs attributed to the Reef Plan is reviewed to establish they are the most effective and efficient.	Recommendation fully implemented
3	That catchment monitoring is expanded to aid in determining the effectiveness of practice management change and to enhance the confidence in modelled outcomes.	Recommendation fully implemented
4	That a rigorous verification process is applied to data on land management practice change, and deficiencies in model inputs be addressed, to improve confidence in, and the accuracy of, inputs into catchment modelling.	Recommendation partially implemented
5	That unambiguous references be included in the tier one Reef Report Card which disclose the degree of uncertainty and levels of potential variability in the reported results.	Recommendation fully implemented

Note: The tier one Reef Report Card is a high-level progress overview, at whole-of-reef level and by region, using modelled data.

Source: Queensland Audit Office.

Program management and investment

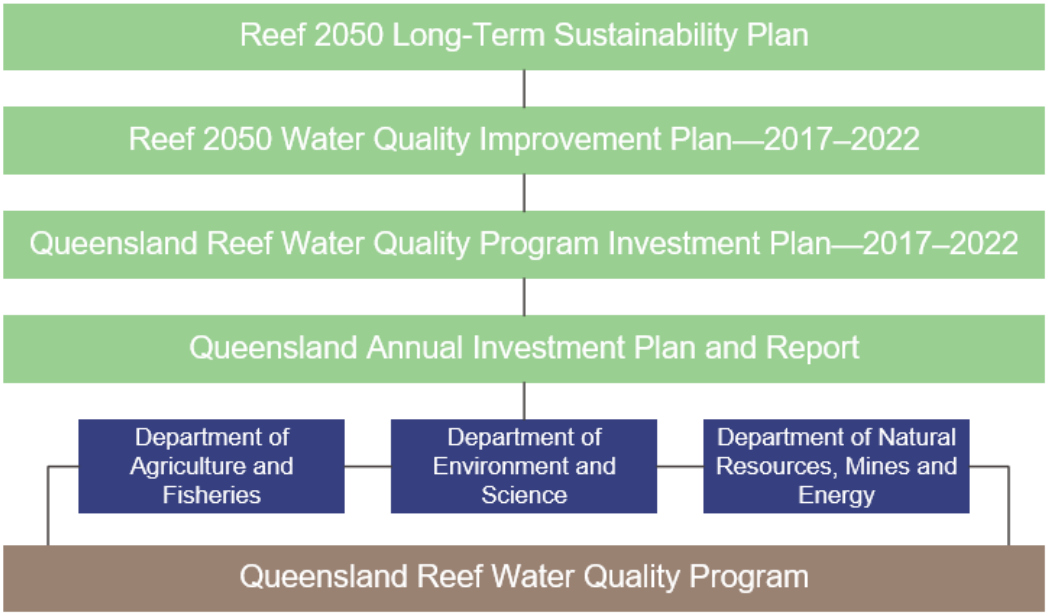
In addition to Commonwealth funding, the Queensland Government commits $35 million annually for reef water quality action. In 2015, it provided an additional $90 million over five years. In the 2018–19 budget, Queensland Government announced increased funding of $13.8 million over four years to support the cane, grazing and banana industries in Great Barrier Reef catchments to improve water quality. It also included funding for other Great Barrier Reef and climate change initiatives.

Establishing the Office of the Great Barrier Reef (within the Department of Environment and Science) has improved the state's reef program governance, design, management, and investment planning. The office manages, coordinates, and is accountable for the state's contribution to achieving the *Reef 2050 Long-Term Sustainability Plan* (the Long-Term Plan) goals and targets. The Long-Term Plan (jointly developed by the Australian and Queensland governments) provides the overarching framework for managing and protecting the Reef until 2050.

The Queensland Government has reviewed its reef water quality projects and plans to ensure they align with the Long-Term Plan. Its current projects and activities are based on scientific evidence with a specific purpose of (or link to) improving water quality in the reef catchments.

Figure B shows how the plans fit within the framework of delivering reef water quality improvement.

Figure B
Framework for improving reef water quality



Source: Queensland Audit Office adapted from the Queensland Government Annual Investment Plan 2016–17.

The Office of the Great Barrier Reef provides a single point of reporting on the total package of reef water quality investments, but many departments still contribute to the activities within the program and are responsible for the delivery of their investments.

