REEF 2050 LONG-TERM SUSTAINABILITY PLAN

PROGRESS ON IMPLEMENTATION

REVIEW BY GREAT BARRIER REEF INDEPENDENT REVIEW GROUP

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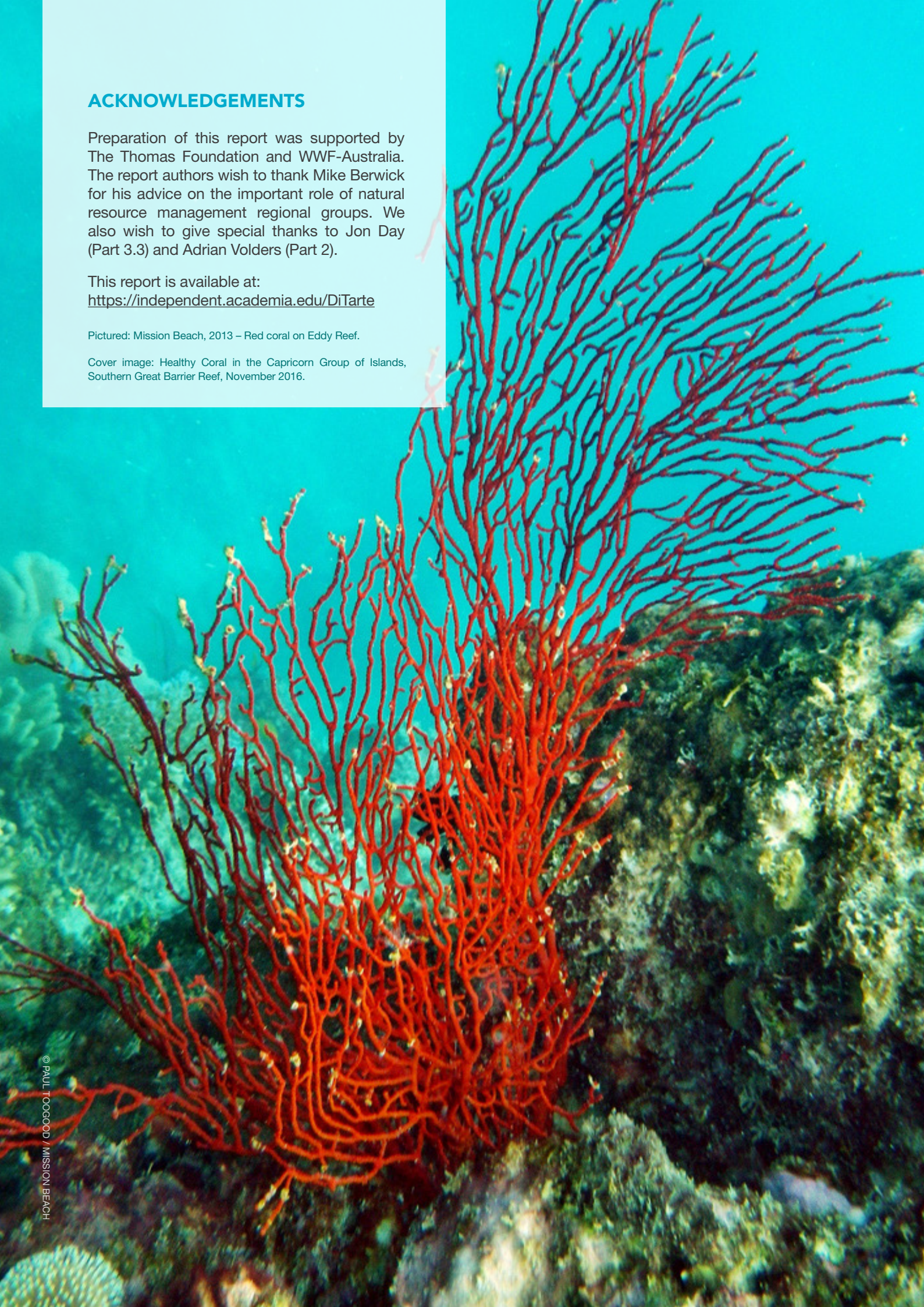
This report is available at:
https://independent.academia.edu/DiTarte

Pictured: Mission Beach, 2013 – Red coral on Eddy Reef.

Cover image: Healthy Coral in the Capricorn Group of Islands, Southern Great Barrier Reef, November 2016.



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EXECUTIVE SUMMARY AND RECOMMENDATIONS

The Great Barrier Reef Independent Review Group (the Reef Review Group) prepared this report to provide an independent analysis of the Australian and Queensland governments' progress in implementing the Reef 2050 Long-Term Sustainability Plan (Reef 2050 Plan). We have reviewed the 2016 Reef 2050 Plan Annual Report and Addendum and the 2016 Update Report on Progress and Investment Framework. These reports cover the first 18+ months of a 5-year plan which is the first implementation phase of the 35-year Reef 2050 Long-Term Sustainability Plan (Reef 2050 Plan). We have also considered government policy responses to issues not covered in the Reef 2050 Plan but critical to the long-term management of the Reef. Finally, we have looked at the implications of the 2016 mass coral bleaching event on future management of the Reef.

We welcome the World Heritage Committee's active engagement on assessing the adequacy of management for ensuring the integrity and improvement of the Outstanding Universal Value (OUV) of the Great Barrier Reef World Heritage Area (GBR WHA). The Committee's ongoing interest reflects the global significance of the Great Barrier Reef, as well as the expectation that if any country can effectively manage its coral reefs in light of the many local to global pressures, then it should be Australia – a relatively prosperous country that derives considerable economic benefit from the GBR.

The Reef 2050 Plan has a number of very important strengths that will be the foundation for its success in the coming decades; so too there have been some promising achievements since its inception 18 months ago. These include Reef 2050 Plan's strong model of partnerships and cooperative federalism, delivery of key actions including commitments relating to managing the impacts of the removal and dumping of dredge spoil, limiting the locations of major trading ports, establishing net free fishing zones and the continuing focus on improving water quality.

However, the unprecedented severe bleaching and mortality of corals in 2016 in the Great Barrier Reef is a game changer. Given the severity of the damage and the slow trajectory of recovery, the overarching vision of the 2050 Plan, *to ensure the Great Barrier Reef continues to improve on its OUV every decade between now and 2050*, is no longer attainable for at least the next two decades. As corals make a substantive contribution to the WHA's OUV for all four of the natural criteria for World Heritage listing, we consider that this event has substantially diminished the Outstanding Universal Value of the GBR WHA. The bleaching also highlights the urgency of bolstering the resilience of the GBR WHA to maximize its capacity to recover before the next bleaching inevitably occurs. The Reef 2050 Plan is a key element of building resilience, but improving water quality can never climate-proof the Reef.

The elevated sea temperatures that caused the 2016 severe coral bleaching and mortality event were due to the global warming effects of climate change. Effective action to address climate change and protect coral reefs worldwide depends on cooperative efforts by the entire international community. Responding to the threat of climate change on the Great Barrier Reef WHA is in part a shared responsibility for all state parties to the World Heritage Convention, with Australia holding a special role. Australia's current national emission reduction targets are not commensurate with a fair contribution to the reduced global carbon budget required to meet the Paris Agreement targets and protect the GBR WHA and coral reefs worldwide. As the guardian of the world's largest coral reef WHA, Australia has an opportunity to play an important leadership role on climate change and to do its fair share of emission reductions, consistent with meeting the 1.5C target. Australia must do more and do it urgently.

Implementation of the Reef 2050 Plan is critically dependent on an effective investment framework. The Investment Framework released alongside the December 2016 Update on Progress is an important initial attempt to quantify the scale of additional investment that will be required to implement the Reef 2050 Plan. However, the analysis provided in the Investment Framework falls short in a number ways. In particular, it is disappointing that the Investment Framework commits no significant new funding to meeting the targets despite the recognised gaps presented.

The Investment Framework identifies a funding gap of between $143 and $408 million to implement all the existing actions committed to in the Reef 2050 Plan (the bulk of the costs is in meeting the water quality targets). It does not estimate the cost of meeting all 33 of the Reef Plan's targets for 2020. As discussed elsewhere in this report, in many cases the existing suite of actions seems unlikely to be sufficient to meet the agreed targets, and additional actions will be required. Hence, the cost of meeting the 2020 targets is likely to be higher than the sum of the cost of meeting each of the individual actions listed. Strategies to address funding gaps through increased government and private sector investment are poorly constructed, non-comprehensive and add little to the achievement of the Reef 2050 Plan.

Documented gaps in future funding for GBR Marine Park field management and monitoring and reporting are concerning because adequate funding is central to the effective management of the GBR WHA and the adaptive management approach of the Reef 2050 Plan.

Improving the quality of water entering the GBR from the catchments is a key action in improving the health and resilience of the Reef. Progress towards achieving the

nitrogen and sediment load reduction targets by 2018, and the uptake of best management practice (BMP) by cane farmers and graziers is very poor, despite the assertion in the Update Report that these actions are on track. The current voluntary uptake of BMP by both sugarcane farmers and graziers is unlikely to meet either 2018 or 2025 targets. Additionally, the widespread failure to meet existing regulated minimum standards must be addressed urgently. The Queensland GBR Water Science Taskforce, in their 2016 report, provided an extensive list of regulative changes that should be introduced in a staged way to accelerate progress towards meeting the Reef 2025 water quality targets.

To date there has not been adequate progress toward the Reef 2050 Plan's targets in relation to protecting native vegetation in Reef catchments. Queensland's acknowledged failure to strengthen its vegetation management laws makes it necessary for both the Australian and Queensland governments to find alternative mechanisms to fulfil their commitments under the Reef 2050 Plan. Both governments have existing legal powers which could be applied to make the expected progress toward the targets of no net loss in riparian vegetation and wetlands in Reef catchments by 2020 and to contribute to the promised cuts in sediment pollution by 2025.

To address the outstanding risks to the GBR WHA by fishing activities that were identified in the 2014 GBR Outlook Report, the implementation of the fisheries reforms contained within the Queensland government's Green Paper is urgently required. Reducing these risks should also contribute to the achievement of Biodiversity Target 3 and Economic Benefit Target 5 in the Reef 2050 Plan. To provide clear guidance in the delivery of these reforms for fisheries operating in the GBR WHA, we consider that GBRMPA should develop a position statement on what constitutes sustainable fishing within the WHA. This position statement should then guide the development by Fisheries Queensland of fisheries management targets and associated management strategies.

We have noted a number of inherent limitations with the Reef 2050 Plan which need to be recognised in any analysis. These limitations mean that, to date, the scale of intervention required to achieve a target or objective is frequently substantially underestimated. As the 2016 Annual Report covers the first 18+ months of a 5-year plan, some measure of progress to targets would provide insight into the likelihood of success, or risk of failure. Leaving an assessment of progress to targets and outcomes until 2019 is unsatisfactory. We have identified a number of issues with the status rating given to each action and have made a number of suggestions on improving the current approach. In our consideration, up to a third of the 103 actions flagged as "on track/ underway" are really just starting, or are seriously under-resourced. We also note that many important actions that will underpin good decision-making are constrained by the slow progress in developing and implementing the proposed Reef Integrated Monitoring and Reporting Program (RIMREP).

The Reef 2050 Plan recognises the importance of good governance to support its implementation and goes some way to addressing the complexity of the system. In many respects, the Plan's 15 governance actions are world's best practice as they strive for governance arrangements that are transparent, accountable, and co-operative and with the principle of subsidiarity paramount. However, the significance and urgency of the issues in the GBR, combined with the complexity of the governance arrangements in the broader GBR catchment, suggest that the governance actions proposed in the Reef 2050 Plan do not go far enough to support its outcomes. Further reforms are needed. We have made recommendations to improve the independence of future GBR Outlook Reports, strengthen GBRMPA and establish a Queensland GBR Catchment Authority to provide a single point of contact for all Queensland Reef-related matters and investment. We also note that significant changes are still required in planning and environmental policy, decision-making and implementation to ensure that the Queensland government meets its commitments in the Reef 2050 Plan to the long-term protection of the Reef's OUV.

Below we present the Review Groups' recommendations to strengthen the Reef 2050 Plan and to clarify key priorities and/or reforms for the remainder of the first 5-year period. We urge that these improvements are reflected in the mid-term review of the Plan scheduled for 2018, and that the review is completed no later than March 2018 and submitted to the 2018 World Heritage Committee meeting.

We also reiterate the increased urgency for effective interventions as a result of the 2016 severe coral bleaching event. Based on the evidence to hand, we consider that key values of the GBR's OUV are in serious decline, particularly since the recent coral bleaching event.

Through the Reef 2050 Plan the Australian and Queensland governments, industries, communities and research partners are making genuine efforts to improve the protection and management of the GBR WHA. However, this Review Report has shown that Australia's overall progress in implementing the Reef 2050 Plan actions and making progress toward the 5-year targets has been less than anticipated in a number of important areas.

For these reasons, it is our view that it would not be constructive for the World Heritage Committee to include the Reef on the "In Danger" list at this point in time, but it is important that the WHC and its advisory bodies maintain active oversight and continue to engage regularly with the Australian and Queensland governments to address the identified shortcomings in implementation of Reef 2050 and assist Australia's response to the recent coral bleaching event.

The Review Group therefore recommends that the state of conservation of the GBR WHA be examined by the WHC in 2017, with a view to requesting Australia to submit the scheduled mid-term review of the Reef 2050 Plan for consideration by the WHC in 2018. This will allow the Australian and Queensland governments to address any WHC recommendations in their December 2019 State Party state of conservation report.

In short, good work is underway. However, it needs to be scaled-up and adequately financed, and the capacity of key sectors such as local government and agricultural industries must be enhanced. Equally important is the need for the spirit of Reef 2050 Plan's cooperative federalism to be translated into bipartisan support for more effective policy, management and investment.

RECOMMENDATIONS

Limitations of Reef 2050 Plan and challenges inherent in the Annual Report and Update Report

#1. Subsequent reviews of the Reef 2050 Plan must be underpinned by program logic and more quantitative approaches to either confirm or revise the existing framework of objectives and outcomes, and to determine 5-yearly targets. Each action should include measurable milestones for their delivery over the coming 5 years.

Meeting the 2018 water quality targets

#2. Ensure the updated Reef Water Quality Protection Plan is achieved by mid-2017, and that it contains: revised load targets for each of the 35 major GBR catchments; measurable actions needed to achieve catchment targets; as well as a properly costed investment strategy to deliver actions; and that its implementation is given high priority.

#3. Implement all of the recommendations made by the Queensland GBR Water Science Taskforce particularly the 'incentives' and 'regulations' recommendations [1] to assist in driving agricultural management practice changes which should also include consideration of 'land use change' for the marginal agricultural lands.

Need for more effective regulations to reduce Reef pollution

#4. That the Queensland government move urgently to implement the regulatory recommendations of the GBR Water Science Taskforce.

#5. That the Queensland and Australian governments provide sufficient resources to ensure that existing and proposed regulations are fully implemented and the necessary education and support services are provided.

#6. Meanwhile the Queensland government should rapidly escalate its renewed compliance effort for the existing agricultural water quality regulations to ensure the current 40% non-compliance levels are quickly reduced.

Controlling vegetation loss in Reef catchments

#7. As soon as possible, Queensland should act again to strengthen state vegetation management legislation as required by Reef 2050 Plan Action Ecosystem Health Action 20.

#8. In the meantime, the Australian and Queensland Governments should work together to rapidly reduce vegetation loss in Reef catchments using existing legal mechanisms, with a particular focus on protecting riparian and wetland vegetation as intended under Reef 2050 Plan targets Ecosystem Health Target 3 and Water Quality Target 2. This can be achieved by a combination of the following steps:

(i.) Australian Government:

- Improve reporting and monitoring systems to ensure vegetation clearing proposals that may impact the GBR WHA are referred and assessed as required under the *Environment Protection and Biodiversity Conservation (EPBC) Act*

(ii.) Queensland Government:

- Use powers under the *Vegetation Management Act 1999* to make a declaration to protect riparian and wetland vegetation in Reef catchments.
- Further tighten self-assessable codes to reduce clearing in GBR catchments that will impact the reef.

Planning framework and protecting the Reef's OUV

#9. Maintaining and enhancing the GBR WHA OUV should be a top priority strategic outcome sought in all land use planning laws and policies and development approvals.

1 Great Barrier Reef Water Science Taskforce (2016). Rec 4 & 5.

#10. Ensure that Reef 2050 Plan Ecosystem Health Action 24 is effectively implemented so that local government has the capacity to effectively implement coastal planning laws and policies to protect the Reef, commencing with a thorough assessment of the implementation chain within local government and the development industry.

Fisheries management

#11. Ensure that a clear position statement is developed by GBRMPA to outline what constitutes sustainable fishing within the WHA and this is explicitly recognised by Fisheries Queensland during the development of fisheries management targets and strategies for GBR fisheries.

Governance arrangements underpinning Reef management

#12. Enhance the independence of the Great Barrier Reef Outlook Report by establishing an independent steering committee drawing on the expertise of the Reef 2050 Plan's Independent Expert Panel (IEP), Reef Advisory Committee (RAC) and the proposed Queensland GBR Catchment Authority.

#13. Strengthen the Great Barrier Reef Marine Park Authority by establishing an expertise-based Board with an Independent Chairman and strong links with Reef 2050 Plan's IEP and RAC and the proposed Queensland GBR Catchment Authority

#14. Establish a Queensland Great Barrier Reef Catchment Authority with effective linkages with GBRMPA Board and Reef Plan's Independent Expert Panel and Reef Advisory Committee.

Monitoring, modelling, evaluation and reporting

#15. Review the scope and complexity of the Reef 2050 Integrated Monitoring and Reporting Program and ensure a revised version commences in mid-2017.

#16. Increase investment in GBR monitoring, modelling, evaluation and reporting.

Reef 2050 Plan Investment Framework

#17. Develop an effective, adequate and comprehensive Investment Framework, Strategy and Business Plan capable of catalysing the additional funding from public and private sector sources required to meet the Reef 2050 targets. Meanwhile the Australian and Queensland governments should increase their investments to better reflect the recommendations of the 2016 Alluvium and Jacobs reports.

#18. Include annual targets for investment, actions and pollution load reductions in the Investment Plan to be developed by June 2017 as part of the new Reef Water Quality Protection Plan.

#19. Consolidate investment related to Reef 2050 outcomes across multiple jurisdictions and entities into a single entity to ensure effectiveness and accountability.

#20. Implement regulation to cap pollution sources and provide supportive and 'fit for purpose' institutional and market mechanisms to encourage private investment in pollution reduction.

#21. Develop a strategic implementation plan for the Reef Fund to ensure significant water quality outcomes.

#22. Provide adequate investment in GBR Marine Park field management and monitoring and reporting programs to ensure effective adaptive management.

Implications of the 2016 coral bleaching event for the GBR World Heritage Area

#23. Given the scale of impacts on the northern region of the GBR WHA from the 2016 mass coral bleaching event, a reassessment of individual GBR values should be done in time for the mid-term review of the Reef 2050 Plan (scheduled for 2018), rather than waiting until the 2019 Outlook Report.

#24. Use the mid-term review of the Reef 2050 Plan to recalibrate the Plan to accelerate and enhance current reform efforts in a way that will make a significant difference to the Reef's chances of survival in the face of climate change.

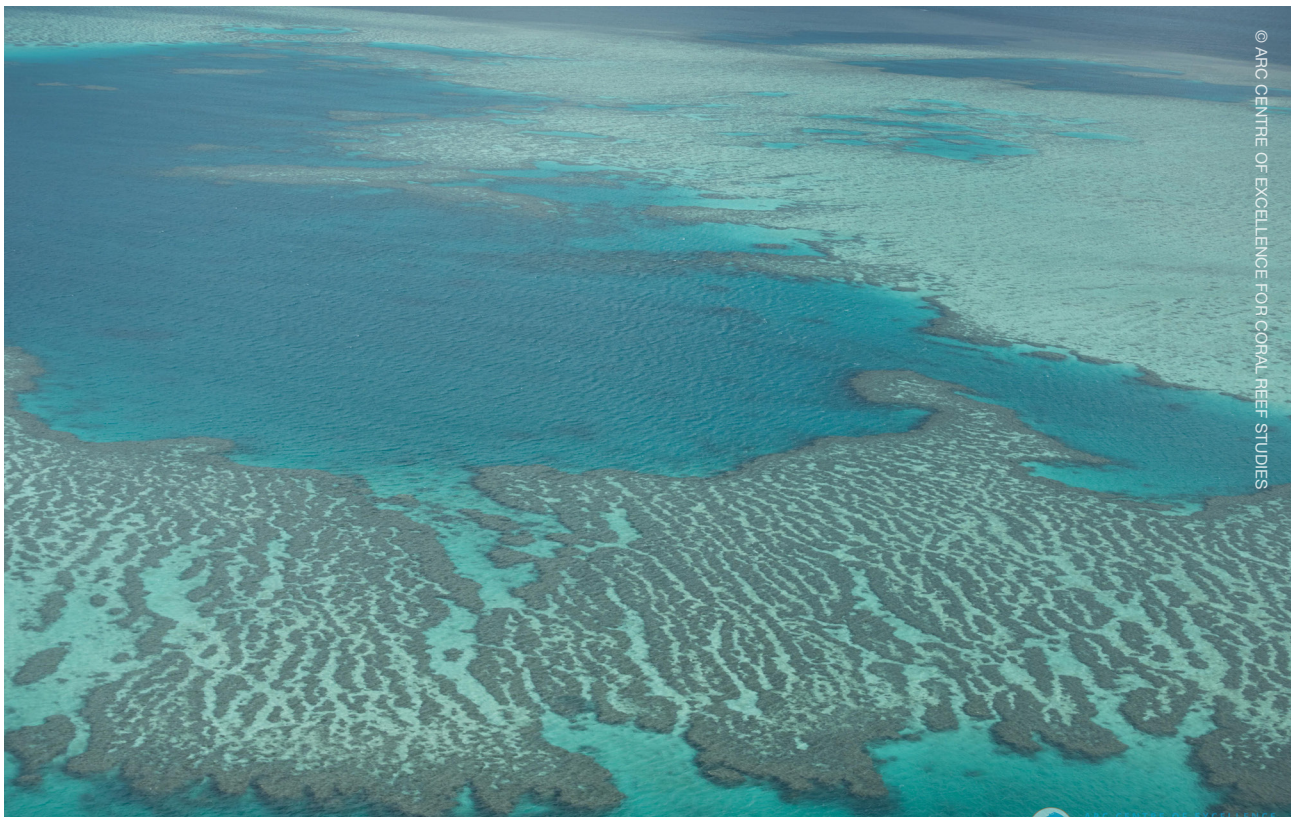
#25. By March 2017 GBRMPA should confirm an immediate program of work to respond to the 2016 mass coral bleaching event.

Addressing climate change to protect the Great Barrier Reef

#26. That the World Heritage Committee respond to the 2015-2016 global coral bleaching event by urging all state parties to redouble their efforts to address climate change, and note the importance of achieving the targets in the UNFCCC Paris Agreement, for the purpose of the World Heritage Convention.

Mid-term review of Reef 2050 Plan

#27. Ensure that the mid-term review of the Reef 2050 Plan is completed in the first quarter of 2018 and the updated Plan is submitted to the 2018 World Heritage Committee along with the updated assessment of individual values of the GBR WHA (see recommendation #23). To facilitate the ongoing engagement of the World Heritage Committee, we recommend that the state of conservation of the GBR WHA be examined by the WHC in 2017, with a view to requesting Australia to submit the scheduled mid-term review of the Reef 2050 Plan for consideration by the WHC in 2018.



