



REVIEW OF STATE PARTY REPORT ON THE STATE OF CONSERVATION OF THE GREAT BARRIER REEF WORLD HERITAGE AREA (AUSTRALIA)

DIANE TARTE AND TERRY HUGHES

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The Australian Marine Conservation Society commissioned this review to provide an independent expert analysis of the State Party Report. The review co-authors, Diane Tarte and Professor Terry Hughes are engaged extensively in the long-term management and research of the Great Barrier Reef. Professor Hughes is a member of the Reef 2050 Long-term Sustainability Plan (Reef 2050 Plan) Independent Expert Panel and Ms Diane Tarte is a member of the Reef 2050 Plan Reef Advisory Committee.

DIANE TARTEⁱ AND TERRY HUGHESⁱⁱ

i Marine Ecosystem Policy Advisors

ii ARC Centre of Excellence for Coral Reef Studies, James Cook University

OVERVIEW

In response to the 2015 and 2017 decisions of the World Heritage Committee¹, the Australian government submitted to the World Heritage Centre in December 2019 the State Party Report² on the state of conservation of the Great Barrier Reef (GBR) World Heritage Area (WHA). The 2017 decision of the World Heritage Committee (WHC) focussed on two areas in particular, namely:

4. *accelerate efforts to ensure meeting the intermediate and long-term targets of the [Reef 2050 Long-Term Sustainability] plan ... in particular regarding water quality;*

6. *demonstrating the effective and sustained protection of the property's Outstanding Universal Value and effective performance in meeting the targets established under the 2050 LTSP [Reef 2050 Long-Term Sustainability Plan], linked to the findings of the 2014 and 2019 Great Barrier Reef Outlook Reports.*³

This review also focusses on these two areas, as well as the implications of Australia's current climate change policies and the existing funding arrangements for management of the GBR.

Relative to previous GBR State Party Reports (2013, 2014, 2015) the 2019 Report provides more detail on funding arrangements and progress to achieving management targets. Overall, it is a more informative document. However, it still overstates the efficacy of existing management arrangements and understates the critical importance of effectively and immediately addressing the causes of climate change. We are concerned particularly by the present Australian government's inadequate national climate change and energy policies and programs, and the implications these have for the future of the Great Barrier Reef.

CONCLUSIONS

- The 2019 GBR Outlook Report provides clear evidence that the world heritage values of the property have declined since 2014, and the prognosis for the future has changed from "poor" in 2014 to "very poor" in 2019. Thus, the management measures currently in place are insufficient to *provide effective and sustained protection of the property's Outstanding Universal Value* as requested by the WHC in 2017.
- As a consequence of the back-to-back coral bleaching in 2016 and 2017, the integrity of the property has been seriously compromised.
- The critical drivers affecting the property all originate outside its boundary, and so governance arrangements need to be improved to effectively address local, property-wide, national and global pressures.
- A major flaw in Australia's stewardship of the Great Barrier Reef is the Australian government's failure to adequately address climate change, the number one driver of the Reef's ongoing decline, in accordance with its international commitments.
- Australia must do its proportionate share, both nationally and globally, to limit the extent of climate change and reduce its impacts. Of primary importance is for Australia to align its climate change policies and programs with the 1.5°C goal of the Paris Agreement.
- The annual \$270 million investment by the Australian and Queensland governments during the 10 years from 2014-15 to 2023-24 is insufficient to meet present and emerging threats and to redress the water quality impacts of past land use decisions in the catchments.

¹ 39 COM 7B.7 and 41 COM 7B.24 Great Barrier Reef (Australia) (N 154)

² *State Party Report on the state of conservation of the Great Barrier Reef World Heritage Area (Australia)*, Commonwealth of Australia, 2019

³ UNESCO World Heritage Committee, 2017. Decisions adopted during the 41st session of the World Heritage Committee (Krakow, 2017). WHC/17/41.COM/18, p. 102.