Over the 2015–16 and 2016–17 financial years, the Queensland Reef Water Quality Program actual expenditure was about $12.8 million short of the planned investment. Annual investment reports provide examples of where total planned expenditure was not spent, but they do not acquit actual expenditure against planned investment for each program. This decreases transparency and accountability. It is important that any underspend is carefully and transparently managed and acquitted to ensure confidence in the management of public funds. It would also demonstrate that necessary actions to improve water quality are undertaken on a timely basis.

Catchment monitoring

The Queensland Government's Great Barrier Reef Catchment Loads Modelling Program estimates average annual loads of key pollutants (sediment, nutrients and pesticides) for each of the 35 catchments draining to the Great Barrier Reef as part of the Paddock to Reef program. It assesses progress towards the reef water quality targets by reporting on baseline levels and the change in loads for each subsequent year due to adoption of improved land management practices.

The number of catchment monitoring sites has almost doubled. The Great Barrier Reef Catchment Loads Monitoring Program conducted a clear and logical process to ensure the funding and site prioritisation would provide the highest benefit to the reef.

The program now monitors all intensive land use catchments. It includes 43 monitored sites across 20 key catchment areas for monitoring sediments and nutrients, and 20 sites for pesticides. This represents a significant improvement on the 26 monitoring sites in 14 of the 35 catchments in 2015. The additional monitoring is at both the end-of-catchment and sub-catchment scales.

Fifteen of the 35 catchments are still not monitored. These catchments are low priority and represent the predominantly low-intensity land use areas, for example, nature conservation areas.

Expanding the number of sites means the program monitors and analyses more water samples for total suspended sediments and nutrients discharged to the reef. Currently, between 86–100 per cent of sediment, nitrogen, and pesticide loads discharged from rivers to the reef are monitored. This compares to 75–86 per cent in 2015. This increase in monitoring means the program can calibrate and validate modelled outputs with greater confidence. The increased data strengthens the verification of and increases confidence in modelled reporting.

Paddock to reef program

Model inputs

The departments have made significant efforts to address the model input deficiencies identified in the original audit. They have implemented changes to improve confidence (reduce the degree of uncertainty and potential variability) in the data, although some limitations remain in the complex models used. The departments are committed to further improving the model verification and accuracy.

Model quality improvements include better data collection processes and the use of custom-built geographic information system tools, aerial photography, and uniform grids for mapping purposes.

The main remaining data limitations relate to the impact of land clearing and to data on management practice change (the change in agricultural practices of landholders).

In our original audit, we found that data was not available on clearing rates for riparian vegetation corridors (vegetation bordering rivers and streams). The modelling still does not directly include data on land clearing. The model does, however, include remotely sensed ground cover, which may provide some indication of where land has been cleared.

Currently, there is insufficient data to know how much of the cleared land has subsequently been planted with crops. Further study is needed to evaluate the impact land clearing has had and its long-term effects. At present, the government does not know the net effect the impact of cleared land is having in offsetting any gains they make in land management practice programs.

Land management practice

Since the original audit, the Department of Agriculture and Fisheries has implemented several changes to improve confidence in the capture and analysis of management practice data. However, it is still unable to adequately report on the level of change in management practice. This is because it does not have all the management practice data it needs to measure the degree of change.

While the departments hold and analyse data, there are some projects and programs that are not providing satisfactory data. The most significant of these are the industry best management practice programs. The farm management practice data is currently held by industry groups that host the best management practice portals. Despite being funded by government, no information on site-specific management practices or changes in practice is provided to the departments, with industry groups citing 'privacy concerns'.

This information includes the level of practice and any progress made by individual producers in moving towards improved industry standards. These data restrictions mean government has no indication of what, if any, progress has been made. It means government cannot measure the degree of practice change or assess the value achieved from its investment of public funds. The Office of the Great Barrier Reef is currently negotiating with industry groups to gain access to the data the departments need and should have access to.

In the meantime, the rate of engagement and accreditation with best management practice programs is the only measure available to assess program performance. This is not an adequate measure for practice change.

Since our 2015 report, accreditation rates for the Grazing and Smartcane best management practice programs have increased. The number of accredited graziers has increased from 10 to 87 and the number of canegrowers from four to 256. However, despite significant efforts, best management practice programs are still only used by two per cent of graziers and seven per cent of canegrowers. Accelerated uptake is needed to meet the 2018 target (of 90 per cent of sugarcane, horticulture, cropping and grazing lands in priority areas being managed using best management practice systems).