BACKGROUND

The Great Barrier Reef (GBR) has attracted significant public attention over the past 50 years starting with proposals to mine for limestone and explore for oil in the 1960's through to concerns raised at the 2011 World Heritage Committee about the extent and scale of Liquefied Natural Gas processing and port facilities on Curtis Island within the GBR World Heritage Area (WHA)[2].

The *Great Barrier Marine Park Act 1975* came into effect in 1976 and the subsequent zoning plans that prescribed management measures were developed during the 1980s. In 1981 the Great Barrier Reef was listed as a World Heritage Area encompassing the GBR Marine Park and parts of Queensland's coastal waters and islands. It is important to recognise that the Great Barrier Reef does not stop at the tip of Cape York, but extends through Torres Strait.

In 2009 the first Great Barrier Reef Outlook Report provided a comprehensive analysis of the condition of the Great Barrier Reef Region (inclusive of the GBR Marine Park and areas around major ports) and an assessment of the pressures on the Reef and the activities causing those pressures. The 2009 prognosis was that, *the overall outlook for the Great Barrier Reef is poor and catastrophic damage to the ecosystem may not be averted. Ultimately, if changes in the world's climate become too severe, no management actions will be able to climate-proof the Great Barrier Reef ecosystem.*[3]

The second GBR Outlook Report released in 2014 detailed a similar prognosis, namely, *Even with the recent management initiatives to reduce threats and improve resilience, the overall outlook for the Great Barrier Reef is poor, has worsened since 2009 and is expected to further deteriorate in the future. Greater reductions of all threats at all levels, Reef-wide, regional and local, are required to prevent the projected declines in the Great Barrier Reef and to improve its capacity to recover.*[4]

2 WHC Decision: 35 COM 7B.10 http://whc.unesco.org/archive/2011/whc11-35com-20e.pdf

3 Great Barrier Reef Marine Park Authority. (2009) p.ii.

4 Great Barrier Reef Marine Park Authority (2014b) p. vi

RECENT WORLD HERITAGE COMMITTEE DECISIONS

Since 2011 the World Heritage Committee has been actively scrutinising Australia's management of the GBR WHA. As a result, a number of important documents have been produced commencing with two comprehensive strategic assessments, one covering the GBR Region[5] and the second Queensland's coastal zone[6]. Then followed the 2014 GBR Outlook Report and finally the Reef 2050 Long-term Sustainability Plan (Reef 2050 Plan). Appendix 1 shows the chronology of recent decisions.

At Bonn in 2015 the World Heritage Committee (Decision 39 COM 7B.7 [7]) welcomed the establishment of the Reef 2050 Plan and identified a number of critical steps to improving and sustaining the Outstanding Universal Value (OUV) of the Great Barrier Reef (GBR) World Heritage Area (WHA). Key elements of the decision included:

A. Requesting *the State Party to rigorously implement all of its commitments of the 2050 Long-Term Sustainability Plan (LTSP), including where necessary through their inclusion in legislation, in order to halt the current documented declines in the property, create the conditions for sustained recovery and to enhance the property's resilience;* (clause 6)

B. Noting *the State Party commitment to establish an investment framework in 2015 and also considers that this is an essential requirement for the effective implementation of the 2050 LTSP, that should be established as a matter of priority;* (clause 7)

C. Requesting *the State Party to submit to the World Heritage Centre, by 1 December 2016, an update on progress with implementation of the 2050 LTSP to confirm that the inception of the plan has been effective, and the Investment Strategy has been established, for examination by the World Heritage Centre and IUCN, and if in their assessment the anticipated progress is not being made, for consideration at the subsequent session of the World Heritage Committee in 2017.* (clause 8)

In recognition of the commitments by the Australian and Queensland governments the WHC did not include the GBR WHA on the List of World Heritage in Danger.

THIS REPORT AND THE REEF REVIEW GROUP

The Great Barrier Reef Independent Review Group (the Reef Review Group) prepared this report to provide an independent analysis of the Australian and Queensland governments' progress in implementing the Reef 2050 Long-Term Sustainability Plan (Reef 2050 Plan). In undertaking this review, we have considered government policy responses to issues not covered in the Reef 2050 Plan but critical to the long-term management of the Reef. We have also considered the implications of the 2016 mass coral bleaching event on future management of the Reef.

The Review Group includes four accomplished academics and practitioners in Reef science, environmental management and public policy. In preparing this report we have drawn on our wide-ranging scientific, public policy and management expertise to review relevant peer reviewed and grey literature as well as publicly available government reports.

The review focusses on four of the Reef 2050 Plan's seven areas of 'action for the future': ecosystem health; biodiversity; water quality; and governance. It does not analyse the other three areas in any detail: heritage; community benefits; and economic benefits. Nor does this review assess or comment on progress toward actions or targets related to traditional owner management, cultural heritage, or indigenous community engagement in the Reef 2050 Plan. This is recognised as a welcome and essential aspect of the Reef 2050 Plan but was beyond the expertise of the Review Group, and the time available, to address in any satisfactory way.

Appendix 2 includes the Group's Terms of Reference and short biographies of members.

5 Great Barrier Reef Marine Park Authority (2014a)

6 DSDIP. (2013)

7 WHC Decision: 39 COM 7B.7 http://whc.unesco.org/en/decisions/6216

PART 1 – PROGRESS IN IMPLEMENTING THE REEF 2050 LTSP

In Clause 6 of the 2015 decision, the World Heritage Committee,

Considers that the effective implementation of the 2050 LTSP, supported by clear oversight and accountability, research, monitoring and adequate and sustained financing, is essential to respond to the current and potential threats to the property's Outstanding Universal Value, and requests the State Party to rigorously implement all of its commitments of the 2050 LTSP, including where necessary through their inclusion in legislation, in order to halt the current documented declines in the property, create the conditions for sustained recovery and to enhance the property's resilience [8]*;*

The Reef 2050 Plan Annual Report and Implementation Strategy 2016[9] and Addendum[10] report on implementation of the Plan to mid-2016 and future actions for 2016-17. The Addendum provides reasonable detail on the implementation of the Plan's 151 actions in the first 15+ months of operation. On 1 December 2016, the Australian and Queensland governments submitted the *Update on Progress*[11] (Update Report) and *Investment Framework*[12] to the World Heritage Centre and IUCN. The Update Report provides some new information and draws substantially on the 2016 Annual Report and Addendum.

1.1 WELCOME STEPS FORWARD

The Reef 2050 Plan has a number of very important strengths that will be the foundation for its success in the coming decades; so too there have been some promising achievements since its inception 18 months ago.

The Reef 2050 Plan is broad, ambitious and based on a strong model of partnerships and cooperative federalism. The importance of building and securing collaborative partnerships to support its implementation cannot be overstated and the Independent Expert Group (IEG) and the Reef Advisory Committee (RAC) represent strong foundations for the continued involvement of scientists, industry groups, Traditional Owners, and conservation, regional natural resource management and other key user groups.

The Reef 2050 vision, objectives and targets are in the main, appropriate, comprehensive and measurable. The water quality targets are supported by a well-developed program of actions, as discussed further in this report, but the assessment of the uptake of best management practices is less satisfactory. The 151 actions listed in the Reef 2050 Plan are almost all well-considered and necessary. However this report highlights ongoing concerns as to whether the current suite of actions is adequate to achieve the Plan's targets and objectives.

The complexities and challenges that characterise the Great Barrier Reef World Heritage Area demand a long term, strategic outlook that can account for new developments as they arise. The Reef 2050 Plan is both *long term* and *adaptive* in its design. The five yearly phases that are core to the Reef 2050 Plan's 'logic', as well as the regular review and reporting periods, provide such opportunities for adaptive management. It must be stressed, though, that the Reef 2050 Plan's adaptive capacity relies on the Australian and Queensland governments having both the intent and power to fully exploit those opportunities and make meaningful changes to the Plan when the need arises.

The *Reef 2050 Plan – Update on Progress* points to the actions that have been completed and/or commenced, and while this Reef Review Group sees serious shortcomings in the prioritisation and measurement of progress (see Section 1.2), some initiatives are very welcome. For example, commitments for new legislation and regulations in Queensland to prohibit the dumping of capital dredge spoil in the World Heritage Area have been implemented. The establishment of three new net-free zones in Cairns, Mackay and Rockhampton, together with the progress made in protecting the Fitzroy Delta, North Curtis Island and Keppel Bay are achievements that go some way towards the targets

8 WHC Decision 39 COM 7B.7 clause 6
9 Commonwealth of Australia (2016a).
10 Commonwealth of Australia (2016b).
11 Commonwealth of Australia (2016c)
12 Commonwealth of Australia (2016d)

for biodiversity conservation and ecosystem health. Similarly, there has been concerted effort dedicated to the adoption of better land management practices, and ongoing support for regional waterway health partnerships producing annual regional report cards.

The in-principle acceptance by the Queensland government of the Great Barrier Reef Water Science Taskforce's recommendations is a significant development. The implementation of these recommendations will support improvements to best practice standards, the application of best practice standards for all industries, mandating catchment load limits and developing a water quality offsets framework to drive nitrogen and sediment reduction. To that end, the Queensland government has prioritised working with agricultural communities to achieve better land management practices. Compliance and enforcement remain deeply problematic, but numerous partnerships have arisen to support the necessary behavioural change. Together, these achievements speak to the importance of the 'stakeholder centric' approach that is so foundational to the Reef 2050 Plan.

A number of important investigations have been undertaken over the course of the last 18 months to estimate the level of investment required to achieve the outcomes of the Reef 2050 Plan. These suggest that the necessary level of investment is significantly greater than that currently agreed to by the Australian and Queensland governments.

In addition to prioritising investment for water quality achievements, effort so far appears to have been dedicated to identifying ways in which private sector funding can be mobilised to achieve conservation outcomes, and how pre-existing investments can be reoriented to Reef 2050 Plan outcomes. As we detail in this report, much more work remains to be done to secure those gains, but in principle these developments are promising.

Overall, 18 months since its inception, it seems clear that the Reef 2050 Plan is an appropriate vehicle with which to restore and improve the GBR's Outstanding Universal Value. But, with the recent (2016) severe coral bleaching event there is now a sense of urgency that needs to be embraced if the Plan's outcomes are to be achieved. In the remainder of this report we outline where key priorities and/or reforms lie for the remainder for the first 5-year period.

1.2 CHALLENGES AND LIMITATIONS

Limitations of Reef 2050 Plan

There are a number of inherent limitations with the Reef 2050 Plan which need to be recognised in any analysis. Table 1 summarises the structure of the Reef 2050 Plan [13] and its outcomes framework and seven overarching themes. While quite comprehensive, unfortunately at the time of the Plan's preparation there was no mechanism to assess whether or not the combination of actions under the respective themes will either deliver the relevant targets, or at least make measurable progress to the targets. Additionally, for most targets there was no mechanism to test the validity of the targets in contributing to achieving the Plan's objectives, and likewise with the objectives contributing to the outcomes. Expert knowledge combined with experience to date was used to derive the Plan's framework, and resulted in an overall lack of program logic . This is a major shortcoming because the scale of intervention required to achieve a target or objective is frequently substantially underestimated.

13 Commonwealth of Australia (2015).

Table 1. Structure of the Reef 2050 Long-Term Sustainability Plan

Vision To ensure the Great Barrier Reef continues to improve on its Outstanding Universal Value every decade between now and 2050 to be a natural wonder for each successive generation to come.			
Outcomes to deliver the Vision 2050	Objectives 2035	Targets 2020	Actions 2015-2020
Ecosystem health: The status and ecological functions of Ecosystems within the Great Barrier Reef World Heritage Area are in at least good Condition with a stable to improving trend.	3	5	32
Biodiversity: The Reef maintains its diversity of species and ecological habitats in at least a good condition with a stable to improving trend.	5	5	25
Heritage: Indigenous and non-Indigenous heritage values are identified, protected, conserved and managed such that the heritage values maintain their significance for current and future generations.	2	3	11
Water quality: Reef water quality sustains the Outstanding Universal Value, builds resilience and improves ecosystem health over each successive decade.	2	5	24
Community benefits: An informed community that plays a role in protecting the Reef for the benefits a healthy Reef provides for current and future generations.	4	4	13
Economic benefits: Economic activities within the Great Barrier Reef World Heritage Area and its catchments sustain the Reef's Outstanding Universal Value.	4	6	18
Governance: The Outstanding Universal Value of the Reef is maintained and enhanced each successive decade through effective governance arrangements and coordinated management activities.	4	5	16

Thus, subsequent reviews of the Plan must be underpinned by a program logic that identifies the priority actions required to deliver the objectives, outcomes and vision. This will lead to an understanding of assumptions that lie behind the choice of priority actions, a more measurable set of actions, and refinement of 5-yearly targets.

Challenges inherent in the Annual Report and Update Report

The Annual Report states, *Reporting on progress towards the Reef 2050 Plan targets, and outcomes will be undertaken separately through Great Barrier Reef Report Cards and Outlook Reports.*[14] However, the 2016 Annual Report covers the first 15+ months from March 2015 to mid-2016, a quarter of the way to the Plan's 5 year targets and so some measure of progress would provide insight into the likelihood of success, or risk of failure. Leaving an assessment of progress to targets and outcomes until 2019 is unsatisfactory.

One challenge in reviewing the Annual and Update Reports is determining whether or not the progress on actions is sufficient given the elapsed time. This is particularly the case for the "on track/underway" classification which includes the majority of actions. Despite at times quite lengthy descriptions on progress in the Addendum, it is hard to gauge whether or not an action is 20% - 50% complete, or just commenced. Ideally, each action should have a clear set of milestones, and progress would be reported against these milestones. This

14 Commonwealth of Australia (2016a). p.iii.

compounds the underlying problem with the Reef 2050 Plan as discussed previously, namely the lack of frequent explicit linkages between achieving the actions, delivering the targets and so contributing to the objectives.

We have reviewed the description of progress against each action in the Addendum to the 2016 Annual Report since this report provided the basis of the status of actions presented in the Annual Report. While recognising the subjective nature of such assessments, we question the "on track/ underway" status of 38 of the 103 actions given the "green light" (see Appendix 8). Thirty of these actions come under ecosystem health, biodiversity and water quality themes. Additionally, a number of the "completed, in place" actions are in fact ongoing, and so their status will be determined by the ongoing availability of resources. It would be more appropriate to separate the fully completed actions, and those that are "in place" and requiring ongoing resources to be delivered.

Conclusions

There are a number of inherent limitations with the implementation of the Reef 2050 Plan which need to be recognised in any analysis. These limitations mean that, to date, the scale of intervention required to achieve a target or objective is frequently and substantially underestimated.

The 2016 Annual Report covers the first 15+ months of a 5-year Plan, and so some measure of progress to targets would indicate the likelihood of success, or risk of failure. Leaving an assessment of progress to targets and outcomes until 2019 is unsatisfactory.

We have identified issues with the status rating provided for each action and have made a number of suggestions on improving the current approach.

Recommendation #1

Subsequent reviews of the Reef 2050 Plan must be underpinned by program logic with more quantitative approaches to either confirm or revise the existing framework of objectives and outcomes, and to determine 5-yearly targets. Each action should include measurable milestones for their delivery over the coming 5 years.

1.3 PROGRESS TOWARD KEY WATER QUALITY TARGETS

Improving the quality of water entering the GBR from the catchments has been recognised for over two decades as an essential action in improving the health and resilience of the Reef. It is a top priority in the Reef 2050 Plan [15] and is regarded as the second biggest pressure to the Reef after climate change.

In this section, we focus on the Reef 2050 Plan actions listed under Improving broadacre land management (WQA1-3 [16]) since this is the major source of pollutants affecting the GBR. The key agricultural industries are sugarcane and grazing, and the two key pollutants are nitrogen and sediment. Reef 2050 incorporates two sets of targets [17] for assessing progress of these actions:

- *quantitative load reduction targets* for nitrogen (dissolved inorganic nitrogen – DIN) and sediment (total suspended sediment – TSS) to be achieved by 2018 in priority areas,
- *uptake of best management practices* by farmers to be achieved by 2018 in priority areas.

Progress against these targets is reported annually in the GBR Reef Report Cards [18], which makes it fairly simple to assess whether programs are on track to achieve targets. These targets need to be achieved if the more ambitious 2025 targets, which were a new commitment as part of the Reef 2050 Plan, have any chance of being reached.

The Update Report uses information from the 2015 GBR Report Card (the most recent available) to assess progress. This showed there has been *very poor progress* in the achievement of both the load reduction targets and the uptake of best management practice (see Table 2). Although the 2015 GBR Report Card reflects largely the situation before the introduction of the Reef 2050 Plan, there is no reason to expect that the rate or trajectory of water quality improvements would have altered since then. Indeed, Queensland's GBR Water Science Task Force recently concluded that, *Transformational change is needed over the next 5-10 years if the targets have any chance of being achieved* [19]. The Update Report notes that, *Solving this challenge will require ongoing collaboration of all stakeholders and will require innovation and improving our knowledge base* [20].

15 Commonwealth of Australia (2016c). p.15

16 Commonwealth of Australia (2015). pp43-44

17 Note: these targets relate to the total GBR catchment, although there is a move to establish regional targets for each of the 35 GBR catchments (Commonwealth of Australia (2016c). p16).

18 Not to be confused with the Reef 2050 Annual Report. The GBR Report Cards have been published each year since 2011 as part of the Reef Water Quality Protection Plan

19 Great Barrier Reef Water Science Taskforce (2016). p.26

20 Commonwealth of Australia (2016c). p.16

Table 2. Progress to targets and assigned scores in the 2015 Great Barrier Reef Report Card.

Activity	2018 Target[1]	Progress to target[2]	Score[3]
DIN load	50% reduction	18%	Poor 'E'
Sediment load	20% reduction	12%	Moderate 'C'
Sugarcane land – managed to best practice standard	90%	23%	Poor 'D'
Cattle grazing land – managed to best practice standard	90%	36%	Poor 'D'

1. Load targets are the reduction in anthropogenic loads based on modelled estimation of anthropogenic loads; **2.** to 2015; **3.** ABCD scoring system

The Update Report claims that all Reef 2050 Plan water quality actions are 'on track/underway', stating, *the actions prioritised under the themes of water quality and ecosystem health are among the most consequential for the future of the Reef and these actions are on track*[21].

However, as the GBR Water Science Taskforce Report (see Appendix 3) and the 2015 Report Card (see Appendix 6) assessment clearly show, progress with water quality load targets is **not** 'on-track' and it is highly likely that most 2018 targets will not be met. Consequently, if the 2018 targets are not met, it will be extremely challenging to meet the 2025 targets, particularly for DIN, which is the highest target to achieve (up to 80%), but has the worst performance to date. We find it difficult to understand how the governments have assessed progress of the Reef 2050 Plan water quality targets as being 'on-track', and this claim undermines the credibility of the Update Report.

The GBR Water Science Taskforce, established by the Queensland government, recommended a suite of action and reforms needed to achieve the 2025 targets. While accepted by the Queensland government in principle, these are largely in the planning stage and have yet to be implemented. For the success of the Reef 2050 Plan it is critical that these reforms are urgently rolled out and adequately funded (see also Part 2 Investment Framework).

The Update Report makes a welcome commitment to update by mid-2017[22] the 2013 Reef Water Quality Protection Plan (WQPP). The updated WQPP will be a key instrument for operationalising the Taskforce's recommendations, for example by establishing revised load targets for each of the 35 major GBR catchments[23]. For this reason, the development and implementation of the new Reef Water Quality Protection Plan needs to be given high priority so that progress towards the 2025 water quality targets can be accelerated.

Conclusions

Improving the quality of water entering the GBR from the catchments is a key action in improving the health and resilience of the Reef. Progress towards achieving the nitrogen and sediment load reduction targets, and the uptake of BMP by cane farmers and graziers by 2018 is **very poor**, despite the assertion in the Update Report that these actions are on track. These targets need to be achieved if the more ambitious 2025 targets, which were a new commitment as part of the Reef 2050 Plan, have any chance of being reached.

Recommendation #2

Ensure the updated Reef Water Quality Protection Plan is achieved by mid-2017, and that it contains: revised load targets for each of the 35 major GBR catchments; measurable actions needed to achieve catchment targets; as well as a properly costed investment strategy to deliver actions; and that its implementation is given high priority.

Recommendation #3

Implement all of the recommendations made by the Queensland GBR Water Science Taskforce particularly the 'incentives' and 'regulations' recommendations[24] to assist in driving agricultural management practice changes which should also include consideration of 'land use change' for the marginal agricultural lands. (see also Section 1.4).

21 Commonwealth of Australia (2016c). p.6
22 Commonwealth of Australia (2016c). p.16
23 Great Barrier Reef Water Science Taskforce (2016). P.49
24 Great Barrier Reef Water Science Taskforce (2016). Rec 4 & 5.

1.4 NEED FOR MORE EFFECTIVE REGULATIONS TO REDUCE REEF POLLUTION

Regulation is an important part of the mix of policy instruments to accelerate progress towards meeting the Reef water quality targets. Queensland enacted Reef protection regulations in 2010 to apply to cattle grazing on properties of greater that 2,000 ha and all commercial sugarcane farming in the Burdekin, Mackay-Whitsunday and Wet Tropics catchments. However, under the previous state government the regulations were not enforced and this continued until early 2016 [25].

Although the current Queensland government has reinstated the compliance program for these regulations, the Update Report acknowledges there is widespread non-compliance of around 40% for the cane sector. The uptake of best management practices allows for cross-compliance with regulated standards. However, voluntary uptake of best management practice by both sugarcane farmers and graziers is poor. The most recent SmartCane Best Management Practice program has prompted only a small number (119 or 3%) of cane farmers to achieve accreditation.

No comprehensive regulatory and compliance regime to protect water quality and drive improvement has been enacted. The current regulations in high-risk areas require keeping records, matching of fertiliser application to soil testing outcomes and following label controls for the application of pesticide. These requirements are minimalist in comparison to the full suite of recommended best practice activities. Continued low uptake of best management practice programs indicates the need for a broader, supportive regulatory regime.

The GBR Water Science Taskforce recommended an extensive list of regulatory changes (see Box) that should be swiftly introduced to accelerate progress towards meeting the Reef water quality targets. The Queensland government has accepted these recommendations in principle and is consulting with stakeholders to implement them. The Queensland government will decide whether to initiate further regulatory interventions in 2017.

GBR Water Science Taskforce – Recommendations for the staged introduction of regulations applying to cane farms and grazing operations.

Implement staged regulations to reduce water pollution throughout the Reef regions.

1. Set and progressively reduce catchment pollution load limits in legislation to provide a regulatory framework to help drive load reductions to meet water quality targets.
2. Incentives to continuously improve practices should be complemented by staged regulations that should:
    - improve existing minimum regulated standards (for example for urban, stormwater and point source) over time,
    - establish minimum standards across all agricultural industries to address sediment and nutrient pollution,
    - mandate the provision of farm level yield data, nutrient and other relevant data across all agricultural industries,
    - consider progression to other approaches, including farm-based caps, if other stages are not successful within 5 years.
3. Minimum standards must be set in consultation with affected industries and have explicit regard to the cost and benefits of those standards.
4. Extend regulations to protect riparian areas and natural wetlands to all Reef regions, taking into consideration any impact this may have on landholders' ability to trade in ecosystem services.
5. Establish regulations to ensure no net decline in water quality from intensification and expansion in the agricultural sector.
6. Establish a water quality offset framework that can apply across industries (urban, ports, agriculture).
7. Seek continuous improvement in regulations and compliance capacity for point source pollution and stormwater and erosion and sediment control in urban and industrial areas.
8. Improve management of irrigation to maximise water use efficiency and to minimise pollutant losses and associated impacts on water quality.