Turtle, Great Barrier Reef.
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Oceanic Imagery

- The current 10-year 2014-15 to 2023-24 investment of \$826 million to meet the 2025 water quality targets in the Reef 2050 Plan is significantly less than the estimated \$4.5 billion investment needed to meet the 2025 water quality targets in all GBR catchments.
- The reef restoration and adaptation program (RRAP) allows the Australian government to be seen to be ‘doing something’, while failing to adequately address climate mitigation and water pollution. These restoration interventions are promoted to reinforce the impression that it is feasible to reverse degradation of the WH property without addressing the long-term and often distant drivers of reef decline.
- The Queensland government has passed new laws for improved management of vegetation and agricultural and urban activities in GBR catchments. This should result in measurable reductions in land sourced pollutants entering GBR waters. Effective enforcement and compliance efforts will be needed to maximise the potential outcomes from this legislative reform.
- Without relevant and effective legislation, the progress in the uptake of best management practices, and progress to reach Reef 2050 Plan water quality targets, has been disappointingly slow, particularly in the sugarcane industry (Section 4.2.5 Water quality).
- The crown-of-thorns starfish “control” program demonstrably does not prevent outbreaks from occurring and spreading along the length of the GBR. Until adequate investments are made in reducing nutrient runoff, starfish outbreaks will continue unabated.

- Additional management measures will be crucially important to manage the impacts of predicted increases in port operations and shipping associated with predicted increases in ship traffic and bulk commodity exports, in particular coal and LNG.

In preparing this report we are mindful of the enormous impact of the recent bushfires on a number of Australia’s terrestrial natural World Heritage properties. So far, it is estimated that 80% of the Greater Blue Mountains and 50% of the Gondwana World Heritage properties have been extensively burned. It is likely that the ecological consequences for these properties will be at least as serious as the 2016 and 2017 back-to-back extensive coral bleaching events’ impacts on the GBR WH property. The triggers of both the large-scale coral bleaching events and extensive bushfires have been exacerbated by climate change. The Australian government continues to resist national and international pressures to reduce greenhouse gas emissions, despite the escalating impacts of anthropogenic heating on iconic WH properties. Instead, the government continues to support the expansion of fossil fuels, while encouraging “resilience and adaptation” to anthropogenic climate change.

We have provided detailed analysis of the following sections of the State Party Report.

SECTION 3.2.1 GOVERNANCE ARRANGEMENTS (P.9)

The State Party Report presents a basic depiction of the formal governance* arrangements for the GBR WHA. It focusses almost exclusively on the arrangements for the Reef 2050 Plan by the Australian national and Queensland state governments; yet this is only a small part of a complex set of formal and informal arrangements. The informal governance of the Property is increasingly powerful, and plays an often-unrecognized role in stewardship of the GBR.

***GOVERNANCE – THE WAYS IN WHICH SECTORS OF SOCIETY SHARE POWER AND MAKE DECISIONS – HAS TWO ELEMENTS, FORMAL AND INFORMAL.**

Governance of the Great Barrier Reef, broadly defined, has evolved substantially over time from a local mix of fishing and tourism stakeholders, local conservation groups, scientists, and Traditional Owners to a much more complex governance regime that now includes the fossil fuel and mining industries, ports, agricultural industries, the media, international tourists, and globally-active environmental NGOs. The

assumption that strong formal institutions can maintain the ecological resilience and Outstanding Universal Value (OUV) of the property – via ecosystem-based management and restoration – is too simplistic. More realistically, securing a future for the GBR under climate change is as much a political challenge as an ecological or social one (Morrison *et al.* 2020).

In Australia, the political dynamics of greenhouse gas emissions represents the single largest failure of governance, formal and informal, of the WH property. The Intergovernmental Panel on Climate Change (IPCC) Special Report (2018) concluded that most coral reefs will struggle to cope with further increases of global average temperatures of 0.5°C to 1°C above current levels⁴. While Australia has many government policies for protecting the Great Barrier Reef, the Australian and Queensland governments also seek to expand mining for fossil fuels, coal and gas export ports, shipping, and agricultural sectors in the WHA and its catchments. These proposed expansions are frequently opposed by other stakeholders. While the World Heritage Convention requires State parties to *do all [they] can ... to the utmost of [their] own resources* to

⁴ Coral reefs, for example, are projected to decline by a further 70–90% at 1.5°C (*high confidence*) with larger losses (>99%) at 2°C (*very high confidence*). The risk of irreversible loss of many marine and coastal ecosystems increases with global warming, especially at 2°C or more (*high confidence*). (IPCC, 2018)

⁵ Convention Concerning the Protection of the World Cultural and Natural Heritage, Articles 4 and 5.

protect and conserve World Heritage properties,⁵ Australia and other State parties have resisted moves to consider climate change impacts and the adequacy of climate mitigation measures as part of “in danger” listing assessments for individual WH properties.