The proposal to broaden and enhance the existing reef protection regulations seeks to ensure that minimum practice standards are utilised across key industries and land uses in all reef catchments. This means adoption of minimum practice standards will no longer be voluntary.

Reef report card

Since 2014, the Reef Report Cards include a confidence indicator graph that illustrates the model's level of uncertainty or potential variability for each of the major reporting themes measuring the land, catchments, and human dimensions affecting water quality. The approach compares the range and variability of reporting methods and data sets within the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program (Paddock to Reef program). The metrics and rankings are reviewed by the Reef Independent Science Panel. To further aid readers' understanding of the reported results, the report could provide greater clarity that the results are based on modelled (estimated) rather than monitored (actual) results.

The Reef Report Cards from 2014 to 2016 show no change in confidence levels achieved from year to year.

From 2018, the Reef Report Card will report on revised water quality and land management targets. While most of the targets are relevant and informative, the three land management targets relating to riparian vegetation management and stakeholder and program engagement are ill-defined. They do not define or measure the desired increase in either the extent of riparian vegetation or engagement.

This means that government cannot adequately report on the effectiveness of the programs and projects contributing to these targets.

Audit conclusions

The Great Barrier Reef is vulnerable to threats that the Queensland Government cannot control or influence, such as extreme weather events. It can, however, influence other threats, such as the quality of water entering the reef from adjacent catchments—specifically agricultural run-off.

The Queensland Government now has an overarching program to coordinate and monitor reef strategies and its programs aimed at improving the health of the Great Barrier Reef. The Office of the Great Barrier Reef provides a single point of accountability for the effective and efficient delivery of the Queensland Reef Water Quality Program. This has resulted in stronger governance, coordination, and oversight, providing greater assurance that public funds are spent and monitored in a way that maximises Queensland's ability to reduce the harm to the reef.

There is a shared commitment among the departments and program partners to working cooperatively. The entities responsible for delivering the state's reef program are working together on clear policy objectives and intended outcomes.

Greater oversight, monitoring, tracking, and reporting of allocated investment at a whole-of-state-government level means there is now more clarity on how much is spent each year and on what. However, the Office of the Great Barrier Reef is not able to fully understand the effectiveness of this public investment, in part because it doesn't have access to key industry information related to some of the programs it funds. This inhibits it and the public in assessing value for money of this investment of public funds.

Ongoing improvements to the water quality model are essential for properly evaluating and reporting on investment outcomes and optimising program delivery. The increase in water quality monitoring sites, and therefore in measured data, means the government can better validate modelled data.

Practice change information held by industry groups is also a critical input to the model. It is incumbent on government to obtain the information needed from the funded non-government organisations holding this information.

Despite significant efforts, the rate of voluntary adoption of best management practices by producers is not yet sufficient to achieve water quality targets. The proposals underway to broaden and enhance existing reef protection regulations will go some way to achieving the right balance between industry-led voluntary approaches and regulatory enforcement. Once the legislation is amended, the adoption of minimum practice standards will no longer rely solely on voluntary participation.

While government has made some progress within the program, progress towards the *Reef 2050 Long-Term Sustainability Plan* targets has been slow. The present trajectory will not meet the targets. Scientific experts report that accelerated change is needed.

The significant work done by Queensland Government in the last three years to build a more effective reef program, targeting effort and investment on activities more likely to improve water quality in the Great Barrier Reef catchments, is a positive step towards change. It links well with Commonwealth Government reef efforts and initiatives. The program and supporting activities will, however, take time to establish results. Water quality outcomes will take even longer to determine, and the reef remains vulnerable to threats—including water quality from broadscale land use.

Recommendations

Department of Environment and Science

We recommend that the Department of Environment and Science:

1. acquits actual expenditure against planned investment for Queensland's Reef Water Quality Program, in future annual investment reports, to increase transparency and accountability (Chapter 2)
2. obtains reliable, timely, and adequate practice change information from relevant industry groups to understand the progress made, measure the degree of practice change, and account for outcomes for the public funds invested (Chapter 4)
3. work with the Commonwealth Department of Environment and Energy, to refine over time the land management targets in the *Reef 2050 Water Quality Improvement Plan 2017–2022* to define the increase in the percentage of riparian vegetation and the increase in stakeholder engagement targeted (Chapter 4).

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