Source: Great Barrier Reef Water Science Taskforce (2016), p62

25 ABC News Feb 2016, Qld Country Hour http://www.abc.net.au/news/2016-02-12/reef-water-quality-compliance-officers-ready-to-visit-farms/7162276

Conclusions

The current voluntary uptake of best management practices as measured by the annual GBR Report Card by both sugarcane farmers and graziers is poor, and unlikely to meet either 2018 or 2025 targets. There is widespread failure to meet existing regulated minimum standards which must be addressed urgently. The Queensland GBR Water Science Taskforce provided an extensive list of regulative changes that should be introduced in a staged way to accelerate progress towards meeting the Reef water quality targets.

Recommendation #4

That the Queensland government move urgently to implement the regulatory recommendations of the GBR Water Science Taskforce.

Recommendation #5

That the Queensland and Australian governments provide sufficient resources to ensure that existing and proposed regulations are fully implemented and the necessary education and support services are provided.

Recommendation #6

Meanwhile the Queensland government should rapidly escalate its renewed compliance effort for the existing agricultural water quality regulations to ensure the current 40% non-compliance levels are quickly reduced.

1.5 CONTROLLING VEGETATION LOSS IN REEF CATCHMENTS

Vegetation management targets in the Reef 2050 Plan

The Reef 2050 Plan includes the following targets regarding protection of wetlands and riverside vegetation by 2020.

> *Target EHT3 – There is no net loss of the extent, and a net improvement in the condition, of natural wetlands and riparian vegetation that contribute to Reef resilience and ecosystem health.*
>
> *Target WQT2 – The extent of riparian vegetation is increased. There is no net loss of the extent, and an improvement in the ecological processes and environmental values, of natural wetlands.*

Preventing loss of native vegetation is also important for meeting Reef 2050 Plan target WQT3 in relation to reducing sediment loads flowing into Reef waters.

In order to meet these targets, the Reef 2050 Plan relies heavily on a single action:

> *EHA20 – Strengthen the Queensland Government's vegetation management legislation to protect remnant and high value regrowth native vegetation, including in riparian zones.*

As acknowledged in Australia's Update Report to UNESCO, the Queensland government has been unable to implement this action since the necessary legal amendments to the Queensland *Vegetation Management Act* were rejected by the State Parliament in 2016. These laws alone would not have been wholly sufficient to meet the targets in question, but would have resulted in significant reduction of clearing rates.

Recent Clearing Rates in GBR Catchments

According to the latest Queensland government figures, Great Barrier Reef catchments recorded a woody vegetation clearing rate of 108 000 ha/year in 2014-15, an increase of 46% since 2011-12 [26]; 85% of clearing in 2014-15 was undertaken for pasture conversion purposes by the grazing industry [27]. Analysis of government data shows that approximately 12,992 ha of riparian vegetation was cleared in 2013-14 and 14,990 ha in 2014-15 [28]. Current rates of re-vegetation are far below those needed to replace this rate of clearing. Although these figures largely relate to the period just before the Reef 2050 Plan commenced, there is evidence to suggest the rate of vegetation clearing has increased since that time. For example, government data shows that in the four months between 20 July and 30 Nov 2016 notifications made under self-assessable codes for clearing remnant vegetation add up to 164,000ha state wide [29]. Apart from its impact on runoff, tree clearing is a major contributor to Australia's greenhouse gas emissions.

Mechanisms to control vegetation loss

Australia's Update Report notes that… *the Queensland Government remains committed to strengthening the State's land clearing laws* [30]. However, this position is not supported by the state opposition and it is highly uncertain when or if a future Queensland Parliament may act to pass stronger vegetation management laws.

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26 Qld Govt (2016) Land cover change in Queensland 2014–15, p.27.

27 WWF analysis of data from Qld Govt (2016) Land cover change in Queensland 2014–15,

28 WWF analysis of data from Qld Govt (2016) Land cover change in Queensland 2014–15

29 Queensland Government Register of self-assessable code notifications see: https://data.qld.gov.au/dataset/vegetation-management-register-of-self-assessable-code-notifications

30 Commonwealth of Australia (2016c). p.1

This makes it necessary for both the Australian and Queensland governments to find alternative mechanisms to fulfil their commitments under the Reef 2050 Plan. Both governments have existing legal powers which could be applied to make the expected progress toward the targets of no net loss in riparian vegetation and wetlands in Reef catchments by 2020 and contribute to the promised cuts in sediment pollution by 2025.

Role of Australian Government in controlling vegetation loss

Under Australia's national environment laws (the *Environment Protection and Biodiversity Conservation Act 1999*) any activity that could have a significant impact on 'matters of national significance' (including World Heritage Areas and nationally threatened species or vegetation communities) must be referred to the federal environment department for assessment and approval. However, in practice this system relies on land-owners to voluntarily notify the federal environment department before commencing clearing. Analysis of government data indicates that vegetation clearing regularly occurs in mapped habitat of nationally protected species and in riparian zones in Reef catchments, without referral under the EPBC Act [31]. Improving reporting and monitoring systems to ensure vegetation clearing activities are referred and assessed under national environment laws, as required by law, is a simple but important way to prevent inappropriate vegetation clearing that could impact the Great Barrier Reef.

Role of Queensland Government in controlling vegetation loss

Under Queensland's existing *Vegetation Management Act (VMA) 1999* the State Government has the power to make declarations (or temporary interim declarations) to prevent vegetation clearing in an area of high conservation value or an area vulnerable to land degradation. The Queensland government could apply this power to protect riparian and wetland vegetation in Reef catchments, in accordance with the Reef 2050 Plan targets.

Clearing of remnant vegetation is currently allowed without a permit if it is for the purposes of thinning, fodder harvesting or high value agriculture. Clearing for these purposes is subject to self-assessable codes (SACS). The Queensland government has begun a process to strengthen the SACs for fodder and thinning but there is further scope to tighten these codes to reduce clearing in GBR catchments, without any need for amendments to the legislation.

Conclusions

To date there has not been adequate progress toward the Reef 2050 Plan's targets in relation to protecting native vegetation in Reef catchments. Queensland's acknowledged failure to strengthen its vegetation management laws makes it necessary for both the Australian and Queensland governments to find alternative mechanisms to fulfil their commitments under the Reef 2050 Plan. Both governments have existing legal powers which could be applied to make the expected progress toward the targets of no net loss in riparian vegetation and wetlands in Reef catchments by 2020 and to contribute to the promised cuts in sediment pollution by 2025.

Recommendation #7

As soon as possible, Queensland should act again to strengthen state vegetation management legislation as required by Reef 2050 Plan Action Ecosystem Health Action 20.

Recommendation #8

In the meantime, the Australian and Queensland governments should work together to rapidly reduce vegetation loss in Reef catchments using existing legal mechanisms, with a particular focus on protecting riparian and wetland vegetation as intended under Reef 2050 Plan targets Ecosystem Health Target 3 and Water Quality Target 2. This can be achieved by a combination of the following steps:

(i) Australian Government:

- Improve reporting and monitoring systems to ensure vegetation clearing proposals that may impact the GBR WHA are referred and assessed as required under the *Environment Protection and Biodiversity Conservation (EPBC) Act*

(ii) Queensland Government:

- Use powers under the *Vegetation Management Act 1999* to make a declaration to protect riparian and wetland vegetation in Reef catchments.
- Further tighten self-assessable codes to reduce clearing in GBR catchments that will impact the reef.

31 Analysis undertaken by WWF Australia using government data. A map of these properties, including those outside of Reef catchments, is available online https://fusiontables.google.com/DataSource?docid=1Z1eCiFzpof9UwuokJ8T558yvqUlfKBjGTdyTCRh#map:id=3

1.6 PLANNING FRAMEWORK AND PROTECTING THE REEF'S OUV

The Reef 2050 Plan states that: *Queensland's planning policy and environmental decision-making system now require explicit consideration of matters protected under Australia's national environment law (including the Outstanding Universal Value of world heritage properties).* [32]

Under the Reef 2050 Plan's ecosystem health theme three actions are directed at Queensland's planning and policy arrangements and have been scored as "in place" (EHA25) or "on track/underway" (EHA23, EHA24). While progress with master planning of ports is welcome, its efficacy in supporting protection, restoration and management of coastal ecosystems that contribute to Reef health and resilience has yet to be proven. Unfortunately, the coastal protection measures being delivered under EHA23 are not sufficient in scale and time to reduce the impacts of ongoing coastal development or to accommodate the impacts of climate change. While EHA24 is noted as "on track/underway", many local governments lack the capacity and knowledge to deliver coastal planning and management that will avoid impacting the Reef's OUV.

The previous Queensland government largely dismantled the environmental component of planning legislation, policy and land use planning [33], removing reference to climate change impacts, narrowing the focus of regional land use plans, removing the right of local governments to seek offsets for Local Matters of Significance where they intersect with either National or State Matters of Significance, and widening the opportunity for development on floodplains and coastal inundation hazard zones. While the current government is committed to reversing many of those changes, approvals given in the interim mean suboptimal outcomes for the coastal zone will continue, resulting in further detrimental effects on Reef health.

The Reef 2050 Plan Policy Guideline for Decision Makers is a key document provided to give guidance to decision makers in considering impacts on the Reef. [34] The completion of this guideline under GA7 means that this action is scored as "completed". However, as an early indicator of its limited influence to date, neither the guideline, nor reference to Reef 2050 Plan objectives and principles, are incorporated into any of the key Queensland planning framework documents under development.

While the new proposed draft State Planning Policy [35] provides more explicit mention of the Great Barrier Reef and the need to protect the Reef's Outstanding Universal Value (OUV), this is not specifically stated in the guiding criteria. The State Planning Policy guidelines, which assist in the implementation of the State Planning Policy, also do not mention the OUV in the guidelines on biodiversity nor on coastal environment. Additionally, neither the current [36] nor the proposed new [37] State Development Assessment Provisions [38] mention OUV and provide very limited mention of the Reef.

Key planning and policy problems, both short and long term, continue including:

- Development continues on land already zoned for urbanisation and mapped as subject to storm surge around most communities on the Queensland (including GBR) coastline.
- There is limited consideration of avoiding detrimental impact on important coastal ecosystems linked to the Reef's OUV in planning and managing coastal development.
- Local government continues to struggle to implement good planning and management measures to limit Reef impacts, nor does it have the resources to develop and implement best practice coastal planning and management.
- There is a lack of specific detailed guidance in the Queensland planning framework to guide state and local government decision makers as to how matters of OUV are to be integrated into planning decision making.

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32 Commonwealth of Australia, *Reef 2050 Long-Term Sustainability Plan* (2015), 18..

33 EDO Qld (2016). Report to GBR Independent Review Group. Analysis of achievement of Reef 2050 law reform commitments.

34 Commonwealth of Australia, Reef 2050 Plan—Policy guideline for decision makers, 2016, available at: http://www.environment.gov.au/system/files/resources/1d989144-ec34-4e7f-adec-d10ec09052ab/files/guidelines-decision-makers-reef-2050-plan.pdf

35 Queensland Government, Draft State Planning Policy, November 2016, available at: http://betterplanning.qld.gov.au/resources/planning/irp/draft-state-planning-policy.pdf

36 Queensland Government, State Development Assessment Provisions, version 1.10, 28 November 2016, available at: http://www.dilgp.qld.gov.au/resources/policy/sdap/state-development-assessment-provisions-v-1-10.pdf

37 Queensland Government, Draft State Development Assessment Provisions, version 2, currently open for consultation, available at http://betterplanning.qld.gov.au/resources/policy/sdap/draft-state-development-assessment-provisions.pdf

38 Note. The State Development Assessment Provisions provide detailed guidance to decision makers as to how impacts to State interests provided through the State Planning Policy should be assessed.

Conclusions

Significant changes are still required in planning and environmental policy, decision-making and implementation to ensure that the Queensland government meets its commitments in the Reef 2050 Plan to the long-term protection of the Reef's OUV.

Recommendation #9

Maintaining and enhancing the GBR WHA OUV should be a top priority strategic outcome sought in all land use planning laws and policies and development approvals.

Recommendation #10

Ensure that Reef 2050 Plan Ecosystem Health Action 24 is effectively implemented so that local government has the capacity to effectively implement coastal planning laws and policies to protect the Reef, commencing with a thorough assessment of the implementation chain within local government and the development industry.

1.7 FISHERIES MANAGEMENT

The 2014 Outlook Report [39] identified five remaining very high or high risk fisheries related matters: illegal fishing; incidental catch of species of conservation concern; effects on discarded catch; extraction of predators; and, extraction from spawning aggregations. Fishing activities in the GBR WHA are primarily managed by the Queensland government; this includes licences, fish size, possession limits and seasonal closures. [40] However, all fishing activities are required to comply with the Great Barrier Reef Marine Park Zoning Plan 2003. The role of GBRMPA in the management of Queensland's fisheries is outlined in the 2015 Great Barrier Reef Intergovernmental Agreement (GBR IGA) [41]. GBRMPA's role should be supported by a clear position statement on what constitutes sustainable fishing within the WHA and so guide the development by Fisheries Queensland of fisheries management targets and associated management strategies for GBR fisheries.

An independent review [42] initiated by the previous state government and completed in 2014 contained 80 separate recommendations needed for Queensland to adopt best practice fisheries management. A fisheries management Green Paper based on the Review's recommendations was released in July 2016 seeking public comment on 10 reform areas: managing target stocks; managing impacts on the ecosystem, including non-target species; resource sharing arrangements between sectors; access to the resources; decision making framework; harvest strategies; data and information; consultation and engagement; fisheries compliance; and, funding.

The Reef 2050 Plan included five fisheries related actions and two targets specific to fisheries [43]. Many other actions and targets relating to ecosystem health, biodiversity and economic benefits would benefit from fisheries reform. Progress has been made on a number of actions including the release of the Green Paper mentioned above (BA23). Three new net free zones (BA6) covering 1621 square kilometers were introduced in November 2015 and the associated structural adjustment package removing 46 net licences was finalised in September 2016.

Non-compliance with marine park zoning [44] by recreational and commercial fishers is an ongoing major issue for the WHA's resilience [45] with a Queensland stock assessment assuming up to 20% of fishing effort occurs within marine national park (green) no-fishing zones [46]. Trials of vessel tracking onboard departmental vessels and a small number of volunteer Reef Guardian fishers' vessels, have not been expanded to cover all high-risk vessels.

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39 Great Barrier Reef Marine Park Authority (2014b)

40 http://www.gbrmpa.gov.au/managing-the-reef/how-the-reefs-managed/fisheries-in-the-marine-park/fisheries-management

41 Commonwealth of Australia and State of Queensland (2015). Schedule E.

42 MRAG Asia Pacific (2014).

43 Reef 2050 Plan Actions EHA32, BA6, BA23, EBA12, EBA15 and Targets BT3, EBT5

44 Reef 2050 Plan's action EHA32 seeks to *enhance compliance with zoning Plans, fish habitat and other regulations through improved enforcement and adoption of new technologies*; this action is scored as "on track/underway".

45 http://www.gbrmpa.gov.au/media-room/latest-news/compliance/2016/illegal-recreational-fishers-caught-in-the-act

46 http://era.daf.qld.gov.au/4547/1/CoralTroutStockAssessment2014.pdf

Of concern. Over 16 % of the harvested weight of GBR sharks are hammerhead species listed in CITES Appendix 2 and currently under assessment for listing as protected species under the EPBC Act.

The ability for Fisheries Queensland to control fish harvest, including the take of high risk species like sharks, is low under the existing management framework. For example, the shark catch in the GBR jumped by 87% between 2013-14 and 2015-16, mostly driven by a 257% increase in the Cairns region, with no apparent management response. Similarly, on 19 November 2016, after more than five years of inaction on management reforms, the Queensland government announced that the Queensland scallop population had crashed to just 6 per cent of the original stock biomass.

Conclusions

Significant deficiencies in fisheries management for both recreational and commercial fishing continue to undermine the objectives of the Reef 2050 Plan and thus the OUV status of the GBR WHA. This is not a new area of interest or concern for stakeholders in the Reef. Implementation of the recent recommendations in the Queensland government's fisheries management green paper would go some considerable way to addressing these problems. Additionally, clear guidance from GBRMPA in the delivery of these reforms for fisheries operating in the GBR WHA is apparently missing. Such guidance should cover both targeted stock, bycatch and interactions with species and habitats of conservation significance.

Recommendation #11

Ensure that a clear position statement is developed by GBRMPA to outline what constitutes sustainable fishing within the WHA and this is explicitly recognised by Fisheries Queensland during the development of fisheries management targets and strategies for GBR fisheries.

1.8 GOVERNANCE ARRANGEMENTS UNDERPINNING REEF MANAGEMENT

Effective management of most of the pressures on the GBR WHA involves coordination across seven Australian Government Acts and seventeen Queensland Government Acts. Additionally, over time, a complex set of institutional arrangements has been put in place including a myriad of committees. Figure 6 (following page) from the GBR Water Science Taskforce Final Report [47] shows the complexity of existing arrangements. Yet the Reef's key indicators of ecosystem health have been in marked decline over the last three decades - particularly since the 1990s [48] [49] .

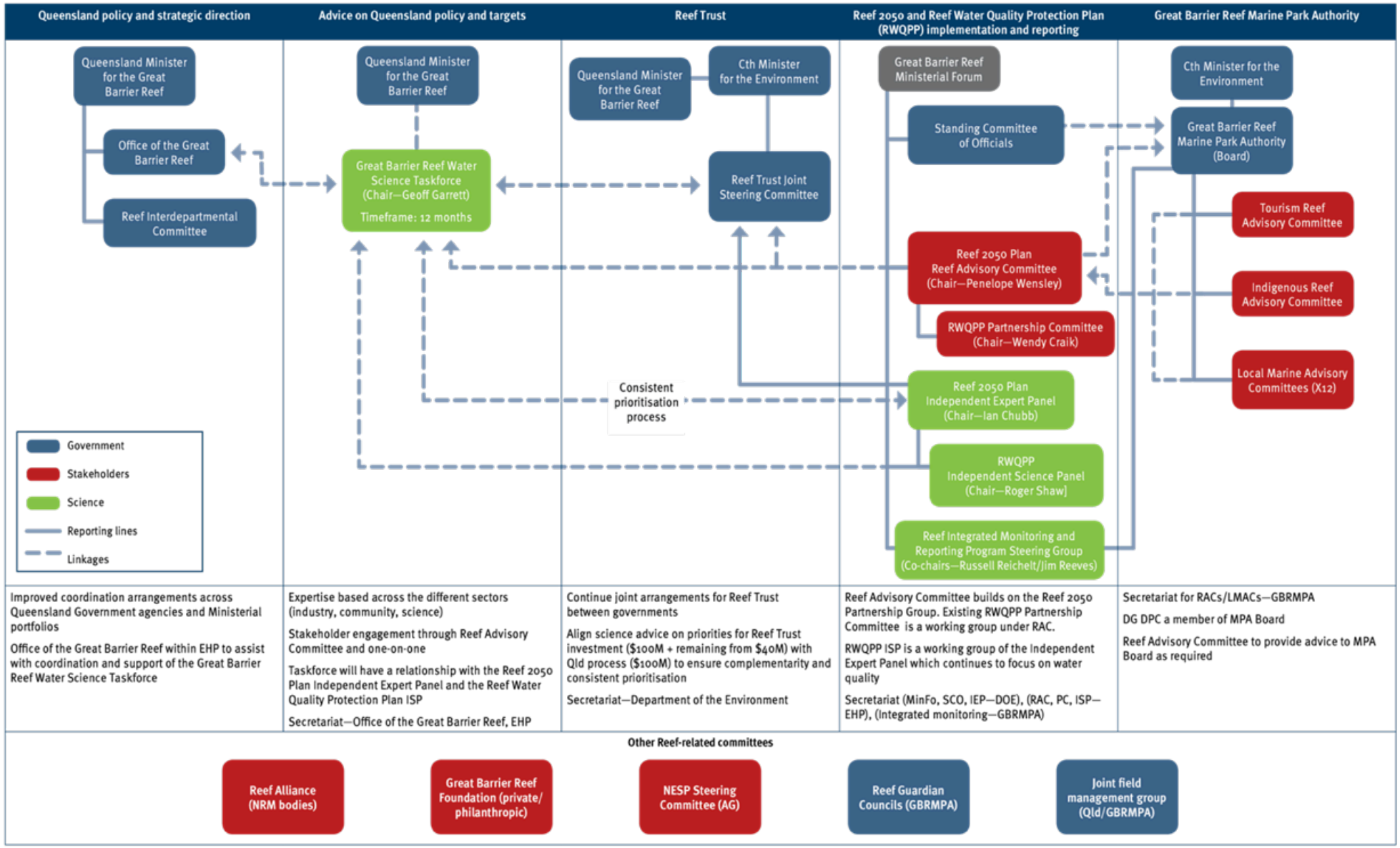
Overlaying all moves for improved governance of the GBR is the inherently competitive and political nature of Australia's federation. Reef 2050 Plan's Inter-Ministerial Forum goes some way to overcoming such difficulties, but even relatively straightforward measures such as channelling all government funding through a single investment mechanism or having a single government web site for Reef information, invariably meets with strong resistance from some department or Ministerial office.

The Reef 2050 Plan recognises the importance of good governance to support its implementation and goes some way to addressing the complexity of the system.

In many respects, the Plan's 15 governance actions are world's best practice as they strive for governance arrangements that are transparent, accountable, and co-operative and with the principle of subsidiarity paramount. However, the significance and urgency of the issues in the GBR, combined with the complexity of the governance arrangements in the broader GBR catchment, suggest that the governance actions proposed in the Reef 2050 Plan don't go far enough to support its outcomes. Further reforms are needed.

47 Great Barrier Reef Water Science Taskforce. (2016). P.36
48 De'ath et al. (2012)
49 Great Barrier Reef Marine Park Authority. (2014a)

Governance model for Reef 2050, Reef Water Quality Protection Plan and Great Barrier Reef Water Science Taskforce



The recently released Queensland GBR Water Science Taskforce report [50] provides a straightforward analysis of the problems and a pathway forward for improved governance of *all* Reef-related management activities (see Box below).

Taskforce conclusions

Reef-wide, water quality governance arrangements from policy to on-ground delivery are currently complex and poorly aligned. Improved alignment, simplification and coordination of effort across the system is needed to improve water quality outcomes.

This is an essential element to get right, across the wide range of organisations involved in the Reef space.

Key issues that need to be resolved in order to improve governance include agreement on objectives, alignment of programs, clarity of roles and responsibilities, and accountabilities.

Taskforce recommendations

10. SIMPLIFY AND STRENGTHEN GOVERNANCE AND CLARIFY ROLES AND RESPONSIBILITIES WITHIN AND BETWEEN THE QUEENSLAND AND AUSTRALIAN GOVERNMENTS.

10.1. Implement a simplified and more effective governance structure across Queensland and Australian governments to deliver better joint arrangements in funding and decision-making, and more efficient delivery arrangements and trial them through the major integrated projects.

10.2. Reach agreement on critical delivery systems operating within catchments and undertake progressive reform to improve coordination between partners including local, Queensland and Australian governments, regional NRM bodies, industry bodies, River Improvement Trusts, Drainage Boards and Traditional Owners to ensure more efficient and informed delivery.

10.3. Monitor and report on the effectiveness of the governance system affecting Reef water quality outcomes, resolving agreement on objectives, alignment of programs, clarity of roles and responsibilities and accountabilities.

*10.4. Work across the Queensland Government to ensure the existing $35 million per year investment has a direct Reef water quality benefit to respond to the Queensland Audit Office recommendations.**

* Note: 10.4 should apply to all government funding, both Australian and Queensland, directed to water quality benefits in the first instance.

