

# GREAT BARRIER REEF MARINE PARK AUTHORITY POSITION STATEMENT ON CLIMATE CHANGE

*The Reef Authority acknowledges the expertise, wisdom, and enduring connections that have informed the guardianship of the Reef for millennia. We pay our respects to the Traditional Owners as the first managers of this Land and Sea Country, and value their traditional knowledge, which continues to inform the current management and stewardship of the Reef for future generations.*

## Our position

Climate change is the greatest threat to the world's coral reefs. Most coral reefs have already declined and are facing irreversible change. The action we take today will determine the Great Barrier Reef we know tomorrow.

Every increment of global warming is compromising the Reef's unique biodiversity, significant cultural heritage, social benefits, and the ecosystem services it provides.

Urgent global action is critical to deliver on international commitments to limit temperatures to 1.5°C of warming, or as close as possible. This will deliver the best possible future for the Great Barrier Reef and the livelihoods that depend on it.

## The threat

Human activities, principally through emissions of greenhouse gases, have indisputably caused global warming, with 2011-2020 average global surface temperatures measured at 1.1°C above the pre-industrial (1850-1900) baseline. Larger increases have been recorded over land (1.59°C), than over the ocean (0.88°C) (IPCC AR6 WG1 2021).

By 2021, average sea surface temperatures in the Australian region had warmed by 1.05°C since 1900, with eight of the 10 warmest years on record during 2013-2020 (CSIRO and BoM 2022). The average sea surface temperature for the Great Barrier Reef has warmed by 0.94°C since 1900 (BoM 2023).

Global warming of 1.5°C relative to 1850-1900 is

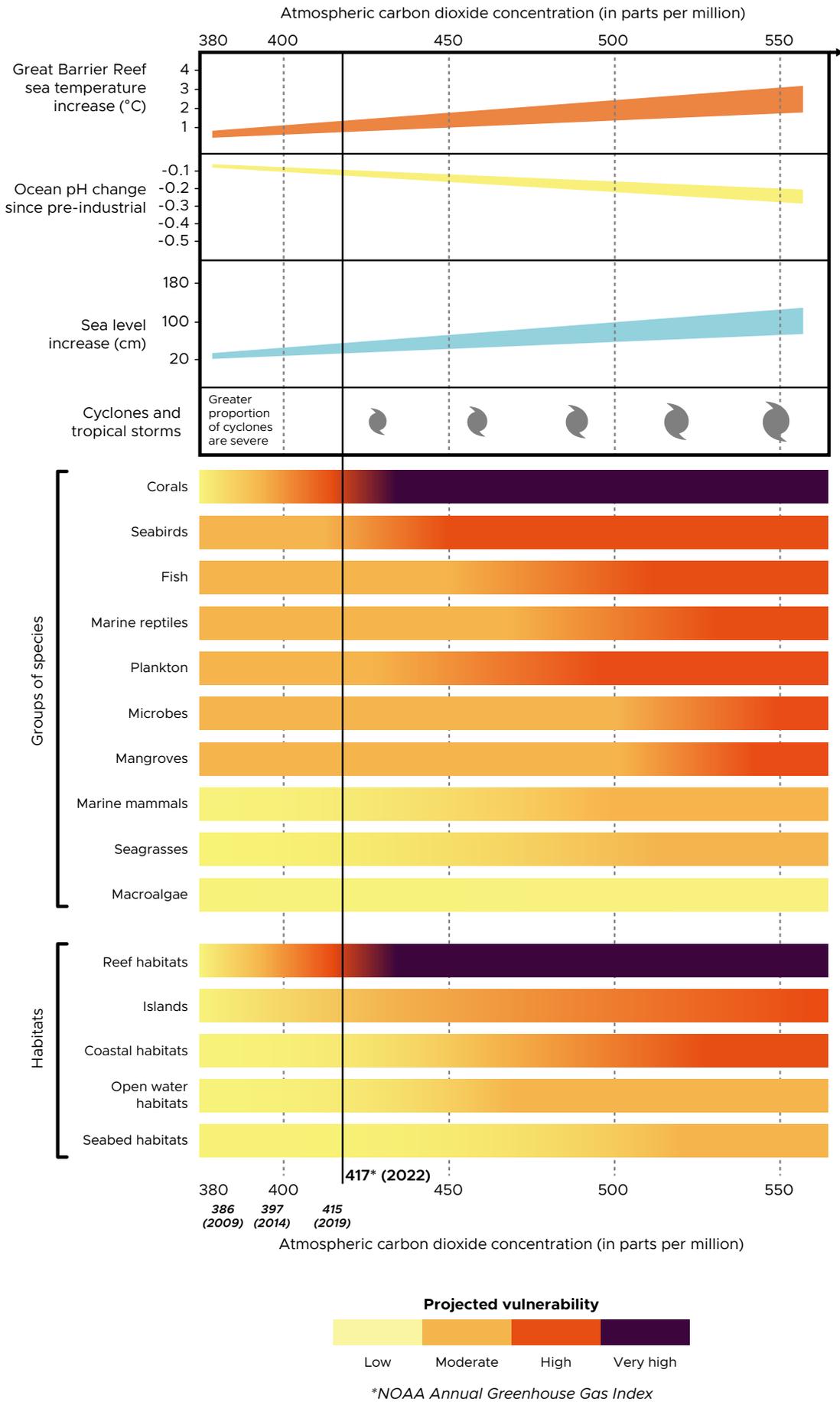
likely to be reached by 2035 without deep and rapid reductions in emissions (Diffenbaugh & Barnes 2023).