The establishment of the Great Barrier Reef Marine Park Authority (GBRMPA) in 1976 was a major innovation in governance. However, four decades later, the major drivers affecting the Property all originate outside its boundary, especially climate change. The proximate drivers of fishing and pollution on the GBR are themselves driven by distant dynamics in national and transnational markets, consumption, wealth and human demography. Framing the degradation of the Reef as a local problem reinforces the notion that non-local drivers are external and therefore ungovernable.

Similarly, poorly-scaled governance has focused attention on symptoms (e.g. loss of corals, outbreaks of crown-of-thorns starfish), rather than the root causes of loss of OUV. The recent back-to-back bleaching in 2016 and 2017 has further exposed the limitations of conventional place-based ecosystem governance. In particular,

the lack of any changes by the Australian government to climate policies to speed up decarbonization of the Australian economy following the recent back-to-back bleaching of the GBR demonstrates that the preferences of the fossil fuel industry continue to outweigh those of the Reef’s tourism and fishing industries, local communities, scientists, conservationists and domestic and international visitors.

The controversial allocation of \$443 million by the Australian government to the Great Barrier Reef Foundation in 2018 represents a significant shift in GBR governance. A private NGO, the Foundation has strong links to major industries including mining and fossil fuel. It now has substantial responsibility for land-based water quality improvement programs, starfish culling programs, Traditional Owner engagement, and small-scale ecological restoration. The emergence of an additional organisation with substantial government funding has confused lines of communication, shifted responsibilities from other agencies (e.g. GBRMPA, AIMS, CSIRO), and delayed the delivery of some existing programs. It remains to be seen if the Foundation’s commitment to raise private funding is realistic.

SECTION 3.3 INVESTING FOR IMPACT (P.10)

This section and Appendix B of the State Party Report provide reasonable detail on the Australian and Queensland governments’ investment in managing the GBR WH property. Previous State Party reports have not been so accountable.

For the 10 years from 2014-15 to 2023-24, the funding available to address the major, predominantly “external”⁶ risks to the Reef (identified in both the 2014 and 2019 GBR Outlook Reports) comprises \$1.24 billion of the total government investment of \$2.75 billion (cf. Appendix B, State Party Report). This funding is disbursed through the Australian government’s Reef Trust and Reef 2050 programs (\$875 million) and the Queensland government’s Reef water quality program (\$364 million). \$443.3 million of the Reef Trust funding was provided

to the Great Barrier Reef Foundation (GBRF) in June 2018 as a one-off payment. Between 2018-19 and 2023-24, the GBRF is responsible for disbursing this funding under five investment priority areas namely water quality (\$201 million), crown-of-thorns starfish control (\$57.8 million), reef restoration and adaptation research (\$100 million), integrated monitoring and reporting (\$40 million), Traditional Owner Reef protection (\$42 million), and community Reef protection (\$10 million).

The balance of the \$2.7 billion is spent on managing ongoing activities within the property including shipping, fishing and port activities, and day-to-day management over the 10 years to 2023-24.

Relative to other Australian World Heritage properties, and most other WH properties globally, this investment in managing the GBR is significant. However, this level of investment is insufficient to prevent the ongoing decline in OUV, and is relatively modest given the size of the property (348,000 km²) and its annual recurrent economic value (\$6.4 billion supporting some 64,000 jobs⁷).

The 2016 Jacobs report, *Investing in the Great Barrier Reef as economic infrastructure*⁸, commissioned by the Queensland Farmers’ Federation, Queensland Tourism Industry Council, World Wide Fund for Nature Australia and the Association of Marine Park Tourism Operators, conservatively estimated that, if the GBR was considered as an infrastructure asset (e.g. road or dam) then the expected annual maintenance and operational budget would be \$547M with annual depreciation estimated at \$283M. We note that the current annual GBR investment is much less – \$270 million per annum over the decade 2014-15 to 2023-24.

The Alluvium 2016 report, *Costs of achieving the water quality targets for the GBR*⁹ calculated that \$2-\$8 billion was required to meet the Reef 2050 Plan water quality targets, depending on what pollutants are targeted and where interventions occur in the GBR catchments. This report has now been updated in 2019 for the Great Barrier Reef Foundation¹⁰ to reflect

the increased understanding of the costs and effectiveness of remedial actions; the revised estimate of investment needed to meet water quality targets in all catchments is \$4.5 billion (T. Weber¹¹). Importantly, this latest report also assesses the reductions in pollutants that are likely to be achieved through the introduction of new Queensland regulations for sugar cane and grazing activities in the GBR catchments (see Table 1, Alluvium (2019)).