The importance of adopting an integrated, all-encompassing approach to governance is reinforced in a recent paper by Dale et al (2016) [51] which identifies 40 governance subdomains influencing GBR outcomes, organised across 15 domains and 3 themes. Through literature review, targeted discussions and focus groups, the authors determined a risk rating for each sub-domain, related to the consequences to the GBR should the sub-domain's governance system fail. Low risk means the governance system is very likely to deliver its intended outcomes for the Reef, while high risk means the failure of the sub-domain will have significant consequence for GBR outcomes. According to this analysis, the domains that present a high risk of undermining the success of the Reef 2050 Plan are: regional land use planning; Northern Australian development; and ecosystem service delivery.

The implications of that analysis and others, is that any assessment of governance arrangements for the GBR needs to include the efficacy of both:

- specific policy and legislative arrangements pertaining to the marine park itself; *and*
- the broader institutional structures and governance 'landscape' in which they operate including the on-ground and regional delivery organisations exemplified by the NRM regional groups (see Appendix A7).

For example, regulations controlling fertiliser use, land clearing or fisheries by-catch might be adequate and enforced, but if approvals processes relating to the development of northern Australia fail to account for impacts on the GBR's OUV, the integrity of the whole system is at risk.

50 Great Barrier Reef Water Science Taskforce. (2016). P.8, pp 35-36, p.76.

51 Dale et al. (2016).

Independence of the Great Barrier Reef Outlook Report

Good governance requires good information. Since 2009, the Great Barrier Reef Marine Park Authority (GBRMPA) has produced and published the 5-yearly GBR Outlook Report to *provide a regular and reliable means of assessing reef health and management in an accountable and transparent way.*[52] In 2014, for the first time and following a request from the World Heritage Committee, the report specifically considered the Great Barrier Reef Region's heritage values, including world heritage values, and an explicit assessment of the area's Outstanding Universal Value.

The 2015 WHC decision requests Australia to: *submit to the World Heritage Centre, by 1 December 2019, an overall state of conservation report …. demonstrating effective and sustained protection of the property's Outstanding Universal Value and effective performance in meeting the targets established under the 2050 LTSP, linked to the findings of the 2014 and anticipated 2019 Great Barrier Reef Outlook Reports, for examination by the World Heritage Committee at its 44th session in 2020.*[53]

Such a report is likely to bring considerable additional public scrutiny on the Outlook Report. Hence it would be prudent to strengthen the independence of the Outlook Report by establishing an independent steering committee drawing on the expertise of the Independent Expert Panel and the Reef Advisory Committee while retaining the technical capabilities of GBRMPA.

In the longer term, the scope of the Great Barrier Reef Outlook Report could be expanded to report on the broader health of the GBR catchments in addition to that of the GBR World Heritage Area. It could expressly report on the efficacy of the broader governance domains identified, in particular those that have a profound impact on the health of the Reef such as regional land use planning, and farming and grazing practices. Such an expansion of scope would be demanding, but it would provide decision-makers with the necessary 'whole of catchment' perspective that is currently missing.

Strengthen the Great Barrier Reef Marine Park Authority

The Reef 2050 Plan is underpinned by key foundational activities and in particular the effective management of the Great Barrier Reef Marine Park. Over the last three decades the relative power of the GBRMP Act has been diminished, with GBRMPA choosing to restrict its authority to governing activities in the marine park and to seldom invoke its legislative powers vis a vis terrestrial activity. At this point in time, the standing of the GBRMP Act is seen to be subsidiary to the EPBC Act 1999.

To support the outcomes of the Reef 2050 Plan and provide much needed integration across marine and terrestrial activities, GBRMPA should be strengthened by:

- Establishing separate roles for a CEO and Independent Chair, so as to better demarcate the governing and strategic responsibilities of the Authority, from the executive and operational aspects of it.
- Ensure members of the GBRMPA Board are expertise-based and free of conflict-of-interest. An overlap of membership between the Board and the Reef 2050 Plan's IEP and RAC would be desirable.
- Ensure the Chair of the proposed Queensland GBR Catchment Authority (see next recommendation) is on the GBRMPA Board.

A Queensland GBR Catchment Authority

The GBR Water Science Taskforce's Figure 6 shows the many GBR focussed programs and committees already established. However, there is currently no overarching statutory-based institution to oversee the Great Barrier Reef Catchment. Such an entity could be established in the coming 2-3 years to resolve agreement on objectives, and to support the alignment of NRM and statutory land use planning, and design and alignment of programs, as well as clarifying roles and responsibilities and accountabilities. It could provide a single point of contact for all Queensland Reef-related matters and investment. It could be tasked with:

- Coordinating across the many catchment focussed entities, especially those at the sub-state level such as NRM groups;
- Building capacity of local and regional institutions to encourage local ownership, leadership and commitment;
- Providing a statutory base for regional NRM Plans to ensure alignment with statutory land use plans and with coastal planning and management;
- Coordinating and delivering the financial investments that the Queensland government has committed to the Reef 2050 Plan and participating in any joint Australian-Queensland governments' investment planning and delivery institution;

52 http://www.gbrmpa.gov.au/managing-the-reef/great-barrier-reef-outlook-report

53 http://whc.unesco.org/en/decisions/6216 Clause 9.

- Providing independent, transparent and robust information to investors about how funds are being used in support of the GBR's OUV status;
- Providing independent advice on how the complex web of legislative, regulatory and broader governance arrangements could be reformed in the GBR catchment in the coming years to improve the OUV status of the GBR.

An overarching entity of this nature would need to have the necessary resources to oversee developments along the length of the GBR Catchment and within its 35 major catchments, and to coordinate decision-making from one catchment to another. It could provide a platform to support the Reef 2050 Plan's ambitions in relation to best-practice land management.

Such an Authority would work closely with GBRMPA and the Reef 2050 Plan partners and have sufficient resources to be effective. This recommendation complements Recommendation 19 in Part 2, to establish a single pool of financial resources to support the Reef 2050 Plan.

Conclusions

The current crisis in the Reef's health, public concern about its future and ongoing scrutiny by the World Heritage Committee, means a stronger, more independent and better resourced system of governance is essential to the Reef's recovery and to re-build public confidence in the management of the Reef.

Against this background – and while recognising the intent of the governance actions in the Reef 2050 Plan and the progress made to date – we make the following recommendations.

Recommendation #12

Enhance the independence of the Great Barrier Reef Outlook Report by establishing an independent steering committee drawing on the expertise of the Reef 2050 Plan's Independent Expert Panel (IEP), Reef Advisory Committee (RAC) and the proposed Queensland GBR Catchment Authority.

Recommendation #13

Strengthen the Great Barrier Reef Marine Park Authority by establishing an expertise-based Board with an Independent Chairman and strong links with Reef 2050 Plan's IEP and RAC and the proposed Queensland GBR Catchment Authority.

Recommendation #14

Establish a Queensland Great Barrier Reef Catchment Authority with effective linkages with GBRMPA Board and Reef Plan's Independent Expert Panel and Reef Advisory Committee.

1.9 MONITORING, MODELLING, EVALUATION AND REPORTING

The Reef 2050 Plan clearly recognises the importance of a robust and credible monitoring and evaluation program to provide timely information on the effectiveness of the various management actions aimed at ensuring the health and resilience of the GBR.

The Update Report notes that GBRMPA are leading the development of the *Reef 2050 Integrated Monitoring and Reporting Program*, the design of which is scheduled for completion at the end of 2017 (p28). This program will cover the seven overarching themes of the Plan – ecosystem health, water quality, biodiversity, heritage, community benefits, economic benefits and governance.

Work to date has focused on coordinating, aligning and integrating the large number (ca. 100) of existing monitoring and modelling program associated with the GBR [54] [55]. Two important components of this integrated program will be the existing Reef Water Quality Protection Plan Paddock to Reef Program [56] and the annual GBR Report Card [57].

Given that the information from this integrated program will be vital in supporting the GBRMPA Outlook Report in 2019 and the review of the Reef 2050 Plan in 2020, we are concerned that the development phase will not be completed until the end of 2017. We urge that this timing be reviewed with a view to completing at least a first phase of the Program by mid-2017. Additionally, many important actions that will underpin good decision-making are constrained by the very modest progress in developing and implementing the proposed Reef Integrated Monitoring and Reporting Program (RIMREP); 19 actions are directly linked to the delivery of RIMREP including developing ecologically relevant regional standards for ecosystem health (EHA6), Identifying the key indicator species and populations (BA17), Consolidating Reef heritage data (HA7), Supporting the long-term social and economic monitoring program (CBA13). The delivery of RIMREP

54 Great Barrier Reef Marine Park Authority (2015).
55 Addison, P., Walshe, T., Sweatman, H., Jonker, M., MacNeil, A., Thompson, A. and Logan, M. (2015).
56 http://www.reefplan.qld.gov.au/measuring-success/paddock-to-reef/
57 http://www.reefplan.qld.gov.au/measuring-success/report-cards/

is a target (GT5) in the Plan; its design phase is due to be completed by the end of 2017, some three years into the current 5-year Plan. Given the central role of RIMREP in the implementation and evaluation of the Reef 2050 Plan, its development and implementation should have been given higher priority.

While the development of the *Reef 2050 Integrated Monitoring and Reporting Program* appears to be heading in the right direction, we note the following issues that must be addressed:

- We are concerned that this Program will be too ambitious and too expensive, and will not be started in time to provide sufficient information to underpin the 2019 GBRMPA Outlook Report. Its scope and complexity needs to be reviewed and at least a first phase of the Program needs to commenced in mid-2017.
- Current catchment monitoring needs to be expanded to be able to assess the effectiveness of management practice change.
- The data on land management change needs to be more rigorously verified to provide confidence in its accuracy.
- Investment in GBR monitoring and modelling needs to be increased - it is currently not sufficient to allow the adequate measurement of the Reef-wide water quality status and trends for both catchment and marine systems.

Conclusions

A robust and credible monitoring and evaluation program is vital if timely information on the effectiveness of the various management actions aimed at ensuring the health and resilience of the GBR is to be provided to the community.

Many important actions that will underpin good decision-making are constrained by the very modest progress in developing and implementing the proposed Reef Integrated Monitoring and Reporting Program (RIMREP).

The development of the *Reef 2050 Integrated Monitoring and Reporting Program* appears to be heading in the right direction, but the following issues need to be noted and addressed:

- The design of this program is scheduled for completion at the end of 2017, leaving little time for it to provide meaningful information for the GBRMPA Outlook Report in 2019 and the review of the Reef 2050 Plan in 2020.
- The scope and complexity of this ambitious (and expensive) Program needs to be reviewed and at least a first phase of the Program needs to commence in mid-2017.
- Investment in GBR monitoring and modelling is currently inadequate for it to fulfil the function required by the Reef 2050 Plan.

Recommendation #15

Review the scope and complexity of the Reef 2050 Integrated Monitoring and Reporting Program and ensure a revised version commences in mid-2017.

Recommendation #16

Increase investment in GBR monitoring, modelling, evaluation and reporting.

PART 2 – REEF 2050 PLAN INVESTMENT FRAMEWORK

In Clause 7 of the 2015 decision the World Heritage Committee decision states,

Takes note of the State Party commitment to establish an investment framework in 2015 and also considers that this is an essential requirement for the effective implementation of the 2050 LTSP that should be established as a matter of priority;

The Reef 2050 Investment Framework was released alongside the December 2016 Update on Progress. The Investment Framework is an important initial attempt to quantify the scale of additional investment that will be required to implement the Reef 2050 Plan. However the analysis provided in the Investment Framework falls short in a number ways. In particular, it is disappointing that the Investment Framework commits no significant new funding to meeting the targets despite the recognised gaps.

The Investment Framework identifies funding needs, based on the estimations by various lead agencies responsible for delivering actions. There is little transparency on how the figures were arrived at and no calculation is provided as to what the current investment will achieve. Funding continues to be fragmented amongst various departments, and is variable, inadequate and often poorly coordinated.

The Framework identifies a funding gap of between $143 and $408 million to implement all the existing actions in the Reef 2050 Plan. It does not estimate the cost of meeting all 33 of the Reef Plan's targets for 2020. As discussed elsewhere in this report, in many cases the existing suite of actions seems unlikely to be sufficient to meet the agreed targets, and additional actions will be required. Hence, the cost of meeting the 2020 targets is likely to be higher than the sum of the cost of meeting each of the individual actions.

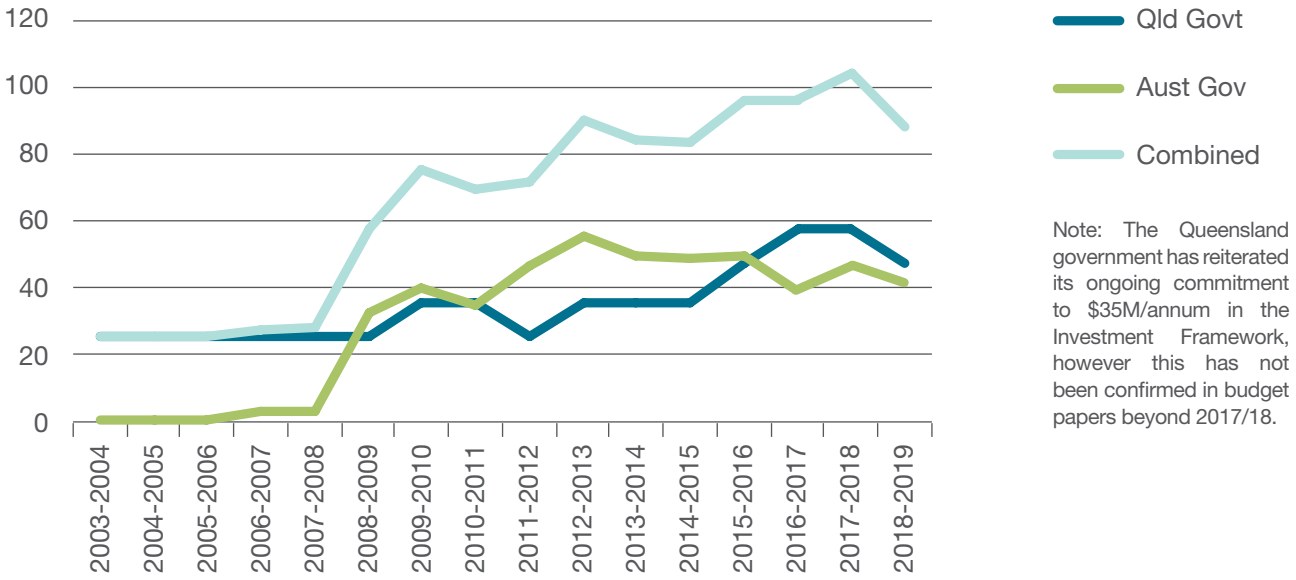
Current investment in water quality is over-estimated

The following analysis is focussed on the investment needed to improve water quality since this is identified as the highest priority in the Reef 2050 Plan and the Investment Framework and is the largest single area of current and future investment.

The Investment Framework identifies that existing investment in water quality over the 2015-2020 period will be $550 million with the Queensland government providing $272 million. The majority of this ($175 million) comes from the recurrent annual investment of $35 million claimed by the Queensland government as a contribution to Reef-related water quality programs. Independent analysis by the Queensland Auditor General [58] found that much of this claimed investment went to programs with no clear water quality benefit. The Queensland Audit Office reported that State departments couldn't readily demonstrate that their programs are effectively contributing to Reef Plan targets, indicating that a significant proportion of the claimed investment is used to fund pre-existing public service administration rather than actual programs of pollution reduction. Analysis drawing on the Water Science Taskforce Final Report and incorporating recent Australian government funding announcements indicates that funding committed to water quality improvement under the Reef Plan is expected to, at best plateau, if not decrease over time (Figure 1).

58 Queensland Audit Office (2015). *Managing water quality in Great Barrier Reef catchments*. Report 20: 2014–15. Brisbane, Queensland. https://www.qao.qld.gov.au/reports-parliament/managing-water-quality-great-barrier-reef-catchments

Figure 1. Combined Australian and Queensland Expenditure on Reef Water Quality Initiatives 2003 - 2019 (millions of dollars per annum)



Note: The Queensland government has reiterated its ongoing commitment to $35M/annum in the Investment Framework, however this has not been confirmed in budget papers beyond 2017/18.

Data sources: Great Barrier Reef Water Science Taskforce Final Report (2016) p.32 plus advice from the Australian government Department of the Environment and Energy on additional funding available through Reef Trust (2014-15 to 2021-22) and implementation of Reef 2050 Plan under the National Landcare Program (2016-17 to 2021-22).

Water quality funding gap is under-estimated

The Investment Framework (p.4) notes that the estimated funding gap for water quality actions (noted as Reef Water Quality Protection Plan actions) is $33 to $133 million. This brings the proposed maximum investment in water quality over the next five years to $673 million. There is a significant body of evidence (see discussion below) that even this maximum amount of funding will not be sufficient to meet the 2025 water quality targets established in the Reef 2050 Plan, namely a 80% reduction in nitrogen and a 50% reduction in sediment.

A report [59] (see Appendix 4) commissioned by the Queensland government estimated the total cost of achieving the 2025 water quality targets for the Great Barrier Reef catchments is around $8.2 billion. The total cost of achieving fine sediment abatement targets is estimated to be $7.8 billion in the most likely case, and $5.3 billion under best-case assumptions, and $18.4 billion under worst-case assumptions. Achieving the 80% nitrogen target by 2025 is estimated to cost at least $400 million. This is likely to be an underestimate because the report only costed achieving around 75% of the nitrogen target in the Wet Tropics, and did not include the eastern-draining catchments of Cape York.

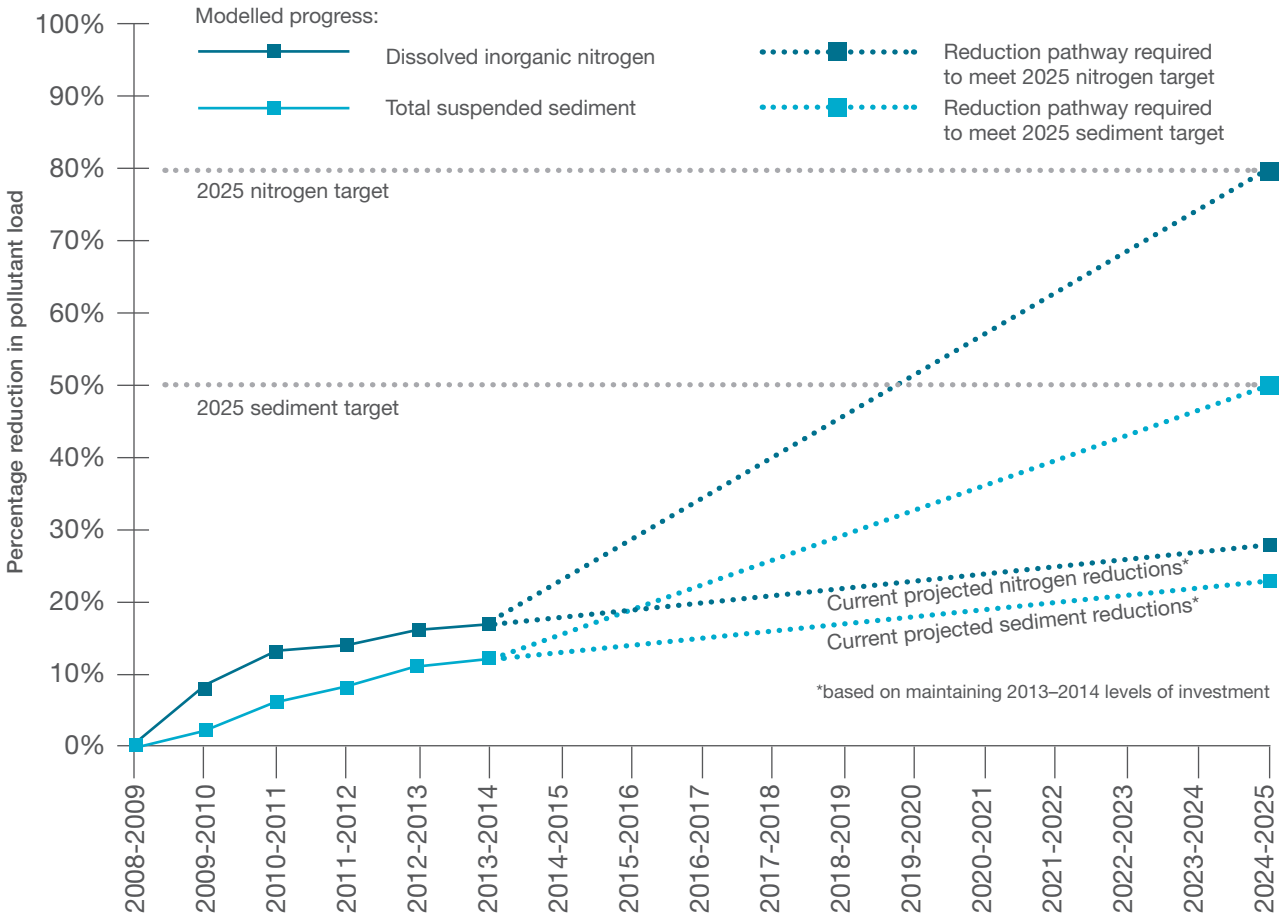
Investing in the GBR – the benefits of GBR protection

A report by engineering firm Jacobs assessed the level of funding that the Great Barrier Reef would receive for operations and maintenance if it were treated the same as a water supply scheme or energy network. Jacobs found that an annual expenditure of up to $830 million would be appropriate based solely on its contribution to the Australian tourism economy. See Appendix 5.

As discussed in section 1.3 above, the Great Barrier Reef Water Science Taskforce found that the targets would not be met unless a substantial increase in resources including funding occurs. The trend analysis and the predicted achievement of targets is illustrated in Figure 2 below.

59 Alluvium (2016).

Figure 2. Nitrogen and Sediment load reductions required to meet 2025 targets



Data source: Great Barrier Reef Water Science Taskforce Final Report (2016) p.27

Strategies to address funding needs

The Investment Framework identifies strategies to fill the funding action gap including accessing additional government, private and philanthropic investment. Details on the strategies to increase funding presented in the Framework are extremely high level and lack planning, detail, specification, implementation actions and targets. Additionally, only a limited number of ways to increase funding for Reef-related activities have been identified. The role of regulation, taxes, charges and fees for commercial and recreational activities [60] that benefit from and contribute to Reef health are given no consideration. The benefits of capturing value from other markets such as carbon sequestration to improve water quality are not included.

Funding from the National Landcare Program is identified as a potential source of Australian government investment for water quality improvement. The program suffered a significant budget cut in 2014 and there is no guarantee of funding beyond June 2018. Its potential contribution is therefore highly questionable.

The Clean Energy Finance Corporation (CEFC) Reef Fund, a ten-year $1 billion investment fund that focuses on clean energy projects that, is identified as a major source of investment to meet the greatest funding gap in water quality. There are significant limitations and uncertainties associated with reliance on the CEFC Reef Fund to fill funding gaps. Under the existing legislative framework, the fund will only be able to invest in projects that have a clean energy

60 For example, there is no discussion of increasing the modest environmental management charge (EMC) of $6.50/day/full-time visitor contributed by the Tourism industry.

outcome, meaning that water quality outcomes will be a secondary and optional consideration. The investment is structured as an equity and low interest loan facility, which is significant because even existing grants programs have had a low level of participation in implementing new technologies with a water quality outcome. The significant price variabilities received in the agricultural sector means the appetite for further debt and therefore participation in the scheme may be limited. Moreover, if the scheme is successful there may be unintended consequences in that the investment could help subsidise the industries and sectors creating the majority of nutrient pollutant in the Reef through cheap electricity and equipment upgrades thereby making alternative, less polluting landuse activities less cost competitive.

The success of regulation in increasing investment by ports in improving water quality is highlighted in the Investment Framework, however no other examples are identified. Drivers for increased private investment in terms of a regulatory cap on key land generated pollutants are missing from the current approach and in their absence, there are few drivers for landholders or third parties to invest in pollution abatement because no market, incentives or trading regime has been created to drive efficiency.

The reliance on philanthropic investment to fill gaps identified in the Investment Framework may be misplaced given the historically low levels of interest and the crowded market for charitable causes. Philanthropic giving by corporations and individuals in Australia is low by global standards with environmental causes receiving approximately 3% of donations [61]. Additionally, the Investment Framework has a strong reliance on financial and technological innovation as a strategy for filling funding gaps; by its nature innovation involves significant uncertainty and risk of failure at a time when significant progress on achieving Reef 2050 Plan targets is essential. Additional government investment will be required until alternative revenue streams are available.

One Way Forward – Leveraging Investment in Carbon to Improve Water Quality

There is an emerging opportunity to improve water quality and restore coastal ecosystems by building on land-sector carbon investment. In most cases the carbon activities have a benefit to the water quality of the catchment, however there are many projects that would yield higher water quality outcomes that cannot be funded by carbon investment alone, particularly in higher rainfall, intensively farmed landscapes.

To this end the Queensland government, a major land-sector carbon project developer and the Queensland Natural Resource Management Regions, have signed an MOU to collectively use their best endeavors so carbon investment can be used to lever additional ecosystem services in the Reef regions. To give effect to this idea, the project developer is proposing an incentive based, market mechanism, tentatively labelled a Reef Credit or Carbon Plus, to generate additional, quantifiable, ecosystem benefits and service payments to improve water quality. The proponents have agreed to pilot methodologies that could be funded by grants in the short term and eventually by cap and trade, beneficiary or polluter pay mechanisms.

Other important funding gaps

The Investment Framework identifies a funding gap in the GBR Marine Park Field Management Program of between $41 and $92 million over the next 5 years. This program delivers the on-water and island management activities to ensure that users in the Marine Park abide by the zoning plan and national park rules. It also covers monitoring and pest management activities as well as responding to incidents. Funding during the past decade for field management has been stable and increased in line with the Central Price Index (CPI). The current level of funding does not reflect increased costs for staff and operations in that period or the increased level of threat and activity in the Marine Park. On water compliance and enforcement is an essential aspect of day-to-day management; hence a reduced presence on water has serious implications for ensuring that the Marine Park is well managed. Outlook 2014 notes, *Due to funding issues, the joint Field Management Program must prioritise compliance activities, based on a detailed risk analysis, and is not able to comprehensively enforce legislation* [62]. The Queensland government recently announced an increase in their contribution to this program [63] with the Commonwealth agreeing to match this increase. Combined this commitment is an additional $3.3M over 4 years to maintain the existing scope of operations, equipment and staff which is still well short of the identified funding gap.

61 Centre for Social Impact (2014) Australian Charities Report 2014. http://australiancharities.acnc.gov.au/

62 Great Barrier Reef Marine Park Authority (2014b), Section 7.4.1, p. 214

63 http://statements.qld.gov.au/Statement/2016/11/29/environment-minister-welcomes-commonwealth-commitment-to-new-reef-funding

On December 20, 2016, the Australian Minister for the Environment and Energy announced a funding boost of $124M over 10 years for GBRMPA [64]. This additional funding appears to offset the forecast decline in special grants to GBRMPA identified in the Department of the Environment and Energy's 2016/17 Budget Statement (Table 3.4, p.239) [65].

The Investment Framework identifies a large gap of between $48 and $157 million for monitoring and reporting activities. The five-yearly adaptive management cycle of the Reef 2050 Plan is reliant on monitoring the effectiveness of actions to achieve targets that have been adopted. In the absence of an effective monitoring and reporting program there is a real danger of continued investment in poorly targeted and sub-optimal programs.

The implementation of the finalised regional Water Quality Improvement Plans (WQIPs) (see Appendix 7) is another significant gap. Water Quality Action 7 commits to the finalisation and implementation of the WQIPs for Reef catchments and key coastal areas. However, the Addendum provides no information on implementation, and the Investment Framework estimates the funding gaps as 'unknown'.

Conclusions

Implementation of the Reef 2050 Plan is critically dependent on an effective investment framework. The Investment Framework as presented by the Australian Government is inadequate to support the implementation task.

Funding continues to be fragmented amongst various departments, and is variable, inadequate and often poorly coordinated. In terms of water quality, the level of current investment is over-estimated. Funding at the levels proposed in the Investment Framework by both the Queensland and Australian governments will clearly not meet the critical water quality targets of the Reef 2050 Plan.

The Investment Framework commits no significant new funding to meeting the targets, despite the recognised gaps. Therefore it can be assumed that current sub-optimal trends in achievement will continue.

Strategies to address funding gaps through increased government and private sector investment are poorly constructed, non-comprehensive and add little to the achievement of the Reef 2050 Plan.

Documented gaps in future funding for GBR Marine Park field management and monitoring and reporting are concerning because adequate funding is central to the effective management of the World Heritage estate and the adaptive management approach of the Reef 2050 Plan.

Recommendation #17

Develop an effective, adequate and comprehensive Investment Framework, Strategy and Business Plan capable of catalysing the additional funding from public and private sector sources required to meet the Reef 2050 targets. Meanwhile the Australian and Queensland governments should increase their investments to better reflect the recommendations of the 2016 Alluvium and Jacobs reports.

Recommendation #18

Include annual targets for investment, actions and pollution load reductions in the Investment Plan to be developed by June 2017 as part of the new Reef Water Quality Protection Plan.

Recommendation #19

Consolidate investment related to Reef 2050 outcomes across multiple jurisdictions and entities into a single entity to ensure effectiveness and accountability.

Recommendation #20

Implement regulation to cap pollution sources and provide supportive and 'fit for purpose' institutional and market mechanisms to encourage private investment in pollution reduction.

Recommendation #21

Develop a strategic implementation plan for the Reef Fund to ensure significant water quality outcomes.

Recommendation #22

Provide adequate investment in GBR Marine Park field management and monitoring and reporting programs to ensure effective adaptive management.

64 http://www.environment.gov.au/minister/frydenberg/media-releases/mr20161220.html

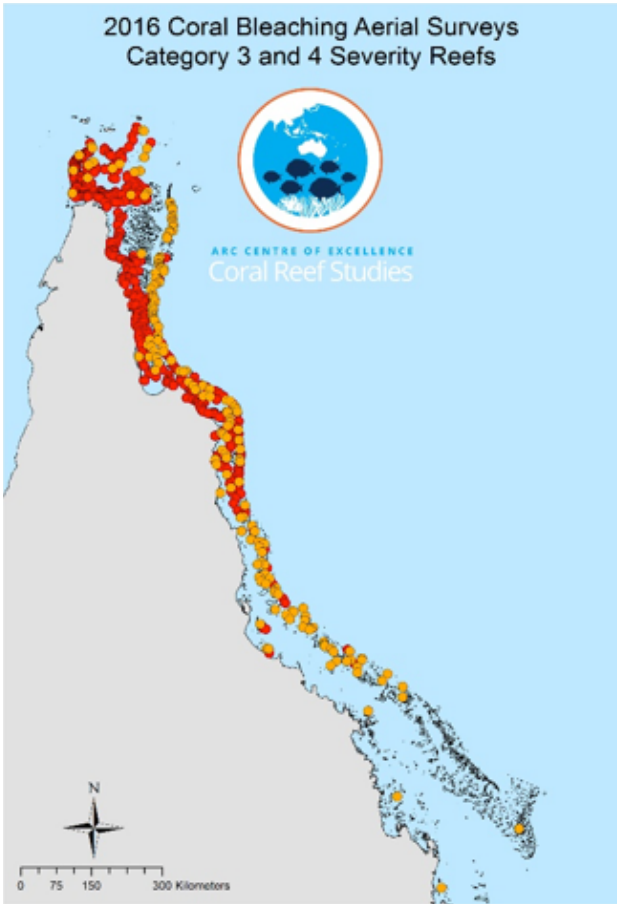
65 http://www.environment.gov.au/about-us/publications/budget/portfolio-budget-statements-2016-17

PART 3 – IMPLICATIONS OF THE 2016 CORAL BLEACHING EVENT FOR THE GBR WORLD HERITAGE AREA

The unprecedented severe bleaching and mortality of corals in 2016 in the Great Barrier Reef is a game changer. Given the severity of the damage and the slow trajectory of recovery, the overarching vision of the 2050 Plan, to *ensure the Great Barrier Reef continues to improve on its OUV every decade between now and 2050*, is no longer attainable for at least the next two decades. Significantly this event has substantially diminished the Outstanding Universal Value of the Great Barrier Reef World Heritage Area. The bleaching also highlights the urgency of bolstering the resilience of the GBRWHA to maximize its capacity to recover before the next bleaching inevitably occurs. The Reef 2050 Plan is a key element of building resilience, but improving water quality can never climate-proof the Reef.

Due to global warming, coral bleaching is increasing in frequency and intensity throughout the tropics. The Great Barrier Reef has now bleached severely three times, in 1998, 2002 and 2016. The footprint of each of the three events differs. This year was the first to severely affect the north, whereas the central GBR has bleached in all three events; and southern nearshore and mid-shelf reefs bleached mainly in 1998 and 2002. The only section of the GBRWHA that has escaped bleaching to date is the offshore southern region (the Swain and Pompey reefs).

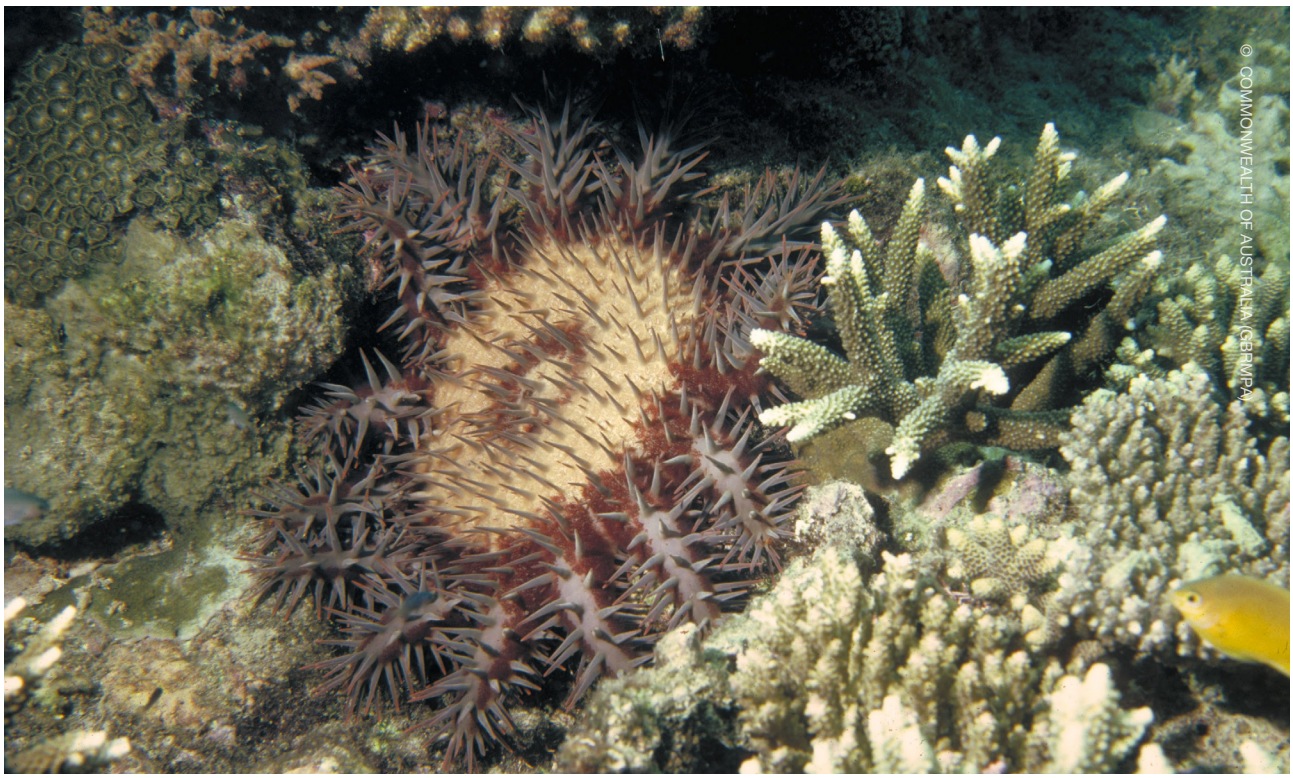
Bleaching in 1998 and 2016 coincided with strong El Nino conditions, but not in 2002. Prior to 1998, recurrent El Nino events did not trigger mass bleaching because sea temperatures were cooler than those experienced today. As sea temperature continues to rise due to global warming, it is a virtual certainty that several more bleaching events will occur over the time-line of the Reef 2050 Plan, including during warm summers outside of El Nino conditions (as occurred already in 2002). According to the Bureau of Meteorology, water temperatures on the GBR in the summer of 2015/2016 were the highest ever recorded. Currently, the Reef 2050 Plan does not adequately acknowledge this new normal.



Map 1. Aerial scores of bleaching in 2016, indicating the extensive footprint. The worst affected area extends from Cairns to Papua New Guinea. Orange reefs had 30-60% bleaching, and red had >60%. The accuracy of aerial scores was confirmed by underwater surveys on >100 individual reefs.

3.1 THE 2016 CORAL BLEACHING EVENT

The 2016 bleaching event was substantially larger in geographic extent and much more severe than in 1998 or 2002. Aerial surveys of 1156 reefs in March and April 2016 show that the 1,500km long northern and central two-thirds of the Great Barrier Reef were extensively bleached (Map 1). In 2016, only 9% of the surveyed reefs were unbleached, compared to 42% in 2002 and 45% in 1998. Conversely, the proportion of reefs that were severely bleached (>60% of colonies affected) in 2016 was 3-4 times higher than the two earlier events. The absence of bleaching on the southern GBR in 2016 was due to ex-cyclone Winston, which cooled down water temperatures in March by 3°C.



Crown-of-thorns starfish, amongst hard Acropora corals

Mortality rates & prospects for recovery

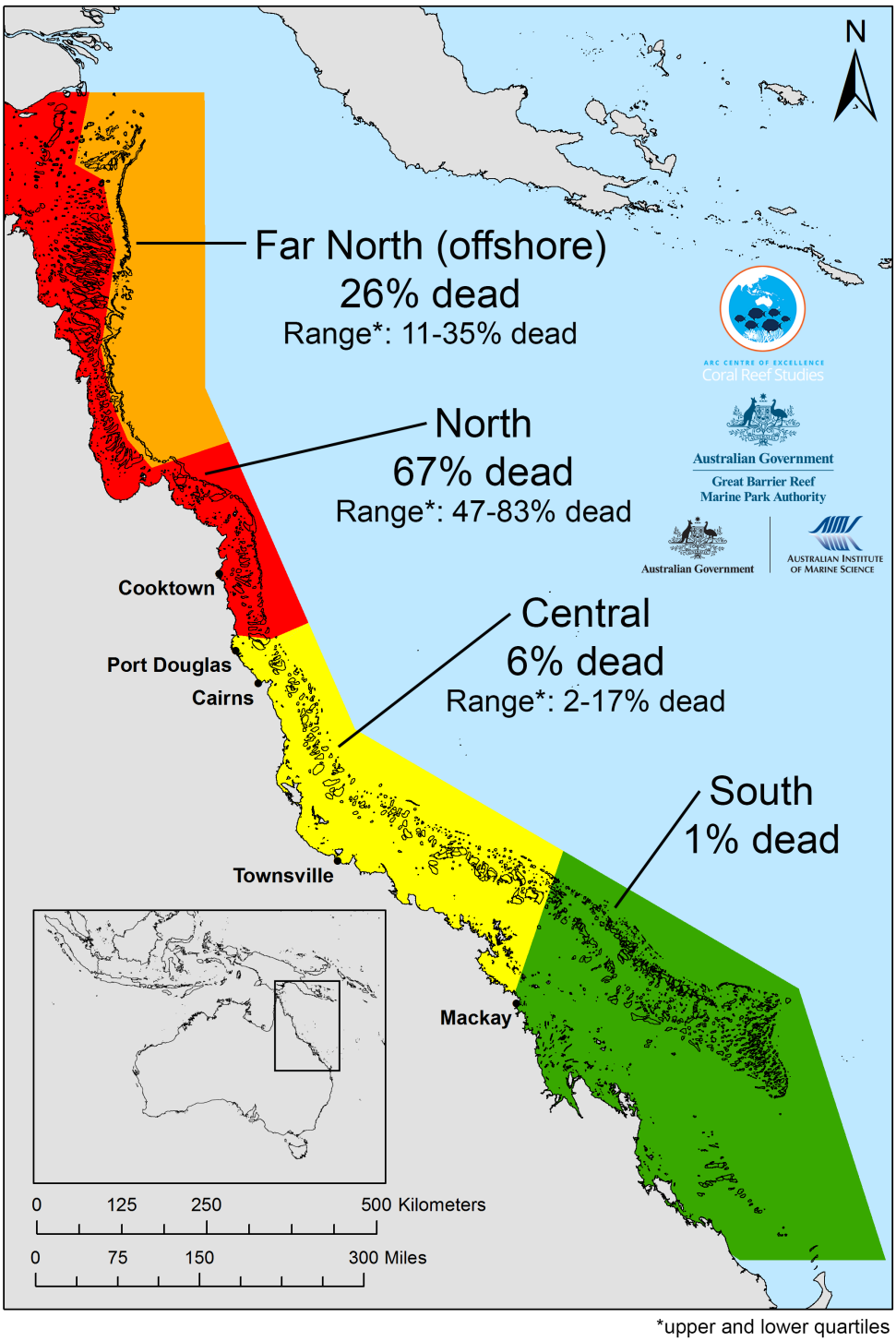
In the northern third of the Great Barrier Reef, the median loss of shallow-water corals on coastal and mid-shelf reefs between February and November was 67% (Map 2). For the top quartile of reefs (the 25% of reefs that were most severely impacted), mortality ranged from 84-99%. When mortality is this high, it affects even long-lived species that are slow to recover – when a 50-year-old coral dies, it takes at least that long for it to be replaced. This die-off is by far the largest loss of corals ever recorded on the GBR, along a 700km stretch of the most remote section of the WHA. In comparison, a severe category 5 cyclone crossing from the Coral Sea to the coast might cause this level of damage across a storm track of 50km in width.

This catastrophic loss of coral cover on the northern GBR in 2016 is greater than the gradual decline of 51% of coral cover documented on the central and southern regions of the Great Barrier Reef due to all causes over the 27-year period between 1985 and 2012[66]. Consequently, the remote near-pristine northern section of the GBR is now in worse condition (in terms of coral cover) than the southern two-thirds of the WHA.

Very high mortality of corals in the northern GBR occurred despite relatively very good water quality, low fishing pressure, and negligible levels of coastal development. Bleaching extended across the continental shelf from turbid, high nutrient coastal reefs to clear-water offshore. Consequently, water quality made a neglible difference to the severity of bleaching. Similarly, the intensity of bleaching was unaffected by reef zoning, e.g. on reefs open versus closed to fishing. In the offshore far north and eastern Torres Strait, lower losses occurred (median 26%; orange zone in Map 2), possibly due to upwelling and tidal flushing.

Longer-term impacts over the next year or two will include higher levels of disease in corals, slower growth rates and lower rates of reproduction. The per capita predation rate on corals has also sharply risen, because there are now far more predators per coral (e.g. the snail *Drupella*, and crown of thorns starfish *Acanthaster*). Loss of corals will have far-ranging impacts on fish and other organisms that depend on them for food and shelter.

66 http://www.pnas.org/content/109/44/17995.full



Map 2. Patterns of coral mortality on the GBR due to bleaching in 2016.

The process of recovery in the north – the replacement of dead corals by new ones – will be slow, at least 10-15 years for the fastest growing species[67]. Maintaining good water quality conditions in the north will be critical for recovery of coral cover on coastal reefs. Older, slow growing corals that have died are unlikely to ever be replaced, because the return time between recurrent bleaching events is now far shorter than their life-span. Consequently, the species composition of corals in the northern GBRWHA is almost certainly permanently changed and irrecoverable.

67 http://theconversation.com/how-will-the-barrier-reef-recover-from-the-death-of-one-third-of-its-northern-corals-60186

3.2 IMPLICATIONS OF 2016 BLEACHING FOR OUV AND INTEGRITY

Corals make a substantive contribution to the WHA's OUV for all four of the natural criteria for World Heritage listing: (1) significant geomorphic features, (2) significant ongoing ecological and biological processes, (3) significant natural habitats for the conservation of biological diversity, and (4) exceptional natural beauty.

Significant Geomorphological Features: The Northern GBR region contains the widest range of reef types within the WHA, including extensive inshore turbid reefs, fringing reefs on high islands, wooded cays, mid-shelf reefs, ribbon reefs, deltaic reefs in the far north, submerged shoals, *Halimeda* bioherms, and mesophotic reefs. These reefs represent major stages in the Earth's evolutionary history and are examples of the northern region's unique outstanding universal value. The 2016 coral bleaching will substantially affect shallow reef-building processes, such as internal and external bioerosion, calcification and reef accretion.

Significant ongoing ecological and biological processes: The two-thirds loss of coral cover in the northern WHA will profoundly change virtually all reef processes, in many cases for at least 1-2 decades. For example, **particle feeding** by corals has declined, **predation** on them has increased (on a per-capita basis), **disease** of corals is increasing, and **recruitment** of corals has been impaired. Other key processes that have been affected are **symbiosis** between corals, zooxanthellae and microbes, **competition** for space, **herbivory**, **calcification**, and the **provision of coral habitat**.

Significant natural habitats for the conservation of biological diversity: Corals form a network of close to 3000 separate reefs throughout the GBRWHA, and 410 species of hard coral create the habitat that supports biodiversity of all reef-associated species throughout the WHA. Reef environments (generated by settlement, growth and accretion by corals) also support reef-dependent industries as well as spiritual, cultural, and social values.

Exceptional natural beauty: Corals provide superlative natural beauty and spectacular underwater scenery. The Reef's natural phenomena include annual coral spawning and significant spawning aggregations of many fish species that depend on corals for habitat, particularly during their juvenile phase. The widespread loss of coral cover in shallow-water habitats in the north has substantially impacted on aesthetic values.

Integrity: The entire Great Barrier Reef (excluding the Torres Strait) was included within the WHA when it was inscribed in 1981, in order to ensure the integrity of the property. Integrity and OUV more broadly has been slowly eroded since inscription by the depletion of megafauna and the 50% loss of coral cover in the central and southern region of the WHA (Table 3). The 2014 Outlook Report notes, *The natural beauty of most of the Region remains, however its underwater aesthetic value has declined in central and southern inshore areas. External pressures are affecting the property's integrity.* (section 4.8.4, p.101) In 2016, the near-pristine northern region experienced a comparable loss of corals, further degrading the integrity of the GBRWHA.