The Alluvium assessments estimate the cost of addressing the Reef 2050 Plan water quality targets only. The governments’ GRB WH investments cover all management costs, both day-to-day management and investment in redressing the consequences of past land use decisions. We estimate that, of the \$2.7 billion budgeted over the 10 years, at best some \$826 million, or approximately 30% of the investment, is targeted at improvements in water quality (see Table 1). This represents an annual investment of just \$83 million averaged over 10 years from 2014-15, compared to the total estimated cost of \$4.5 billion required to meet the Reef 2050 Plan 2025 water quality targets in all catchments. If only the high and very high priority GBR catchments are targeted, then the 5-year cash cost to meet the targets is \$1.032 billion for DIN (dissolved inorganic nitrogen), and \$658 million for sediment.

Table 1. 2014-15 to 2023-24 Australian and Queensland government investments targeting water quality.

Australian government Reef Trust (minus \$443 million to GBRF)	\$260.7 million
Reef Trust Partnership via Great Barrier Reef Foundation	\$201 million
Queensland government Reef Water Quality program	\$364 million
TOTAL	\$825.7 million

Source: Appendix B, State Party Report.

⁸ Jacobs, 2016. *Investing in the Great Barrier Reef as economic infrastructure*. Jacobs Australia Pty Limited.

⁹ Alluvium, 2016. *Costs of achieving the water quality targets for the GBR* by Alluvium Consulting Australia for the Department of Environment and Heritage Protection, Brisbane.

¹⁰ Alluvium 2019. *Effective and Efficient Pathways for Investment in Improved Water Quality in the Great Barrier Reef: Final Report*. A report for the Great Barrier Reef Foundation, Brisbane.

¹¹ T. Weber (2020). Presentation, *Assessing Effective and Efficient Pathways for Investment in Improved Water Quality in the Great Barrier Reef*. Great Barrier Reef Water Quality Synthesis Workshop 2019.

⁶ “External” risks are those risks that impact on the WH property but originate predominately outside of its boundaries; these include climate change and land-based sources of pollution.

⁷ Deloitte Access Economics, 2013. *Economic contribution of the GBR*. GBR Marine Park Authority, Townsville.

SECTION 4.1.1 PILLAR 1: THE WORLD HERITAGE CRITERIA (P.13)

The State Party Report reproduced the assessment of the property's world heritage values provided in the 2019 GBR Outlook Report (GBRMPA, 2019). Tarte and Day¹² reviewed the assessment and concluded that the Outlook Report should include a specific section that *explicitly links the assessment of the relevant key values identified in the SoOUV [State of Outstanding Universal Value] to the overall assessment of the property's WH values*. While the 2019 Outlook Report contains the relevant information, it is not sufficiently

organised to show clearly the condition and trend of the key world heritage values that underpin the property's listing under the four natural heritage criteria, nor does it include any assessment in the change of these values between when the GBR was inscribed as world heritage in 1981 and their present condition.

Table 2 below, which is adapted from Tarte and Day, better illustrates the status and trend between 2014 and 2019 of the 63 components or metrics of the world heritage values of the property.

Table 2. 2019 status (grade) and trend of components of the GBR WH property's OUV.

Components of OUV (number of metrics)	Grade in 2019				Trend in 2019			
	Very good	Good	Poor	Very Poor	↑	↔	↓	—
Natural beauty and superlative phenomena (12)	0	7	4	1	0	5	3	4
Earth's evolutionary history (8)	1	5	1	1	0	2	5	1
Ecological and biological processes (23)	2	11	9	1	0	9	10	4
Habitats for conserving biodiversity (12)	1	5	5	1	1	4	4	3
Integrity (8)	2	2	3	1	0	4	3	1

Key: Trend since last report ↑ Improved ↔ Stable ↓ Deteriorated — No Consistent Trend

The table shows that the status of only one metric has improved since 2014, that 25 have declined during the latest reporting period, while the remaining 37 are either stable (24), or showing no consistent trend (13). We note that the Outlook Report's trend assessment only shows large changes between grades for each metric. It is equally important to understand whether there has been changes within the grade, i.e. has the condition of a particular OUV metric remained much the same or has it improved or diminished in value within the grade previously given.

The table also shows that of the 63 components of OUV, only 6 are still in "very good" condition, 30 are now "good", 22 are "poor", and 5 are

"very poor". The 43% in "poor" and "very poor" condition includes iconic and key attributes such as coral reefs (very poor), seagrass meadows (poor), marine turtles (poor), seabirds (poor), recruitment (poor), dugongs (poor).