	CONDITION			TREND
Components of Outstanding Universal Value (Number of metrics)	VERY GOOD (%)	GOOD (%)	POOR (%)	% of values deteriorating
Natural beauty and superlative phenomena (13)	38	31	31	46
Earth's evolutionary history (6)	50	50	0	50
Ecological and biological processes (8)	12.5	75	12.5	75
Habitats for conserving biodiversity (11)	9	55	36	73
Integrity (3)	67	0	33	66

Table 3. The condition prior to the 2016 bleaching (very good, good or poor) and ongoing trend of components of the Outstanding Universal Value of the Great Barrier Reef World Heritage Area and its Integrity, benchmarked against their condition when the GBR was inscribed by UNESCO in 1981. Data from Great Barrier Reef Strategic Assessment Report (Great Barrier Reef Marine Park Authority (2014a)).

3.3 BENCHMARKING THE OUTSTANDING UNIVERSAL VALUE OF THE GREAT BARRIER REEF WORLD HERITAGE AREA

The approved Statement of Outstanding Universal Value (OUV) for a World Heritage site is a 'key reference point' for the World Heritage Committee, UNESCO and IUCN, and provides an important baseline when decisions are made by the Committee. OUV applies to the WH property as a whole and is comprised of broad statements and multiple values, and hence it is extremely hard to measure. In contrast, individual values themselves can be measured and monitored, and are at the scale relevant for management.

Many of the values in the GBR have changed considerably in the 35 years since inscription. It is important to have contemporary understanding of how much they have changed, whether any change is just natural fluctuations, or if the values, for which the area was inscribed, are considered to be "In-danger".

Drawing on pioneering work in the 2014 Great Barrier Reef Strategic Assessment, the 2014 Australian government's State Party Report to the WH Committee provided such an up-to-date assessment of individual values. The 2014 assessment highlighted the good to very good condition of the northern region of the GBR covering approximately one-third of the Reef Region. Given the scale of impacts on this northern region from the 2016 mass coral bleaching event, a reassessment of individual values should be done in time for the mid-term review of the Reef 2050 Plan (scheduled for 2018), rather than waiting until the 2019 Outlook Report.

While the assessment methodology used in the Strategic Assessment provides a sound methodology to assess the values, there is a need to more effectively highlight the differences in the state of the values across the entire GBRWHA. The current condition and trend of the World Heritage values and attributes need to be reported at a regional-scale, at least for each of the four broad areas indicated in the 2014 Strategic Assessment, namely: Northern Inshore (N.I.); Northern Offshore (N.O.); Southern Inshore (S.I.); Southern Offshore (S.O.).

Example of a contemporary assessment compared to 2014

The example below is 'coral', one of the most relevant values for the GBRWHA:

- **Corals – Excerpt from 2014 Strategic Assessment**

Corals: Although there is an urgent need for more long-term monitoring of inshore reefs, there is consensus that coral diversity and abundance has substantially decreased on reefs south of Cooktown. Hard coral cover has also declined in southern offshore areas, principally due to cyclone impacts. Coral in the far north of the Region is in better condition, largely due to better water quality and fewer extreme weather events. Little is known about the recently discovered cold water corals in very deep parts of the Region (more than 1000 metres).

In an attempt to provide a more up-to-date assessment than the 2014 example above, the Review Group was provided with a preliminary assessment by ten of Australia's top researchers in coral reef ecosystems of the current condition and trend of some of the key values that make up the Outstanding Universal Value (OUV) of the GBR. These 10 researchers included current or previous researchers from GBRMPA, AIMS and JCU; between them, they have 300 years of collective experience in the GBR.

- **Corals – 2016 Assessment**

There was unanimous consensus amongst all those surveyed that corals today in both the Northern Inshore (N.I.) and Northern Offshore (N.O.) are deteriorating and cannot now be considered as stable as stated in 2014. However, there were differing opinions as to the condition in N. I., with the majority split between poor and very poor condition.

Assessment by the experts for the Southern Inshore (S.I.) and Southern Offshore (S.O.) showed an improvement in condition compared to the 2014 assessment, but the overwhelming trend for the S.I. remained as deteriorating. Two-thirds agreed the condition in the S.I. was Poor and Deteriorating; similarly, two-thirds agreed the trend in the S.O. was today stable, but opinion varied as to the current condition for the S.O.

3.4 IMPLICATIONS OF CORAL BLEACHING FOR THE REEF 2050 LTSP

As stated above, given the severity of the damage caused by the 2016 coral bleaching event and the slow trajectory of recovery, the overarching vision of the 2050 Plan, *to ensure the Great Barrier Reef continues to improve on its OUV every decade between now and 2050*, is no longer attainable for at least the next two decades.

A prima facie case can be made that the 2016 bleaching event will make it very difficult to reach several important 2020 targets and will significantly undermine progress toward a number of 2035 objectives within the Reef 2050 Plan. In particular, the following targets and objectives are likely to be adversely affected by the 2016 coral bleaching:

Ecosystem Health

> **Target 5:** *Condition and resilience indicators for coral reefs, seagrass meadows, islands, estuaries, shoals and inter-reefal shelf habitats are on a trajectory towards at least good condition at local, regional and Reef-wide scales.*
>
> **Objective 2:** *The GBR WHA retains its integrity and system functions by maintaining and restoring the connectivity, resilience and condition of marine and coastal ecosystems.*
>
> **Objective 3:** *Trends in the condition of key ecosystems including coral reefs, seagrass meadows, islands, estuaries, shoals and inter-reefal shelf habitats are improved over each successive decade.*

Biodiversity

> **Target 2:** *Trends in the availability and condition of habitat for species of conservation concern are improving at Reef-wide and regionally relevant scales.*
>
> **Target 5:** *Trends in populations of key indicator species and habitat condition are stable or improving at Reef-wide and regionally relevant scales.*
>
> **Objective 4:** *Indices of biodiversity in good or very good condition at Reef-wide and regional scales.*
>
> **Objective 5:** *Reef habitats and ecosystems are managed to sustain healthy and diverse populations of indicator species across their natural range.*

As noted previously, it is a virtual certainty that several more bleaching events will occur over the time-line of the Reef 2050 Plan but currently the Plan does not adequately acknowledge this 'new normal'. The recent bleaching event, and the prospect of more frequent bleaching in the near future significantly increase the urgency to remove other major pressures on the GBR WHA to allow the ecosystem to rebuild its resilience. This strategy would maximize the chance that some of the Reef's Outstanding Universal Value can withstand the impacts of climate change over coming decades, while international and national efforts to rein in global warming take effect.

The modest increase in coral cover observed in recent years in the southern offshore section of the GBR[68] is an encouraging sign that given the right conditions coral reefs have an inherent capacity to recover from disturbance. However, the current pace of the Reef 2050 Plan is too slow and piecemeal to give the Reef the reprieve it needs from other pressures like water pollution within the necessary timeframe. We cannot climate-proof the Reef, but with enough political will, it would be possible to use the Reef 2050 Plan framework to design and implement a full-scale crisis response.

68 05 April: Condition of Great Barrier Reef corals before the mass bleaching event in 2016. http://www.aims.gov.au/docs/media/latest-news

The mid-term review of the Reef 2050 Plan offers an opportunity to recalibrate the Plan to accelerate and enhance current reform efforts in a way that will make a significant difference to the Reef's chances of survival in the face of climate change. The Reef 2050 Plan was designed to be adaptive, but as noted in Part 1, in practice the adaptive capacity of the Plan relies on the Australian and Queensland governments having both the intent and power to use the opportunities built into the Plan's adaptive cycle to make meaningful changes when the need arises.

In the meantime, government, industry and community partners must adopt a sense of urgency and provide the resources necessary to implement the priority actions already committed to in the Plan (and supplement these with additional actions where necessary) to meet the required targets by 2020 at the latest.

A panoramic image of coral bleaching at Lizard Island on the Great Barrier Reef, captured by The Ocean Agency / XL Catlin Seaview Survey in March 2016.

3.5 AUSTRALIA'S RESPONSE TO CORAL BLEACHING

The immediate monitoring and research response to the 2016 coral bleaching, led by the National Coral Bleaching Taskforce (comprising 10 research and management institutions) was rapid and comprehensive. Monitoring and research efforts are ongoing and are providing a high quality information base to inform management responses. However, it is extremely challenging to identify management responses that will be effective in the face of such a large and severe bleaching event, particularly in the context of ongoing increases in global sea temperature due to climate change. Despite the severe threat to the Great Barrier Reef of increased shipping, dredging and carbon emissions, Australia is still strongly supportive of developing the world's largest new coal mines in the Galilee Basin.

Australia's Update Report mentions a small number of management actions taken in the short term, and explains that in November the GBR Ministerial Forum requested further advice from agencies on any further action required [69]. State and federal agencies have begun developing a formal management response to the bleaching event but so far there is little evidence of substantial changes in day to day management, policy frameworks, or investment priorities. In October, the Reef 2050 Advisory Committee discussed the development of a Northern Great Barrier Reef Response Plan *which outlined current and future actions to reduce pressures on the northern Great Barrier Reef and give it the greatest chance of recovery* [70]. The Reef 2050 Independent Expert Panel provided advice to Ministers on the issue in April, and provided feedback on the draft Northern Reef Response Plan in October [71].

69 Update report p.27

70 Reef 2050 Advisory Committee Communique 11 October 2016 see: https://www.environment.gov.au/marine/gbr/reef2050/advisory-bodies

71 Independent Expert Panel Communiqué 18 October 2016 see: https://www.environment.gov.au/marine/gbr/reef2050/advisory-bodies

As discussed above, acting more urgently to implement the actions needed to meet the Reef 2050 Plan targets must be a major part of Australia's response to the coral bleaching event. In the short-term it would be sensible to review the prioritisation of actions and funding in light of the bleaching event. Any response to bleaching should not apply just to the northern third of the Reef, since bleaching also had significant impacts in the central section. Nonetheless, since the north has the highest levels of mortality, the region warrants additional attention. There are a range of new actions that could be considered to reduce existing pressures, and prevent new ones, in the far north, including:

- Managing the eastern draining catchments of Cape York to ensure that there is no impact from catchment activities on the existing good water quality conditions in the northern third of the Reef.
- Reducing any pressures from commercial and recreational fishing activities including minimising the take of herbivorous fish and collections for the aquarium trade, and creating a net-free zone along the Cape York coastline
- Ensuring that development initiatives under the Northern Australian Development Plan do not create additional pressures or degradation in Reef catchments, for example new agricultural development would not be appropriate if it adds to pollution loads
- Undertaking an assessment of commercial shipping traffic through the GBR inner shipping route to ascertain their environmental impact.

Conclusions

The unprecedented severe bleaching and mortality of corals in 2016 in the Great Barrier Reef is a 'game changer'. Given the severity of the damage and the slow trajectory of recovery, the overarching vision of the 2050 Plan, *to ensure the Great Barrier Reef continues to improve on its OUV every decade between now and 2050*, is no longer attainable for at least the next two decades. As corals make a substantive contribution to the WHA's OUV for all four of the natural criteria for World Heritage listing, we consider that this event has substantially diminished the Outstanding Universal Value of the GBR WHA. It also highlights the urgency of bolstering the resilience of the GBR WHA to maximize its capacity to recover before the next bleaching inevitably occurs. The Reef 2050 Plan is a key element of building resilience, but improving water quality can never climate-proof the Reef.

Recommendation 23

Given the scale of impacts on the northern region of the GBR WHA from the 2016 mass coral bleaching event, a reassessment of individual values should be done in time for the mid-term review of the Reef 2050 Plan (scheduled for 2018), rather than waiting until the 2019 Outlook Report.

Recommendation 24

Use the mid-term review of the Reef 2050 Plan to recalibrate the Plan to accelerate and enhance current reform efforts in a way that will make a significant difference to the Reef's chances of survival in the face of climate change.

Recommendation 25

By March 2017 GBRMPA should confirm an immediate program of work to respond to the 2016 mass coral bleaching event.

PART 4 - ADDRESSING CLIMATE CHANGE TO PROTECT THE GREAT BARRIER REEF

Mass coral bleaching and mortality of coral reef ecosystems is one of the most visible impacts of climate change, and warns us of the dangerous world that we are entering as our climate warms. The loss of most if not all functioning coral reef ecosystems from the world's oceans would be an unthinkable tragedy. Unfortunately, that tragedy is on our doorstep today, but is avoidable given the required international leadership. – Consensus Statement on Climate Change and Coral Bleaching, produced by the International Society for Reef Studies, October 2015 [72].

Climate change, coral reefs and the need for international cooperation

There is strong scientific consensus that human-induced climate change threatens the world's coral reefs, including corals protected in marine World Heritage sites [73]. The Great Barrier Reef is the world's largest coral reef system, and the largest coral-reef World Heritage Area. As discussed above, the 2016 coral bleaching event is the worst ever recorded in the GBR WHA, and occurred as part of a global coral bleaching event which impacted up to 15 coral reef systems on UNESCO's World Heritage List [74]. The international community's response to this event can thus be seen as a litmus test for our collective ability to protect the world's natural heritage in the face of climate change.

In the lead-up to the 2015 United Nations Framework Convention on Climate Change (UNFCCC) Paris climate conference, the International Society for Reef Studies issued a scientific consensus statement which called on all nations to limit global warming to *less than 2°C in the short-term, and less than 1.5°C in the long-term to prevent global collapse of coral reef ecosystems and allow coral reefs to survive in perpetuity* [75]. The targets adopted in the Paris Agreement give hope for the millions of people who depend on these vital marine ecosystems for their livelihoods. However, the sum of national emissions reductions committed so far is not adequate to meet these targets [76].

Climate Change and World Heritage

For more than a decade, the World Heritage Committee has expressed deep concern over the impacts of climate change on both natural and cultural World Heritage properties, and encouraged State Parties to play an active and positive role in international mitigation and adaptation efforts.

In 2007 the World Heritage Committee adopted a *Policy Document on the Impacts of Climate Change on World Heritage Properties* to provide guidance to State Parties on this challenging issue. The policy document points to Article 4 of the World Heritage Convention which gives State Parties primary responsibility for protecting World Heritage sites within their territories.

According to the policy document: *In the context of climate change, this provision will be the basis for States to ensure that they are doing all that they can to address the causes and impacts of climate change, in relation to the potential and identified effects of climate change (and other threats) on World Heritage properties situated on their territories* [77].

Hence, it is reasonable for the Committee to consider whether Australia, as the State party with primary responsibility for the Great Barrier Reef WHA, is doing 'all that it can' to address the causes and impacts of climate change.

Australia's role in global mitigation efforts

The United Nations Framework Convention on Climate Change (UNFCCC) is the primary international mechanism for cooperative global action to reduce greenhouse gas emissions. The 'Paris Agreement' on climate change adopted by the UNFCCC in December 2015 commits countries to a goal of limiting global warming to well below 2°C and to pursue efforts to limit warming to 1.5°C. Under the Paris framework, countries nominate domestic

72 International Society for Reef Studies (2015) Consensus Statement on Climate Change and Coral Bleaching

73 ISRS (2015) op cit

74 UNESCO World Heritage Centre Media Statement, 8 June 2016 http://whc.unesco.org/en/news/1507

75 ISRS (2015) op cit

76 Climate Action Tracker (2016) Effect of current pledges and policies on global temperature http://climateactiontracker.org/global.html

77 UNESCO (2008) Policy Document on the Impacts of Climate Change on World Heritage Properties http://whc.unesco.org/en/CC-policy-document/page7

emission reduction targets (known as 'nationally determined contributions' or NDCs) which are to be updated every five years [78].

Under the Paris Agreement Australia's current commitment is to reduce its domestic greenhouse emissions by:

- five percent below 2000 levels by 2020 [79]
- 26-28 per cent below 2005 levels by 2030 [80].

As a developed and wealthy country with one of the highest per-capita rates of greenhouse gas emissions in the world, Australia has a responsibility to play a significant leadership role in global efforts to reduce emissions and meet the goals of the Paris Agreement, and to transition rapidly away from fossil fuels. The recent coral bleaching event has only served to underscore the importance and urgency of addressing climate change for the long-term protection of the GBR.

However, there is a strong argument that Australia's current targets are below its 'fair share' of the global effort to curb emissions. For example:

- In 2014 a report by Australia's Climate Change Authority calculated that to stay within our fair share of the global carbon budget necessary to limit warming to 2 degrees C, Australia should set a 2030 emissions reduction target of between 45-65% below 2005 levels [81].
- According to Climate Action Tracker (an independent scientific analysis produced by three research organisations) Australia's 2030 target *is not in line with most interpretations of a "fair" approach to reach a 2°C warming limit, let alone with the Paris Agreement's stronger 1.5°C limit: if most other countries were to follow the Australian approach, global warming would exceed 3–4°C* [82].
- Australia is considering a $1Billion subsidised loan for building a new rail line to facilitate development of new coal mines in Queensland that will add substantially to global greenhouse gas emissions, as well as posing a threat to the GBR WHA through shipping, dredging and pollution.

2016 Update on Progress Report

Importantly, the report *Reef 2050 Plan – Update on Progress* released in December 2016 stresses the need to address climate change, with the Chairs of the IEP and RAC both emphasizing its imperative.

The twin challenges for the Australian government lie in, first, embracing strong and meaningful domestic action on climate change to underpin the Reef 2050 Plan, and second, ensuring strong global action to reduce greenhouse gas emissions.

However, the 2016 bleaching event made plain the link between climate change and the integrity of the GBR's OUV status and attempting to deal with the two issues separately risks undermining the progress made on Reef 2050 so far. The Update Report does not shy away from this challenge: *It is critical for reefs worldwide, including the Great Barrier Reef, that international efforts under the Paris Climate Agreement are effective. Australia, along with all countries, is required to do our share to address this significant challenge. Among other things, this means transitioning our energy supply to a lower emissions mix.* [83] However, this sentiment is contradicted by Australia's support for new coal mines.

Conclusion

Effective action to address climate change and protect coral reefs worldwide depends on cooperative efforts by the entire international community. Responding to the threat of climate change on the Great Barrier Reef WHA is in part a shared responsibility for all state parties to the World Heritage Convention, with Australia holding a special role. Australia's current national emission reduction targets are not commensurate with a fair share of the global carbon budget required to meet the Paris Agreement targets and protect the GBR WHA and coral reefs worldwide. New coal mines pose a serious threat to the WHA.

Recommendation 26

That the World Heritage Committee respond to the 2015-2016 global coral bleaching event by urging all state parties to redouble their efforts to address climate change, and note the importance of achieving the targets in the UNFCCC Paris Agreement, for the purpose of the World Heritage Convention.

78 The Climate Institute (2015) The Paris climate agreement and implications for Australia

79 Reef 2050 Plan p.22

80 Department of Environment and Energy, Australia and the Paris Agreement https://www.environment.gov.au/climate-change/international/paris-agreement

81 Climate Change Authority (2014) Targets and Progress Review, Recc 9 p.126 http://www.climatechangeauthority.gov.au/reviews/targets-and-progress-review-3

82 Climate Action Tracker assessment, Nov 2016

83 Commonwealth of Australia (2016c). p.2.

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APPENDICES

A 1. CHRONOLOGY OF RECENT WORLD HERITAGE COMMITTEE DECISIONS ON THE GBR WHA.

	Key WHC requests
2011	WHC 2011 Decision: 35 COM 7B.10 http://whc.unesco.org/en/decisions/4418/ - Urges the State Party to undertake a comprehensive strategic assessment of the entire property, identifying planned and potential future development that could impact the Outstanding Universal Value to enable a long-term plan for sustainable development that will protect the Outstanding Universal Value of the property. - Also requests the State Party to invite a World Heritage Centre / IUCN reactive monitoring mission as soon as possible to consider the state of conservation of the property as a whole, and to contribute to the strategic assessment process
2012	Mission Report. Reactive Monitoring Mission to Great Barrier Reef (Australia) 6th to 14th March 2012 http://whc.unesco.org/en/documents/117104 The report included 14 recommendations for improved management of the GBR WHA stating, *that the State Party should take urgent measures to implement the following recommendations immediately to prevent a further erosion of the OUV and address important threats to the property.* WHC 2012 Decision: 36 COM 7B.8 http://whc.unesco.org/en/decisions/4657 - Requests furthermore the State Party to complete the Strategic Assessment and resulting long-term plan for the sustainable development of the property for consideration by the World Heritage Committee at its 39th session in 2015. - Requests moreover the State Party to undertake an independent review of the management arrangements for Gladstone Harbour
2013	WHC 2013 Decision: 37 COM 7B.10 http://whc.unesco.org/en/decisions/4959/ - Notes with concern the limited progress made by the State Party in implementing key requests made by the Committee (Decision 36 COM 7B.8) and the recommendations of the March 2012 joint World Heritage Centre/IUCN reactive monitoring mission as well as on-going coastal development on the Reef.. - Further requests the State Party to submit to the World Heritage Centre, by 1 February 2014, an updated report on the state of conservation of the property, including on the implementation of actions outlined above as well as on the other points raised in the 2012 mission report, for examination by the World Heritage Committee at its 38th session in 2014, **with a view to considering, in the absence of substantial progress, the inscription of the property on the List of World Heritage in Danger.**
2014	WHC 2014 Decision: 38 COM 7B.63 http://whc.unesco.org/en/decisions/6049/ - Notes with concern the recent approvals for coastal developments in the absence of a completed Strategic Assessment and resulting Long-Term Plan for Sustainable Development, and regrets the State Party's approval for dumping 3 million cubic metres of dredge material inside the property prior to having undertaken a comprehensive assessment of alternative and potentially less impacting development and disposal options … - Further requests the State Party to submit to the World Heritage Centre, by **1 February 2015**, an updated report, … on the state of conservation of the property, including on the implementation of actions outlined above as well as on the other points raised in the 2012 reactive monitoring mission report, and the documents relevant to the Committee's past decisions, for examination by the World Heritage Committee at its 39th session in 2015, **with a view to considering, in the case of confirmation of the ascertained or potential danger to its Outstanding Universal Value, the possible inscription of the property on the List of World Heritage in Danger.**
2015	WHC 2015 Decision: 39 COM 7B.7 http://whc.unesco.org/en/decisions/6216 See page 9.

A 2 GREAT BARRIER REEF INDEPENDENT REVIEW GROUP TERMS OF REFERENCE

Terms of Reference
Great Barrier Reef Independent Review Group

Background

In 2016 two significant events, highly relevant to the long-term future of the Great Barrier Reef (the Reef) are occurring.

Firstly, on 1 December 2016 the Australian and Queensland governments are due to submit a report to the World Heritage Centre and World Conservation Union (IUCN) in response to a request made by the World Heritage Committee at its meeting in Bonn, Germany in June 2015.

Specifically, the World Heritage Committee requested:

> *(8) Also requests the State Party to submit to the World Heritage Centre, by **1 December 2016**, an update on progress with implementation of the 2050 LTSP to confirm that the inception of the plan has been effective, and the Investment Strategy has been established, for examination by the World Heritage Centre and IUCN, and if in their assessment the anticipated progress is not being made, for consideration at the subsequent session of the World Heritage Committee in 2017;*

Key expectations were set out in the following clauses of the World Heritage Committee's 2015 decision:

> *(6) Considers that the effective implementation of the 2050 LTSP, supported by clear oversight and accountability, research, monitoring and adequate and sustained financing, is essential to respond to the current and potential threats to the property's Outstanding Universal Value, and requests the State Party to rigorously implement all of its commitments of the 2050 LTSP, including where necessary through their inclusion in legislation, in order to halt the current documented declines in the property, create the conditions for sustained recovery and to enhance the property's resilience;*
>
> *(7) Takes note of the State Party commitment to establish an investment framework in 2015 and also considers that this is an essential requirement for the effective implementation of the 2050 LTSP, that should be established as a matter of priority;*

Secondly, between March and May 2016 a major coral bleaching event affected extensive areas of the Reef in particular the more remote far northern sections of the Reef. The mass bleaching event was the worst on record for the Reef. The consequences of this event are still emerging but evidence to date shows extensive mortality of coral for the northern third of the Reef.

The Reef Review Group

With support from The Thomas Foundation and WWF Australia, five accomplished academics and practitioners in Reef science, environmental management and public policy have formed the Great Barrier Reef Independent Review Group (Reef Review Group). Members are:

- Professor Barry Hart, Emeritus Professor Monash University; Member, Murray-Darling Basin Authority
- Professor Terry Hughes, ARC Centre of Excellence for Coral Reef Studies
- Professor Karen Hussey, Deputy Director, Global Change Institute, The University of Queensland
- Diane Tarte, Marine Ecosystem Policy Advisors

Ms Tarte is convenor of the Reef Review Group.

Short biographies of the Reef Review Group members are attached.

Purpose of the Reef Review Group

The Reef Review Group will produce an independent report on whether Australia's progress to date is adequate to fulfil the undertakings given by Australia and Queensland, and meet the expectations of the World Heritage Committee. In particular, it will provide expert advice and recommendations on the following:

a) Implementation of the Reef 2050 Plan, including:
   - progress towards targets;
   - the government's report on implementation; and
   - adequacy of the Reef 2050 investment framework.

b) Implications of the 2016 coral bleaching and mortality event for the Reef 2050 Plan's objectives and implementation.

Approach and outputs

The Reef Review Group members will draw on their wide-ranging scientific, public policy and management expertise to review relevant peer reviewed and grey literature as well as publicly available government reports to prepare an independent report. Where necessary, the Reef Review Group will commission additional reviews and research.

The report will be submitted to the UNESCO World Heritage Centre and World Conservation Union (IUCN) by the end of this year, and published online.

Short biographies of Reef Review Group members

Professor Barry Hart is currently director of an environmental consulting company Water Science Pty Ltd. He is an emeritus professor at Monash University and has previously held the positions of Director of the Water Studies Centre at Monash University and Director of Research at the Cooperative Research Centre for Freshwater Ecology.

Professor Hart has established an international reputation in the fields of ecological risk assessment, environmental flow decision-making particularly using Bayesian Network models, water quality and catchment management and biogeochemistry. He has published over 175 peer-reviewed scientific papers (see www.waterscience.com.au).

He is also well known for his sustained efforts in developing knowledge–based decision making processes in natural resource management in Australia and south–east Asia particularly with the Mekong River Commission and Papua New Guinea.

He is a member of the Board of the Murray-Darling Basin Authority and is a Director of the consulting company Alluvium Consulting Australia. Professor Hart has chaired a number of government scientific and strategic advisory committees.

Professor Terry Hughes FAA, ARC Laureate Fellow and Director of the ARC Centre of Excellence for Coral Reef Studies, James Cook University.

Professor Hughes is a Distinguished Professor of Marine Biology at James Cook University in Queensland, Australia. He is currently an Australian Research Council Laureate Fellow and Director of the Australian Research Council (ARC) Centre of Excellence for Coral Reef Studies. His research interests encompass coral reef ecology, macroecology and evolution, as well as social-ecological interactions. His recent work has focused on marine ecology, macroecology, climate change, identifying safe planetary boundaries for human development, and on transformative governance of the sea in Australia, Chile, China, the Galapagos Islands, Gulf of Maine and the Coral Triangle. He is an ISI Highly Cited Researcher, with career citations exceeding 25,000.

He was appointed Professor in 2000 and established the ARC Centre of Excellence for Coral Reef Studies in 2005. Hughes has published in excess of 130 peer reviewed publications, so far. His work receives extensive media coverage and he actively communicates his findings to a broader audience through popular articles, radio and television. Under the direction of Hughes, the ARC Centre has grown to become the world's foremost authority on coral reef science and is a hub for world-leading research and graduate training. The ARC Centre produces greater than 350 publications annually and was recently awarded further funding until 2020. He was an independent reviewer of the 2009 and 2014 Great Barrier Reef Outlook Reports.

Professor Karen Hussey is Deputy Director at the Global Change Institute at The University of Queensland, a position she took up in September 2015.

Trained as a political scientist and economist, Karen undertakes research in the field of public policy and governance, with a particular interest in public policy relating to sustainable development. Her recent research has focused on: water and energy security and the links between the two; the role of the state in climate change mitigation and adaptation; the links between international trade and environmental regulation; and the peculiarities of public policy in federal systems.

Prior to taking up her position at UQ, Karen was Associate Professor in the Fenner School of Environment and Society at the Australian National University, where she now holds an Honorary Professorship. From 2007-2010 Karen was based in Brussels as the ANU Vice Chancellor's Representative in Europe, where she was responsible for developing the ANU's research relationships and profile with European research teams and institutions. Karen holds a PhD (University of Melbourne), M.Econ.Sc (University College Dublin) and a B.A (University of Melbourne).

Diane Tarte is Director of Marine Ecosystem Policy Advisors P/L providing advice on policy and programs addressing research and management of marine, coastal and catchment areas with a particular focus on ecosystem based management of catchments, waterways and fisheries. She has a Science Degree from the University of Queensland and was awarded the Centenary Medal for services to marine and coastal conservation.

Through her roles leading a range of organizations and contributing to many government and NGO planning and management processes she has extensive experience in strategic planning and facilitation and chairing of multi-stakeholder groups. Over the past 35 years she has been involved in the protection and management of the Great Barrier Reef and Australian tidal wetland areas, the development of government planning and management policies and legislation focusing on integrated coastal zone management and Oceans Policy, and the involvement of the community in the management of marine protected areas, coastal wetland reserves and rehabilitation of riparian zones. Between 2002 and 2009 she was the Project Director of the South-East Queensland Healthy Waterways Partnership.

Since the late 1970s Diane has undertaken field inventory work on GBR islands and cays and Queensland coastal tidal wetland systems and been involved in a range of Reef-related committees. Currently she is: Independent chair of the Mackay Whitsunday Healthy Rivers to Reef Partnership; Australian Committee for IUCN representative on the Reef 2050 Advisory Committee and member of the Water Space Working Group for the North-East Shipping Management Plan. She was also a member of the Queensland Great Barrier Reef Water Science Taskforce.

A3. GREAT BARRIER REEF WATER SCIENCE TASKFORCE FINAL REPORT

In May 2016, the Great Barrier Reef Water Science Taskforce released their final report. The Taskforce was established by the Queensland Minister for Environment and Heritage Protection and comprised 22 scientific and industry experts. The Queensland Chief Scientist led the Taskforce and the subsequent report involved significant stakeholder consultation and was peer reviewed by a panel of 24 eminent water quality professionals. The purpose of the report was to identify *where we are now, where we want to get to and how to get there* (p.18).

Report Background

The Great Barrier Reef Water Science Taskforce was established in May 2015 by the Queensland Government with a Terms of Reference to provide the government with advice on:

- the best approach to meeting the government's water quality targets; and
- priority areas for investment for an additional $100 million.

Link to the Reef 2050 Plan

The Reef 2050 Plan adopted the following water quality targets to be achieved by both the Australian and Queensland governments:

- Reduce nitrogen run-off by up to 80% in key catchments such as the Wet Tropics and the Burdekin by 2025.
- Reduce total suspended sediment run-off by up to 50% in key catchments such as the Wet Tropics and the Burdekin by 2025.

These targets were specifically referenced in the World Heritage Committee 2015 Decision (39 COM 7B.7).

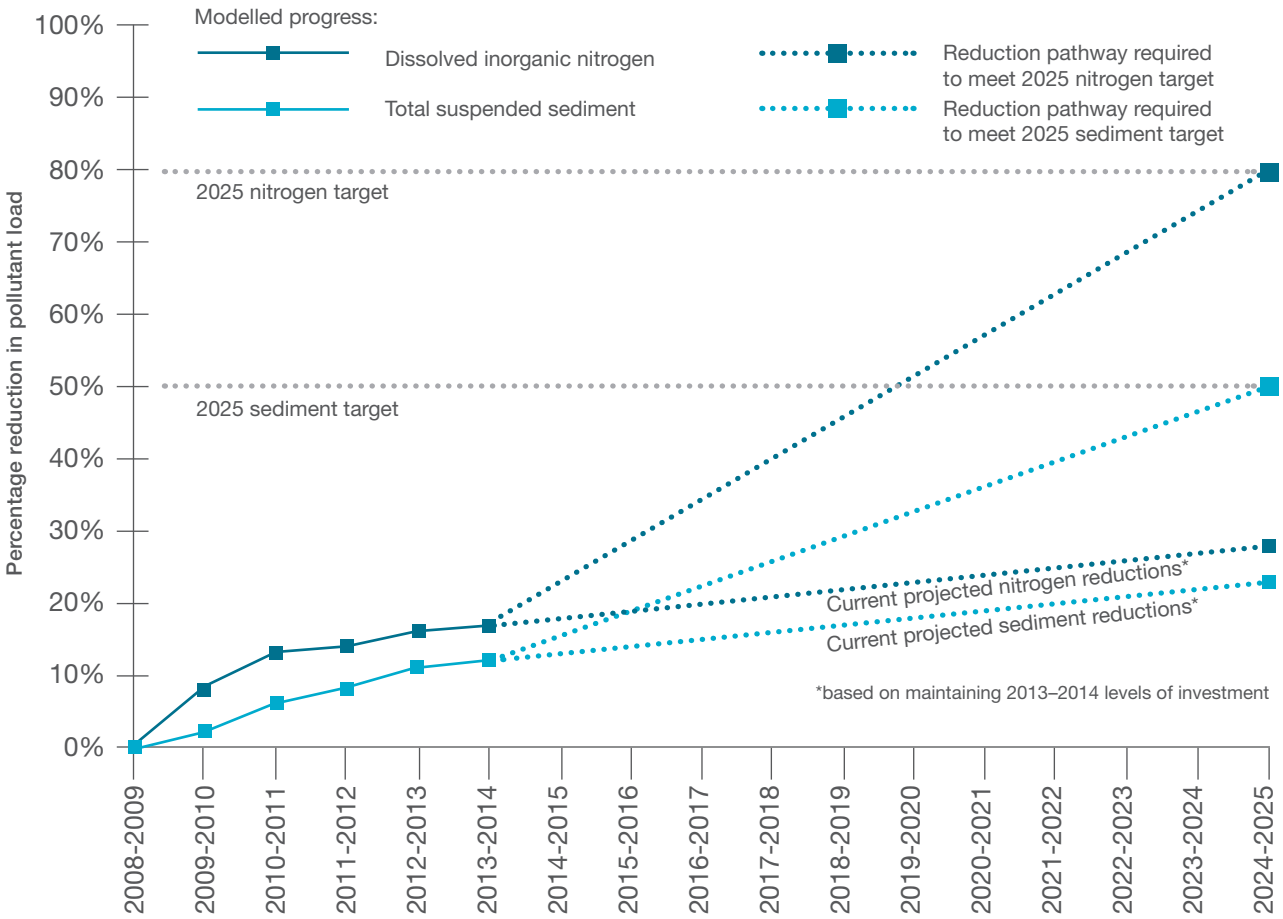
Whilst the Reef 2050 Plan adopted these targets, there was no information on the actions needed to achieve them nor the finance that would be required. Therefore, the situation analysis and findings of the Water Science Taskforce are highly relevant to the assessment of whether the Reef 2050 Plan is being properly implemented and adequately financed.

Key Findings

Key Taskforce findings include:

- *Transformational change in land management is required over the next 5 to 10 years if the targets are to be achieved….*
- *The challenge is to lead and manage a much needed and significant practice and management change program across such a vast scale. A program of this scale is likely to require significantly more investment than currently available. Leadership, clearly defined accountabilities and adequate resourcing are key.* (p.26)
- *Some considerable changes have been made across many sectors… However the resulting changes have not been rapid or widespread enough to improve or even maintain water quality on the Reef.* (p.23)
- *Figure 5 shows progress to date, the poor outcome of continued business-as-usual as per current investment, and an indicative steep trajectory that will be needed to meet water quality targets.* (p.26-27)

Nitrogen and Sediment load reductions required to meet 2025 targets



Recommendations

The Taskforce made 10 key conclusions and associated recommendations that are summarised below.

1. The targets are important and accelerating progress is necessary. Targets need to be refined and regional and basin targets established.
2. Strong leadership and two-way communication are necessary. Collaborative communication approaches, consistent communication and science synthesis programs are required.
3. Agricultural extension activities are vital. Enhanced investment, training, innovation and partnering is required.
4. Incentives and market approaches are required and should complement, and integrate with regulation extension and education. Effective market approaches and innovative incentives need to be developed and implemented.
5. An enhanced regulatory approach is required to meet Reef outcomes. Regulation should set and progressively reduce catchment load limits, establish standards across agricultural industries and protect wetlands and riparian zones.
6. There is a need to improve the alignment of research and innovation. An innovation fund and innovation network should be established.
7. Current investment in monitoring and modelling is inadequate. Finer scale monitoring and modelling of catchments, management practices and large-scale projects is required.
8. Major integrated projects are needed in a number of pollution hotspots. Two major project areas are identified, one with cane growers in the Wet Tropics and one with graziers in the Burdekin catchment.

9. Current funding levels will not be sufficient to meet the targets. Strategic investment plans that pool funding from all levels of government, agree delivery mechanisms and provide future certainty are required.
10. Reef-wide water quality governance arrangements are complex and poorly aligned. There is a need for simplified and effective governance arrangements that improve delivery systems and coordination.

Reference

Great Barrier Reef Water Science Taskforce and Department of Environment and Heritage Protection (2016) Final Report, DEHP, Brisbane.

www.gbr.qld.gov.au/documents/gbrwst-finalreport-2016.pdf

A4. COSTS OF ACHIEVING THE WATER QUALITY TARGETS FOR THE GREAT BARRIER REEF

In July 2016, a significant new report was released assessing the level of funding that would be required to meet the water quality targets for the Great Barrier Reef. The purpose of the report was to estimate the costs of achieving two key regional water quality targets for the Great Barrier Reef catchments as set out in the Reef 2050 Long-Term Sustainability Plan. This was done through an assessment of seven policy solution sets identified by the Queensland Department of Environment and Heritage Protection for evaluation, their abatement contributions in meeting the regional targets, and their associated costs. The targets selected were the Reef Water Quality Protection Plan 2025 targets for anthropogenic end-of-catchment fine sediment loads and dissolved inorganic nitrogen. These were:

- A 20 per cent reduction in anthropogenic end-of-catchment fine sediment loads for Mackay-Whitsunday and Burnett-Mary with a 50 per cent reduction in the Fitzroy, Burdekin and Wet Tropics catchments by 2025.
- A 50 per cent reduction in anthropogenic end-of-catchment dissolved inorganic nitrogen for Mackay-Whitsunday and Burnett-Mary catchments and an 80 per cent reduction in the Burdekin and Wet Tropics catchments by 2025.

The seven policy solution sets selected for investigation were land management practice change, improved irrigation practices, gully remediation, stream-bank repair, wetland construction, changes to land use and improvements in urban stormwater management.

Report Background

The Report was commissioned by the Queensland Government's Department of Environment and Heritage Protection. The report was completed by a consortium of consultants led by Alluvium and including Marsden Jacobs, C20, Mainstream, Natural Decisions and Central Queensland University. The Great Barrier Reef Water Science Taskforce (see Appendix 2) identified the need in their final report for a costings analysis to determine the total costs of a broad range of policy solutions to achieve the water quality targets.

Relevance to Reef 2050 Plan

The Report is a critical input into the Reef 2050 Plan and its associated investment strategy as it identifies the funding required to meet the key water quality target of an 80% reduction in nitrogen and a 50% reduction in sediment by 2025 using the current set of policy solutions.

Key Findings

- The total cost of meeting the targets is estimated at $8.2 billion. The report estimated costs out to 2025 to meet the fine sediment and nitrogen targets.
- The total cost of achieving fine sediment abatement targets is estimated to be $7.8 billion in the most likely case, and $5.3 billion under best-case assumptions and $18.4 billion under worst-case assumptions.
- There is significant difference in the abatement costs of land management and practice change compared to stream-bank and gully repair. Around 85% of total regional fine sediment targets (1.8 million tonnes) are modelled to be achieved through land management and repair activities at a total cost of around $1.8 billion (average cost per tonne of $1,000). The remaining 0.4 million tonnes of abatement comes mainly from a combination of stream-bank and gully repair at an estimated total cost of $6 billion (average cost per tonne of $16,000).

- The total cost of achieving the DIN abatement targets by 2025 is estimated to be $390 million. Around 70% of total regional DIN targets (1,500 tonnes) are delivered mainly through land management (shifting from D to C and C to B in cane production areas) and land repair activities at a cost of around $105 million.
- The following table shows the costs of achieving the targets for each catchment:

Region	100% Fine Sediment	100% DIN Target	100% Total Cost
Wet Tropics	$242,000,000*	$56,100,000*	$298,100,000
Burdekin Dry Tropics	$1,090,000,000	$304,000,000	$1,394,000,000
Mackay Whitsunday	$8,290,000	$28,800,000	$37,090,000
Fitzroy	$6,460,000,000	$0	$6,460,000,000
Burnett Mary	$11,600,000	$1,730,000	$13,330,000
Total	$7,811,890,000	$390,630,000	$8,200,000,000

* target cannot be met with range of actions modeled.

- The scale of investment required is considered reasonable given the scale of the challenge. Catchments flowing into the GBR lagoon are large and degraded. The Burdekin catchment alone is almost double the size of Tasmania and extensive ecological repair work is required.
- The report indicates the policy solution sets assessed in this analysis could meet the two water quality targets in most of the catchments.
- In the Wet Tropics (fine sediment and DIN) the relevant policy solution sets and the actions contained within them cannot be applied widely enough, or cannot address the scale of load reductions required to meet the targets. Meeting targets in this region requires an expansion of the scope of policy solution sets and actions.
- The funding required to meet the targets is far greater than that which is currently being provided.
- Failure to increase current levels of investment could result in future costs that are higher than the most likely estimate.
- Marginal costs of poorly managed future development are very high.
- There is significant uncertainty in the costs estimates due to the availability, variability and quality of data used to generate the estimates.
- The range of policy options considered and costed were limited and did not consider the costs of other options to improve water quality such as an end to vegetation clearing or land use change.

References

Alluvium (2016) Costs of achieving the water quality targets for the Great Barrier Reef by Alluvium Consulting Australia for Department of Environment and Heritage Protection, Brisbane. www.qld.gov.au/documents/costings-report.pdf

Commonwealth of Australia (2015) Reef 2050 Long-Term Sustainability Plan

https://www.environment.gov.au/system/files/resources/d98b3e53-146b-4b9c-a84a-2a22454b9a83/files/reef-2050-long-term-sustainability-plan.pdf

Great Barrier Reef Water Science Taskforce and the Office of the Great Barrier Reef (2016) Final Report, Queensland Department of Environment and Heritage.

www.gbr.qld.gov.au/documents/gbrwst-finalreport-2016.pdf

A5. INVESTING IN THE GBR – REPORT ON BENEFITS OF GBR PROTECTION

In October 2016, a new report was released 'Investing in the Great Barrier Reef as Economic Infrastructure' which provides a comparative way of looking at the challenge of funding Reef catchment repair. The report assesses the level of funding that the Great Barrier Reef would receive for maintenance if it were treated the same as an economically regulated community infrastructure asset such as a water supply scheme or energy network. The purpose of the report was not to determine what level of funding is required to maintain the condition of the Great Barrier Reef but rather to highlight the differential investment approaches for natural and built assets. Built assets such as dams, irrigation schemes, roads, railways, ports, and wastewater infrastructure have well-documented replacement, depreciation, maintenance and operating cost budgets. Natural assets traditionally do not receive the capital and maintenance funding commensurate with their requirements despite the value they generate for users and the broader economy. The purpose of the report is to provide a new perspective on the level of prudent and efficient annual investment that would be appropriate to maintain the Great Barrier Reef as an economically productive asset in good working order.

Report Background

The Report was commissioned by the Queensland Farmers Federation, Queensland Tourism Industry Council and the World Wide Fund for Nature Australia. The report was competed by Jacobs Engineering Group, which is a Fortune 500 company and one of the world's largest professional services firms with more than 60,000 employees.

Relevance to Reef 2050 Plan

The Report is relevant to the Reef 2050 Plan and its associated investment strategy as it provides a basis for assessing the maintenance funding levels that the Great Barrier Reef asset should receive as an economically productive asset.

Key Findings

- The Great Barrier Reef is the critical tourism asset in North Queensland generating more than $7.1 billion in annual expenditure. 42% of international visitors rank the Great Barrier Reef as the most appealing tourist attraction in Australia.
- Declining Reef health will significantly impact on tourism expenditure.
- Based only on the value of the Reef as a tourism asset, a conservative current asset value of $20.7 billion is used as the basis of the analysis.
- The $20.7 billion value is highly conservative and based on a comparative WACC (Weighted Average Cost of Capital) of 7.5%.
- Using a WACC of 5% that is in line with other regulated asset approaches in Australia currently increases the asset value to $38 billion. However to ensure that the maintenance requirements are robust and conservative the lower value is adopted.
- Five electricity and water assets were sampled to compare operating and maintenance budgets with asset values.
- An average of 4% of the asset value was found to be spent on operating and maintaining the services of the built assets sampled.
- Translating this to the Great Barrier Reef translates to an operational and maintenance budget of $547 million annually.
- A depreciation allowance is allowed for built assets; from the built asset sample an average asset life of 73 years was calculated.
- An annual depreciation allowance of $285 million was calculated for the Great Barrier Reef and considered necessary to be set aside for the long sustainment of a built asset of the same economic value.
- Taking the operational and depreciation allowance together Jacobs estimate that if the Great Barrier Reef were treated the same as a regulated built asset an annual expenditure of $830 million would be appropriate to continue to operate the asset.
- Based on analysis of tourism trends over the past an annual growth rate of 4% was identified, which will increase the value of the asset and the associated operational and maintenance expenditure.

- By 2019-2020 tourism expenditure will be more than $11 billion.
- The following table presents the range of asset values and operational budgets encompassing changes in tourism growth, capital costs, asset life and maintenance allowance.

	Asset Value ($m)	Low operation & maintenance (3%) High Asset Life (73 years)	Medium operation & maintenance (4%) Medium asset life (55 years)	High operation & maintenance (5%) Low asset life (36 years)
No tourism growth rate (0%) Medium WACC (7.5%)	$20,717	$830m	$1,205m	$1,611m
Medium tourist growth rate (1.5%) Low WACC (5%)	$64,906	$2,602m	$3,776m	$5,048m

- Current funding by both the Queensland and Australian Governments is $205 million annually and would need to increase by $625 million annually to meet the minimum comparable regulated asset operation and maintenance baseline value.
- Taxation revenues from tourism operators in the Great Barrier Reef is estimated to be $836 million annually and is made up of income tax, company tax, net taxes on products and the environmental management charges.
- Investment at the minimum maintenance and operational requirements for protection of the Reef asset will return between 5.6 and 8.5 times the investment to the Australian economy.

Reference

Jacobs (2016) *Investing in the Great Barrier Reef as Economic Infrastructure.* Report to the Queensland Farmers Federation, Queensland Tourism Industry Council and World Wide Fund for Nature Australia, Jacobs, Brisbane.

A6. REEF WATER QUALITY REPORT CARD 2015

In 2003 the Australian and Queensland Governments adopted the Reef Water Quality Protection Plan (RWQPP). The RWQPP presents a collaborative program of projects and partnerships aimed at reducing diffuse pollution from broad scale agricultural landuse. The RWQPP is aimed at delivering outcomes over relatively short timeframes, with the latest 2013 iteration having a 5-year planning horizon out to 2018.