In their report, Tarte and Day also note: *Of particular concern is the score of "poor" given for the outlook of heritage values. Given that the overall outlook for the region's ecosystems is scored as "very poor", it is inexplicable that the outlook for the region's heritage values are ascribed a higher score given that the heritage values are underpinned by the ecosystems of this natural World Heritage Area* (p.34).

SECTION 4.1.2 PILLAR 2: MEETING THE CONDITION OF INTEGRITY (WHOLENESS AND INTACTNESS) (P.14)

We note that the State Party Report maintains that the integrity of the property is *intact, but borderline in two of the six integrity criteria* (para 1, p.14). However, integrity of the property has steadily eroded due to boundary changes, and the ongoing impacts of the back-to-back bleaching in 2016 and 2017. The State Party Report is inconsistent with the 2019 Outlook Report, which states that the integrity of the property *is challenged and deteriorating* (p.vi).

Boundary changes include reclamation of seabed within the property by expanding ports, particularly in Townsville and Gladstone. These port expansions also result in dredging for expanded shipping channels, as well as the establishment of large anchoring areas (2,881km² within the property) (GBRMPA, 2019) to accommodate primarily shipping of fossil fuels. GBRMPA, the Australian Maritime Safety Authority and Maritime Safety Queensland need to better exercise their responsibility for stewardship of these areas as there is only limited, non-mandatory guidance on the establishment and management of anchorages. Issues associated with anchorages include intermittent noise and light pollution, marine debris, wastewater discharge, disturbance of seafloor habitats, interference with species behaviour, introduction of marine pests,

displacement of other marine users and loss of aesthetic value (GBRMPA, 2019; section 5.8.3).

The opportunity to establish adequate buffer zones adjoining the property has also been lost, due to coastal development on the nearshore boundary of the Property, and to rezoning of the Coral Sea Marine Park in 2018 which severely downgraded the level of protection adjoining the outer boundary of the GBR WHA.

The biodiversity, species abundances, physiology and genetic composition of corals and associated species in the northern and central two-thirds of the property has shifted in response to mass mortality from coral bleaching. The level of regionalization after 2016/2017 is unprecedented, as the ecological trajectory of the southern GBR diverges from the rest of the property. Furthermore, stock-recruitment relationships and larval dispersal have changed, altering and weakening networks of connectivity among reefs. The capacity for the Reef to recover, its interconnectedness and integrity are all severely compromised (Hughes *et al.* 2019). Southern reefs are now especially vulnerable to warm summers because of the prevalence there of heat-sensitive tabular and branching *Acropora*. We predict that it is only a matter of time before the southern region declines as abruptly as the rest of the property.

¹² Tarte, D. and J. Day. 2019. Review of World Heritage Assessments in Great Barrier Reef Outlook Report 2019.

Bleached corals at Agincourt Reef, 2016.
© James Woodford



SECTION 4.2.1 ACTION ON CLIMATE CHANGE (P.17)

Australia is failing to adequately address climate change, the number one driver of the GBR WH property's ongoing decline. Australia has the highest per capita emissions of greenhouse gasses in the OECD, and the government continues to heavily subsidise fossil fuels. The export of coal and fracked gas across the property has serious environmental impacts that are under-reported to UNESCO. These include rising greenhouse gas emissions, chemical, noise and light pollution from shipping and ports, dredging and dumping of maintenance dredge spoil in the property, anchor damage from bulk carriers, in particular coal ships, and increased risk of accidental introduction of invasive species via shipping.

The State Party Report (p3 and p12) claims that: *We are actively managing the pressures over which we have direct control through investment and regulation based on the best available science.* This statement is disingenuous. Australia has direct control, if it chooses to exercise it, over its national emissions and export of fossil fuels. The fossil fuel industry is heavily subsidised by the Australian government. New fossil fuel projects – including thermal and metallurgical coal, conventional and fracked gas, and oil – continue to receive strong government support despite their substantial contribution to global greenhouse gas emissions. Adani's Carmichael mine, currently under construction, will substantially increase volumes of coal exports across the WH property.

The State Party Report states, *Australia is taking strong action as part of global efforts to address the global threat of climate change under the United Nations Framework Convention on Climate Change and the Paris Agreement*

Australia's Paris target to reduce emissions by 26 to 28 per cent below 2005 levels by 2030 is a significant contribution to global climate action (p.17). Yet, the Australian government has repealed legislation that established a price on carbon. As a consequence, Australia will miss its very modest commitment to the Paris Agreement, even with the controversial use of carryover credits from the Kyoto Agreement that effectively halve Australia's stated commitment. So far, Australia has failed to reach its commitment to a 5% reduction in emissions from 2000 to 2020. Instead, emissions have essentially flat-lined (536m tonnes in 2000, projected 534m in 2020¹³). Gains in renewable energy, which are largely due to state-based renewable energy targets, have been cancelled out by increases in emissions in most other sectors, especially fugitive emissions from methane gas extraction. The Australian government has actively campaigned against transition to electric vehicles, and has no emission targets beyond 2030. Despite the extensive Australian bushfires this summer, the Australian government continues to rule out strengthening its 2030 emissions reduction target. The failure to align Australia's 2030 target with the 1.5°C goal of the Paris Agreement is a major flaw in Australia's stewardship of the Great Barrier Reef.

We note that the Great Barrier Reef Marine Park Authority in its position statement on climate change states: *Only the strongest and fastest possible actions to decrease global greenhouse gas emissions will reduce the risks and limit the impacts of climate change on the Reef.*¹⁴



Great Barrier Reef
2016/2017 Bleaching Impact.
© Australian Institute
of Marine Science / LTMP

SECTION 4.2.2 REEF BLUEPRINT FOR RESILIENCE (P.18)

Case study: Building Resilience – helping the Reef help itself

In the face of these pressures we are scaling up investment in reef restoration and adaptation science (p3). Restoration and adaptation will fail under uncontrolled greenhouse gas emissions. The first step of any ecological restoration is to remove the causes of decline. Unless the underlying causes of coral mortality and recruitment-failure are addressed, the local history of chronic and episodic mortality is likely to repeat itself. The proposed interventions include underwater fans, cloud brightening, robots, floating sunscreen, small-scale coral gardening, assisted migration, and in vitro breeding of corals. None of these will restore a “reef” or an “ecosystem”. They may, very locally, help to rebuild local population sizes of a few targeted species.

These interventions are controversial because they are expensive and unscalable. Fans could never cool even one of the 3,000 individual reefs in the property. Floating sunscreen will float away. It is not feasible or cost-effective to scale up restoration of coral populations beyond out-planting one or two species in small plots.

Coral gardening costs \$2-4 million per hectare, and the property has approximately 2.4 million hectares of coral reef habitat.

To date, few restoration attempts have properly monitored the medium-term (>5 years) outcomes of out-planting coral fragments or juveniles. Often the act of out-planting on a reef from a nursery or laboratory is viewed as a successful ending, and the medium-term outcome is unknown. Typically, restoration attempts lack an adjacent control site that is monitored for unassisted recovery – essential for an accurate assessment of the cost-effectiveness of restoration efforts. The proposed creation of new coral strains, so-called super corals, will bring new governance and ethical challenges and risks of unexpected outcomes. It is unlikely that the release of novel genotypes would change the gene pool of much larger wild populations which are themselves under intense natural selection from major bleaching events. The assumption that laboratory genotypes would have a higher fitness than the billions of wild corals that have survived the 2016 and 2017 bleaching events is untested, and unlikely.

¹³ Figure 4 and Table 3, Fig. 4. <https://www.environment.gov.au/system/files/resources/4aa038fc-b9ee-4694-99d0-c5346afb5bfb/files/australias-emissions-projections-2019-report.pdf>

¹⁴ GBRMPA (2019). Position Statement. Climate Change. GBRMPA Document No: 100486 Revision: 0 Date: 25-Jun-2019.

SECTION 4.2.5 WATER QUALITY (P.24)

The 2017 decision of the World Heritage Committee made reference to the need for an accelerated effort to improve water quality. Yet, the GBR Report Card for 2017-18 shows extremely limited progress towards achieving the Reef 2050 Plan 2025 water quality targets particularly for the sugar cane growing industry.

The State Party Report's commentary on water quality on pp. 24-27 provides detail on important legislation introduced by the Queensland government for improving water quality from land-based agricultural and urban run-off, vegetation management to improve water quality, and restrictions on the disposal of dredge material in the Great Barrier Reef Marine Park from capital dredging projects.