The RWQPP includes the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program (P2R) that produces periodic Report Cards to measure progress towards the Plan's goals and targets. The 2015 Report Card is the most recent available and covers the period July 2014 to June 2015.

The Report Cards detail progress towards targets for management practice change in the sugarcane, grazing, horticulture and grains industries and uses modelling to then estimate the overall load reductions achieved in sediment, nitrogen and pesticides. The Report Card details the outcomes of remote sensing to determine late season ground cover and reports on the outcomes of monitoring in the inshore marine environment.

Link to the Reef 2050 Plan

The RWQPP is one of the foundational programs that underpins the Reef 2050 Plan. The RWQPP targets were adopted as targets under the water quality section of Reef 2050 Plan WQT1. The 2015 Annual Report Card is therefore an update on progress toward that target.

Key Findings

Management Practice

- The target for changes in land management practice is that 90% of the area is managed using best management systems by 2018.
- For sugarcane, the 2015 report card shows that poor progress toward the target has been made in the Great Barrier Reef overall, with only 23% of the area under cane considered to be meeting best practice. Achievement in the Burdekin Catchment was considered very poor with 22% of land considered under best practice. All other catchments were considered poor.
- For grazing, poor progress was reported across the Great Barrier Reef with 36% of the area considered to be meeting the best management practice criteria. All catchments scored poor for progress toward the target.
- Confidence levels for the data provided were considered poor.
- Progress toward the target for the horticulture and grains industry, which have proportionally a far smaller footprint than sugarcane and grazing, was moderate with 47% and 56% of land area respectively considered to be under best practice management.

Catchment Loads – Nitrogen

- The catchment load reduction target for nitrogen is a 50% reduction by 2018.
- Very poor progress across the Reef overall is reported with a modeled 18.1% reduction based on the level of adoption of best management practice achieved.
- Progress has been very poor in the Wet Tropics (14.7%), poor in the Burdekin (20%), moderate in the Mackay Whitsunday (25.1%) and good in the Burnett Mary (31.5%).
- Confidence in the data is low.

Catchment Loads – Sediment

- The catchment load reduction target for sediment is a 20% reduction by 2018.
- Moderate progress toward the target is reported for the Reef overall with a modeled 12.3% based on the adoption of best practice achieved.
- Very poor progress is reported in Cape York (8%), Fitzroy (5.5%), and Burnett Mary (3%). Poor progress is reported in the Mackay Whitsunday (9.1%), good progress in the Wet Tropics (13.6%) and very good progress in the Burdekin (17.2%).
- Confidence in the data is moderate.

Catchment Loads – Pesticides

- The catchment load reduction target for pesticide is a 60% reduction by 2018.
- Moderate progress toward the target is reported for the Reef overall with a modeled 33.7% based on the adoption of best practice achieved.
- Very poor progress is reported in the Fitzroy (4.3%) and Burdekin (23.6%), moderate progress in the Burnett Mary (33.1%) and Wet Tropics (31.9%). Very good progress is reported in Mackay Whitsunday (44%).
- Confidence in the data is low.

Catchment Indicators

- The only catchment indicator reported in the 2015 Report Card is groundcover.
- The 2018 target for groundcover is 70%.
- All catchments apart from the Burdekin (69%) have achieved a very good (greater than 70%) result.

Inshore Marine Condition

- The 2015 Report Card shows that the overall condition of the inshore marine environment is poor (D). The score for seagrass has remained the same (high data confidence), while the score for water quality (very low data confidence) and coral (high data confidence) have improved.
- In the Wet Tropics (overall D) scores for all three elements (seagrass, water quality and coral) remained the same.
- In the Burdekin (overall C) seagrass and coral scores remained the same while an improvement in water quality was reported.
- In the Mackay Whitsunday (overall C) seagrass and coral scores remained the same while an improvement in water quality was reported.
- In the Fitzroy (overall D) the seagrass score declined, water quality remained the same, while an improvement in coral was reported.
- The report card also notes that the 2014-15 year was relatively free of severe weather events such as cyclones and floods that have a significant impact on the condition of the inshore marine environment.

Reference

Department of Environment and Heritage Protection (2016) Great Barrier Reef Report Card 2015 Reef Water Quality Protection Plan, DEHP, Brisbane.

Available for download at: http://www.reefplan.qld.gov.au/measuring-success/report-cards/2015/

A7. THE ROLE OF NATURAL RESOURCE MANAGEMENT REGIONAL GROUPS

The six Reef Natural Resource Management (NRM) regions, covering all catchments draining to the GBR, have played a vital role in reducing diffuse pollution from farming and grazing. They have done this by driving change in agricultural practice, initiating ecosystem repair and improving the connectivity between marine and freshwater systems.

The Reef regions are part of a wider network of 56 regions Australia-wide, whose remit covers agriculture practice, urban landscapes, biodiversity conservation and system repair, at a landscape scale. Established in 2004 under the Australian Government's Natural Heritage Trust, the Reef regions are now funded primarily by the National Landcare Program (NLP) and state programs, with some additional philanthropic and corporate contribution. They are community owned, not-for-profit NGOs.

Since their establishment, the Reef Regions have developed constructive partnerships with farming, grazing, conservation, local government, regional business and traditional owners. These partnerships have delivered participation, ownership and commitment to initiatives critical to the land use change required for Reef recovery. Prior to the existence of the NRM regional groups land use sectors were largely in denial of any cumulative impact on the Reef. Today a consortium of the six Reef regions, farming, grazing and conservation groups share a collective governance arrangement and vision to reverse the decline.

The transformational land-use change required in the Reef catchments to meet the Reef targets is a huge task. The area involved is vast (426,000 km2 - 20% larger than Germany) with 16,000 cropping and grazing enterprises.

In 2007 the Reef regions, in collaboration with the rural and conservation sectors, estimated an Australian Government investment of $300 million in cropping and grazing practice change would reduce nitrogen, pesticide and sediment pollution to the GBR lagoon by 25%, 25% and 10% respectively. Half that amount was invested in practice change and a little over half the target was achieved, demonstrating the efficacy of the Water Quality Improvement Plans (WQIPs) on which those estimates were based.

Further development of 2nd generation WQIP's since 2014 has improved the correlations between land use, ecosystem function and water quality. Collectively the WQIPs have estimated that even if 90% of farmers achieve (current) best practice, it will still only realise 25%-35% of the Reef 2050 Plan 2018 targets, indicating the need for transformational change in land use practice and system repair.

Water Quality Improvement Plans

In 2004 the Australian government supported NRM regions to undertake a rigorous science-based process of developing regional water quality improvement plans (WQIP). The first generation regional WQIP's were completed in 2007 and identified 7-year targets for ambient and event water quality and waterway ecosystem function at the sub-catchment scale. In setting targets for enhanced water quality and ecosystem function the WQIP outlines desired rural land use practice improvement and landscape condition improvements and their contribution toward reductions in nutrient, pesticide and sediment pollutant loads at end of catchment. Key information obtained via the WQIP development process includes;

- Baseline water quality and ecological values and condition for terrestrial, riverine and waterways systems for sub-catchments in the GBR catchment.
- Baseline assessment of rural landscape condition and land use practices and costs of implementing various rural practice changes aligned to nutrient, pesticide and sediment management.
- The validation of rural land use practices and resulting water quality at end of farm for nutrient, sediment and pesticide load and concentrations.
- Likely end of catchment water quality (modelled) outcomes from changes in rural practices.
- Rural land mangers' appetite to improve farm practices over a 7-year time frame and, aligned to this, the social and economic barriers to practice improvement in rural landscapes.
- The cost of implementing key land use practice changes on farm for sugar and grazing systems consistent with improvement in off-farm water quality.

A8. COMMENTARY ON STATUS OF REEF 2050 PLAN ACTIONS

The following table lists the 38 actions where the Review Group considers the status given in the Addendum to the 2016 Annual Report and Implementation Strategy – and subsequent 2016 Update Report – is incorrect or imprecise. As explained in the commentary below, we consider the actions are either just starting, are being poorly implemented and/or are seriously under-resourced, or funding is not available after June 2016.

Key: Following is the key to the status of actions

Completed	Implementation of this action is fully completed.
In Place	Initial implementation has been completed, but part of the action is to be implemented on an ongoing basis.
On track/underway	Implementation of this action is meeting expected milestones and progress is being made.
Delayed or limited progress	Major implementation milestones have been delayed by less than 6 months, or only superficial progress has been made in implementing the action.
Significant delays or no progress	Major implementation milestones have been delayed for longer than six months or no progress has been made in implementing the action.
Not yet due	Implementation of this action is not yet due to commence.

Reef 2050 Plan Action	Status – as reported in Reef 2050 Annual Report Addendum	Priority	Review Group Commentary
EHA6 Further develop regionally relevant standards for ecosystem health (desired state, critical thresholds and health indicators) that inform and support the Integrated Monitoring and Reporting program.	Not yet due	Immediate (December 2016)	Priority is immediate and yet work has not begun. This is a critical step in guiding regional management. Investment Framework estimates funding gap at $20-$100 million. See section 1.9 of report.
EHA9 Maintain and work to add to the island and coastal protected area estate and continue to provide funding for protected area management in the Great Barrier Reef coastal zone.	On track/ Underway	Future (June 2020)	According to data from the Collaborative Australian Protected Area Database (CAPAD) protection of the GBR coastal zone grew a modest amount from 2010-2015 but has been stagnant since. The Investment Framework identifies an overall funding gap in the Field Management Program of between $41 and $92 million over the next 5 years. The funding gap for EHA9 in particular is reported as 'unknown'. See Part 2 of report.
EHA10 Improve connectivity and resilience through protection, restoration and management of Reef priority coastal ecosystems including islands through innovative and cost-effective measures.	On track/ Underway	Future (June 2020)	The various State planning policies cited are not explicitly recognizing maintenance of OUV.

Reef 2050 Plan Action	Status – as reported in Reef 2050 Annual Report Addendum	Priority	Review Group Commentary
EHA13 Identify and prioritise key sites of high ecological value and implement recovery programs (Reef Recovery Plans).	On track/ Underway	Medium (June 2018)	This is an optimistic assessment. Mackay Whitsunday Reef Recovery Plan is very limited and as noted there are no resources. Consultation was limited given resource constraints.
EHA14 Implement ecosystem health initiatives through the Reef Trust Investment Strategy.	On track/ Underway	Already prioritized	*Partnerships for the Reef* released, but no information on projects that have attracted private sector funding. Although the action is worded vaguely, this is an optimistic assessment.
EHA15 Improve mapping, modelling and monitoring of Reef ecosystems important to inform planning, assessment and decision-making.	Not yet due	Immediate (December 2016)	Although priority is Immediate (Dec 2016) no progress because of links with RIMREP. See section 1.9 of report.
EHA17 Finalise classification of marine ecosystems within the Great Barrier Reef.	In Place	Medium (June 2018)	This work was completed in 2003, so while the status is correct it seems unusual to claim credit for it as part of Reef 2050 Plan implementation.
EHA18 Avoid, mitigate or offset impacts on marine and coastal ecosystems to achieve a net benefit for Reef resilience and ecosystem health.	On track/ Underway	Already prioritized	The draft policies being developed under this action and EHA19 have limited detail on how they will be implemented and contribute to targets and objectives. The drafts are yet to be released for public comment.
EHA19 Develop guidelines for assessing cumulative impacts (including climate change pressures) on Matters of National Environmental Significance including ecosystem and heritage values in the Great Barrier Reef World Heritage Area.	On track/ Underway	Already prioritized	As for EHA18
EHA20 Strengthen the Queensland Government's vegetation management legislation to protect remnant and high value regrowth native vegetation, including in riparian zones	On track/ Underway	Already prioritized	In the Update Report, Dec 2016, this action is now classified as delayed. Alternative legal mechanisms are available to substitute for this action, in the interim. See section 1.5 of report.
EHA23 Implement coastal planning laws based on the best available science, which take into account expected sea level rise, protect ecologically significant areas such as wetlands, prohibit new development in high-hazard greenfield areas and protect the Great Barrier Reef World Heritage Area.	On track/ Underway	Already prioritized	Some progress though concerns around adequacy of measures to ensure OUV impacts are adequately considered. The coastal protection measures being delivered under EHA23 are not sufficient in scale and time to reduce the impacts of ongoing coastal development or to accommodate the impacts of climate change. See part 1.6 of report.
EHA24 Work with local councils to build their capacity to effectively implement coastal planning laws and policies to protect the Reef.	On track/ Underway	Immediate (December 2016)	While EHA24 is noted as "on track/ underway", many local governments lack the capacity and knowledge to deliver coastal planning and management that will avoid impacting the Reef's OUV. See section 1.6 of report.

Reef 2050 Plan Action	Status – as reported in Reef 2050 Annual Report Addendum	Priority	Review Group Commentary
EHA25 Ensure Great Barrier Reef ports planning incorporates evidence-based measures to support protection, restoration and management of coastal ecosystems that contribute to Reef health and resilience.	In Place	Already prioritized	Although Port Master Planning Guidelines are 'in place' work to develop master plans for each port is ongoing. Only one has been commenced, and none are yet complete. While progress with master planning of ports is welcome, its efficacy in supporting protection, restoration and management of coastal ecosystems that contribute to Reef health and resilience has yet to be proven. See section 1.6 of report.
EHA27 Implement on-ground activities to reduce the volume of debris generated in or entering the World Heritage Area, and undertake education and awareness raising activities to minimise the source and occurrence of marine debris.	In Place	Already prioritized	Some activities are 'in place' but work under this action must be ongoing. Query status given that funding program apparently expires in June 2016. Intent of action is to reduce generation of debris as well as clean-up. What's being done with shipping, charter boats and recreational fishing sources? Funding gap not specified in Investment Framework.
EHA29 Establish condition and resilience indicators for coral reefs, seagrass, islands, estuaries, shoals and interreefal shelf habitats.	On track/ Underway	Already prioritized	Slow RIMREP development means unnecessary delay with this critically important work. See section 1.9 of report.
EHA30 Incorporate condition and resilience indicators for ecosystem health in the Integrated Monitoring and Reporting program.	On track/ Underway	Already prioritized	See EHA29. See section 1.9 of report.
EHA32 Enhance compliance with zoning Plans, fish habitat area and other regulations through improved enforcement, and adoption of new technologies such as vessel tracking systems on vessels in the Great Barrier Reef Marine Park and the Great Barrier Reef Coast Marine Park.	On track/ Underway	Medium (June 2018)	Non-compliance with marine park zoning is an ongoing major issue with a Queensland stock assessment assuming up to 20% of fishing effort occurs within (green) no-fishing zones. Trials of vessel tracking have not been expanded to cover all high-risk vessels. Investment Framework estimates funding gap for this action at $10-20 million. The overall funding gap for GBR Marine Park field management is estimated at $41-92 million. See section 1.7 (Fisheries) and Part 2 (Field Management program funding) of report.
BA5 Further develop and implement dugong and turtle protection plans using the Reef Trust and associated initiatives.	On track/ Underway	Already prioritized	Largely accurate although the package of measures in the Plan are unlikely to meet the relevant Plan targets for turtle and dugong conservation on the GBR. Impacts of poor water quality, degradation and loss of seagrass meadows, entanglement in fishing gear, loss of nesting habitat, climate change, and boat strike are all greater threats to turtles and dugongs than what is reported under this action. Funding gap not specified in Investment Framework.

Reef 2050 Plan Action	Status – as reported in Reef 2050 Annual Report Addendum	Priority	Review Group Commentary
BA12 Identify, protect and manage key habitat for inshore dolphins.	Not yet due	Future (June 2020)	Timing of this action is of concern given pressures on these species. Investment Framework estimates funding gap at $1-5 million.
BA14 Implement further actions to reduce human-related causes of dugong mortality such as vessel strike and net entanglement.	On track/ Underway	Immediate (December 2016)	Inconsistent with progress note, in particular funding for necropsy, etc Funding gap not specified in Investment Framework.
BA15 Reduce cumulative impacts on coastal dolphin populations and their supporting habitats especially Australian humpback and snubfin dolphins.	On track/ Underway	Immediate (December 2016)	Optimistic assessment. Development of a policy is far removed from actual management measures. Funding gap not specified in Investment Framework.
BA16 Implement conservation plans for priority species of conservation concern.	In Place		Simplistic status statement. Does not give actual examples or a concrete sense of what is actually happening on the ground, or which species are covered by conservation plans. Funding gap not specified in Investment Framework.
BA24 Ensure that through the Field Management program resources are available for island habitat restoration projects and pest eradication particularly at critical seabird and turtle nesting sites.	On track/ Underway	Medium (June 2018)	Long standing concerns re adequacy of funding. Note recent commitment for relatively small increase in funding. Investment strategy estimates funding gap between $10-$20 million over five years. See Part 2 of report (funding for field management).
WQA2 Continue improvement in water quality from broadscale land use through implementation of Reef Water Quality Protection Plan 2013 actions.	On track/ Underway	Already prioritized	The GBR Water Science Taskforce Report and the 2015 Report Card clearly show progress with water quality load targets is not 'on-track' and it is highly likely that most 2018 targets will not be met. Consequently, if the 2018 targets are not met, it will be extremely challenging to meet the 2025 targets, particularly for DIN, which is the highest target to achieve (up to 80%), but has the worst performance to date. It is difficult to understand how this action has been assessed as 'on-track'. See section 1.3 of report. Investment Framework estimates funding gap between $10-$20 million over five years – a significant underestimate. See Part 2 of report.

Reef 2050 Plan Action	Status – as reported in Reef 2050 Annual Report Addendum	Priority	Review Group Commentary
WQA3 Pending the outcome of the review of regulation and market-based mechanisms to improve water quality, require farmers to be accredited to best management practice guidelines or to operate under an Environmental Risk Management Plan.	On track/ Underway	Already prioritized	While the recommendations made by the Queensland GBR Water Science Taskforce have generally been accepted by the Queensland government, they have not yet been implemented. This action specifically requires interim measures to enforce existing regulations, until the new regulations can be implemented. The Dec 2016 Update Report acknowledges that 40% of cane growers are not meeting current regulatory requirements. The progress notes in the Addendum acknowledge that very few farm properties have an accredited BMP: – 107 cane growers (3% of the total 3777 growers) – 27 graziers (<1% of the 8500 graziers) Given these facts, it is difficult to understand how this action has been assessed as 'on-track'. See section 1.3 of report. Investment Framework reports this action as 'fully funded'.
WQA4 Implement innovative management approaches through the Reef Trust for improving water quality.	On track/ Underway	Already prioritized	The approaches described are not particularly "innovative". Needs more detail to feel confident of status given. Investment Strategy reports this action as 'fully funded'.
WQA5 Increase use of cost-effective measures to improve water quality from broadscale land use, urban, industrial and port activities.	On track/ Underway	Already prioritized	Delivery is cross-referenced to a number of water quality actions in particular, e.g. WQA2, WQA3, WQA4. Most of these we have identified as having concerns with their reported status; hence the inclusion of this action in this list.
WQA7 Finalise and implement plans (Water Quality Improvement Plans—Healthy Waters Management Plans) for Reef catchments and key coastal areas, identifying implementation priorities for protection of the Reef.	On track/ Underway	Immediate (December 2016)	Key to this action is the implementation of the WQIPs. No status report on implementation. The organisations responsible for implementing WQIPs are the NRM regional bodies which are funded from the National Landcare Program. Available funding fell from $263m/yr in 2013 – 15 to $143m/yr in the period 2016 – 19. Funding beyond 2018-19 is not secure. Investment Strategy estimates funding gap as 'unknown'.

Reef 2050 Plan Action	Status – as reported in Reef 2050 Annual Report Addendum	Priority	Review Group Commentary
WQA10 Review and set regionally relevant standards for urban and point-source discharges into the World Heritage Area and ensure licensees meet these standards.	On track/ Underway	Medium (June 2018)	While progress is given around the establishment of regional water quality objectives for receiving waterways, no progress is provided on establishment of regionally relevant point source discharge standards. Also no update is provided on whether or not licensees discharges are meeting existing standards. Investment Strategy reports this action as 'fully funded'.
WQA12 Implement best practice stormwater management (e.g. erosion and sediment control, water sensitive urban design and capture of gross pollutants) for new development in coastal catchments.	On track/ Underway	Immediate (December 2016)	All voluntary; used to be mandatory for new development. Investment Strategy estimates funding gap as less than $1 million; this seems a significant under-estimate given the cost of stormwater management measures.
CBA7 Ensure the aesthetic values of the reefs, islands and the coast are considered and protected through planning and development decisions.	On track/ Underway	Immediate (December 2016)	Optimistic given resource constraints. Funding gap not specified in Investment Framework.
CBA13 Support the long-term social and economic monitoring program.	On track/ Underway	Medium (June 2018)	Dependent on RIMREP; no capacity at present. Limited progress. See section 1.9 of report. Investment Strategy estimates funding gap as $1-5 million.
EBA15 Recognise tourism-related fishing, particularly charter fishing, as a distinct fishing activity through the development of an action plan which: • Identifies fisheries resources with tourism-related potential at a detailed regional level • Develops mechanisms to enable charter fishing to operate on a sustainable basis.	On track/ Underway	Already prioritized	Optimistic assessment given progress and priority rating. Funding gap not specified in Investment Framework.
GA5 Adopt an approach of continuous improvement as part of adaptive management of the World Heritage Area.	In Place	Already prioritized	Very limited interpretation of what is needed to achieve this action. Funding gap not specified in Investment Framework.
GA7 (b) When reviewing relevant agreements, policies, plans, strategies and programs ensure they support the Plan's outcomes and targets. For example: (b) create a Great Barrier Reef Plan Register with all management plans recorded to simplifying understanding of management arrangements	Delayed or limited progress	Already prioritized	Concerning that this straightforward action can't be progressed. Funding gap not specified in Investment Framework.

Reef 2050 Plan Action	Status – as reported in Reef 2050 Annual Report Addendum	Priority	Review Group Commentary
GA7 (c) When reviewing relevant agreements, policies, plans, strategies and programs ensure they support the Plan's outcomes and targets. For example: (c) develop a policy guideline for decision makers on how to take into account the vision, outcomes, objectives and targets in this Plan in relevant decision making	Completed	Already prioritized	The completion of the Policy Guideline for Decision Makers is welcome. However, as an early indicator of its limited influence to date, neither the guideline, nor reference to Reef 2050 Plan objectives and principles, are incorporated into any of the key Queensland planning framework documents currently under development. See section 1.6 of report.
GA14 Develop, implement and maintain mechanisms and policies to enhance investment in delivering on-ground activities based on good science and evidence that support the Plan's outcomes and targets, and which contribute to a net benefit policy to ensure the outstanding universal value and integrity of the Reef is maintained or enhanced.	On track/ Underway	Immediate (December 2016)	Note range of concerns with Investment Framework. See Part 2 of report.
GA15 Develop, implement, and operate an Integrated Monitoring and Reporting program to facilitate adaptive management for the Reef.	On track/ Underway	Immediate (December 2016)	The development RIMREP is heading in the right direction, but the following issues need to be noted and addressed: • The design of this program is scheduled for completion at the end of 2017, leaving little time for it to provide meaningful information for the GBRMPA Outlook Report in 2019 and the review of the Reef 2050 Plan in 2020. • The scope and complexity of this ambitious (and expensive) Program needs to be reviewed and at least a first phase of the Program needs to commence in mid-2017. • Investment in GBR monitoring and modelling is currently inadequate for it to fulfil the function required by the Reef 2050 Plan. See section 1.9 of report. Investment Framework estimates funding gap as $10-20 million.