Section 4.3.2d Water quality (pp. 42-45) provides more detail based on the 2017-18 GBR-wide report card results¹⁵. It notes, *The*

report card results reflect the large scale of change still required to meet water quality targets. (p.42). It also states, *we are seeing some encouraging progress towards improving the quality of the water flowing to the Great Barrier Reef* (p.42). Evidently, this progress is due mainly to the increased enforcement and compliance efforts relating to existing Queensland GBR agricultural practices legislation first introduced almost 10 years ago, but effectively only enforced since 2017-18.

Table 3 and Figure 1 show the limited progress in achieving best practice management for key industries in the GBR catchments, in order to meet the 2025 water quality targets in the Reef 2050 Plan. There has been minimal change to the percentage of land managed under best practice between 2015/16 and 2017/18.

Table 3: Percentage of land in the GBR priority catchments (Wet Tropics, Burdekin, Mackay Whitsundays) managed at best practice for sugarcane and grazing.

Industry	2025 Land Management Target	2017-18: % managed at best practice	% change 2016-17 and 2017-18
Sugarcane	90% *	9.8%	Nutrient management: 0.9% increase
Grazing	90%*	35.8%	Pasture management: 1.3% increase

* **2025 land management target:** 90% of land in priority areas under sugarcane and grazing are managed using best management practice systems for water quality outcomes (soil, nutrient and pesticides). Source: <https://www.reefplan.qld.gov.au/tracking-progress/reef-report-card/2017-2018>

¹⁵ <https://www.reefplan.qld.gov.au/tracking-progress/reef-report-card/2017-2018>

Flood plume from the Burdekin River starting to bathe Old Reef, south of Townsville, February 2019.

© Matt Curnock. Support for the aerial footage was provided by TropWATER JCU, the Marine Monitoring Program - Inshore Water Quality through the Great Barrier Reef Marine Park Authority, the Queensland Government, the Landholders Driving Change project led by NQ Dry Tropics, CSIRO and the National Environmental Science Program Tropical Water Quality Hub.



Figure 1: Summary of all land management and water quality targets from 2017-18 GBR Report Card.



Source: <https://www.reefplan.qld.gov.au/tracking-progress/reef-report-card/2017-2018>

SECTION 4.2.6 CROWN-OF-THORNS STARFISH CONTROL PROGRAM (P.28)

Recurrent outbreaks of the crown-of-thorns starfish, first reported on the Great Barrier Reef in 1962, continue unabated despite so-called control programs undertaken to kill starfish in the past decade. The root cause of the outbreaks is likely to be nutrient enhancement from agricultural runoff of nutrients, especially during floods, which boosts primary production of phytoplankton eaten by larval starfish. More food (and rising temperatures) hastens larval maturation, leading to pulses of starfish recruitment onto reefs. Thus, the current “control” program is an attempt to deal with the symptom of starfish outbreaks rather than the root causes. As noted elsewhere, investment in reducing nutrient runoff into the property – the

likely driver of starfish outbreaks - is inadequate to meet the targets of the 2050 Reef Plan. Until adequate investments to reduce runoff are made, starfish outbreaks will continue unabated.

The State Party Report (p28) does not divulge that uncontrolled outbreaks have spread throughout the GBR during the past reporting period. Most recently, severe outbreaks have also occurred in the southern Swain reefs which escaped damage from bleaching in 2016 and 2017. According to the State Party Report, culling has *been successful in holding starfish densities below thresholds* (p.28) on 75% of 57 targeted reefs – approximately 1.4% of the 3,000 reefs comprising the WH property.

CORAL BLEACHING AND CYCLONES

The State Party Report consistently understates the game-changing nature of the unprecedented back-to-back coral bleaching events in 2016 and 2017, and overstates the impacts of cyclones. Following the 1998 and 2002 bleaching events, many polluted inshore reefs failed to recover. The spatial scale of unparalleled coral mortality due to thermal extremes in 2016 and 2017 was much greater than 1998 or 2002, and has weakened the resilience of the GBR. Widespread depletion of adult brood stocks in the northern and central regions of the property has caused a collapse of coral recruitment and a shift in the species composition of juvenile corals (Hughes et al. 2019). Recovery of corals from bleaching is likely to be protracted compared to routine regeneration following local cyclone damage. It is also highly likely that post-bleaching recovery in the next few years will be truncated by a fifth bleaching event, as sea temperatures continue to rise due to global heating. The outcome of repeated bleaching events is far-reaching and is consistently understated in the State Party Report which repeatedly lumps cyclones, crown-of-thorns starfish and bleaching into the same sentence (e.g. p.23, 28, 31).

Recurrent cyclones are a natural feature of the property, and they should not be reported by the State Party as a threat. Generally, their spatial scale is smaller than mass bleaching events, and the local loss of corals is less severe and patchier. Corals have evolved a range of strategies to resist and recover from routine cyclones, which open up space on a reef, prevent competitive exclusion, and increase local diversity. Mid- and outer-shelf reefs and sites impacted by cyclones are quick to recover, in part because of the supply of coral larvae from nearby less damaged or undamaged locations. The State Party Report does not adequately acknowledge that due

to climate change, the normal disturbance regime of the property (recurrent cyclones affecting individual reefs with a return-time of 3-4 decades) has already changed dramatically as the frequency and intensity of mass coral bleaching increases.

The number and severity of cyclones affecting the GBR has not changed over the past 50 years, yet their prevalence in Australia's reporting to UNESCO has increased markedly over time. In the latest 2014-2018 period, only five cyclones affected the property (Fig. 3.2, p.51 of the 2019 Outlook Report), compared to thirteen in each of the two preceding 5-year intervals. Yet, the 2019 Great Barrier Reef Outlook Report mentions cyclones four times more often than the 2009 report. The latest Outlook Report also has more mentions of cyclones than bleaching, despite the unprecedented loss of corals in the 2016 and 2017 bleaching events.

The 2016 bleaching event killed more than half of the corals across a broad range of shallow habitats in the northern third of the property as well as extensive areas in the adjacent Torres Straits to the north and the Coral Sea to the east. A year later, the 2017 bleaching had a similar impact on the central third. This level of damage due to anthropogenic heating, is unprecedented. Intact coral populations in the southern region of the property will not provide a substantial source of larvae for recovery further north, because the distance is too great for meaningful levels of dispersal and the East Australia Current flows southwards, in the wrong direction. The marked disparity in the condition of coral reefs in the northern two-thirds of the property points to a catastrophic loss of OUV in 2016/2017, and a marked erosion in the Integrity of the property.

BUILDING REEF RESILIENCE

The capacity to build the resilience of the property to climate change (p19) is exaggerated in the State Party Report. It is naïve to present unscalable interventions such as artificial shading and cooling, coral gardens, or attempts to *modify reef surfaces to promote growth* (p20) as potential solutions to escalating anthropogenic heating. It is another example of treating symptoms while ignoring the (escalating) root causes.

The Resilient Network proposal, which lies at the heart of the Reef Blueprint for Resilience, is deeply flawed. It relies on the identification of "bleaching-resistant" reefs, hopefully scattered evenly along the length of the GBR, that can be targeted for high levels of protection to act as sources of larvae for recovery elsewhere. However, in the aftermath of four bleaching events in 1998, 2002, 2016 and 2017, it is clear that no such network exists. Already, 93% of the property has bleached at least once. The least affected areas, so far, are outer shelf reefs in the northern GBR Marine Park (extending into the outer Torres Strait), and in the far south (the Swains). There is no guarantee that these relatively small sub-regions at opposite ends of the property will remain unbleached for much longer. Furthermore, because of their isolation from the remaining 90% of the property, and the limited dispersal capabilities of coral larvae, they are very poor candidates for re-seeding reefs elsewhere.

It is difficult to propose how levels of protection of unbleached reefs in remote offshore locations could be improved through local management. Reef zoning, including no-fishing and no-entry areas, had no effect on the severity of coral bleaching on northern and central regions in 2016 and 2017. Similarly, despite their remoteness, good water quality, and relatively pristine condition, inner and mid-shelf reefs in the northern GBR had the most extreme heat exposure in 2016 and the highest losses of corals due to bleaching. There is some scientific support for an improved capacity for rebound (i.e. resilience) of coral populations on reefs that are protected from overfishing of herbivores, such as parrotfish. Herbivory limits the abundances of macro- and turf-algae, which compete for space with corals, especially juveniles. However, there is no fishery for herbivorous fishes on the Great Barrier Reef, and amounts of algae are relatively small compared to reefs elsewhere that are polluted or overfished.

The Resilient Network proposal, and the crown-of-thorns starfish programs, are attempting to target their efforts on a small number of specific reefs that are possibly good sources of larvae – to promote the spread of corals, and curb the export of starfish larvae. This approach, based on biophysical models (Hock et al. 2017), has been criticised as highly unreliable due to model limitations and high levels of variability in water movement (Bode et al. 2018).

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