Coral reefs are projected to decline by 70 to 90 per cent at 1.5°C of global warming and by 99 per cent at 2°C of global warming (above pre-industrial levels).

The impacts of climate change are degrading the world's coral reefs and significantly impacting biodiversity, primarily through ocean warming and acidification.

All ecosystems within the Great Barrier Reef are vulnerable to the impacts of climate change (see Outlook 2019 figure). More extreme weather events such as heatwaves, tropical cyclones, and flood events, are accelerating the degradation of coral reefs, seagrass meadows and mangrove forests.

**FIGURE 1.**



Projected vulnerabilities of components of the Reef ecosystem to climate change. Adapted from the Reef Authority's Great Barrier Reef Outlook Report (2019). Trajectories for the groups of species and habitats continue to evolve with the changing climate and in response to climate action.

**Figure 1 (previous page):** The top panel of the figure illustrates the relationship between rising atmospheric carbon dioxide concentration and the observed and projected increases in sea surface temperatures, sea level, frequency of severe cyclones and changes in ocean chemistry. The lower panel summarises the consequences of the current and projected environmental changes for Reef habitats and groups of species. The diagram highlights the differing levels of vulnerability among key Reef components, notably that hard corals and the coral reef habitats they create are the most vulnerable to, and are already being affected by, a rapidly changing climate and ocean acidification.

Marine heatwaves triggered four mass coral bleaching events on the Reef between 2016 and 2022 which is unprecedented since records began. Extreme temperatures in 2016 killed approximately 30 per cent of the Reef’s shallow-water corals (Hughes et al 2018) (GBRMPA 2017).

More frequent disturbances are leading to inadequate recovery windows and the loss of potential ecosystem refuges (Hughes et al 2021; Dixon et al 2022). The Reef will be transformed as coral reef habitats are lost over time.

Reef degradation has significant flow-on effects for Reef-dependent activities such as tourism, fishing, recreational and traditional use. Without urgent action to reduce greenhouse gas emissions, the Reef will continue to degrade, with continuing consequences for its heritage values.

The persistence of the Reef and its provision of goods and services hinges on the health and diversity of reef-building coral species, which have limited capacity to adapt.

Limiting global warming to as close to 1.5°C as possible is critical to minimising significant environmental and societal costs due to loss of Reef habitats (IPCC 2018; McWhorter et al 2022).

### Reef resilience jeopardised by a rapidly changing climate

While recent recovery demonstrates that the Great Barrier Reef is still resilient, its capacity to tolerate and recover is jeopardised by a rapidly changing climate.

The relatively moderate heat stress in the bleaching events in 2020 and 2022 coupled with few other disturbances since 2018 allowed coral cover to increase from some of the lowest levels ever observed in 2017 to the highest (AIMS 2022). This demonstrates the Reef’s resilience; its inherent capacity to tolerate and recover from disturbances. Recovery during disturbance-free periods is vital, however, it does not guarantee future stability. Recent recovery has been dominated by fast-growing *Acropora* corals that are vulnerable to disturbances, evident in the Reef wide recovery “pause” reported by AIMS in 2023. The increasing frequency and severity of climate driven disturbances means that while recent gains are most welcome, they are precarious (AIMS 2023).



©Commonwealth of Australia (Reef Authority). Photographer: Braden Smith

*This is the critical decade for climate action. To limit the impacts of climate change on the Reef, we need to see substantially less greenhouse gases released into the atmosphere, and far more being removed. We also need to strengthen actions to build resilience.*

## What we're doing to address the impacts of climate change

Strong management has protected the Reef's capacity to tolerate and recover from impacts. This management began, and has been continued, by First Nations peoples over millennia.

As Australia's lead management agency for the Great Barrier Reef, we are best-placed to understand what the Reef needs. We can – and will – protect the Reef by mitigating threats within our control and building Reef resilience, improving its capacity to tolerate and recover from climate-related impacts.

This will require more than business-as-usual. We will build on 45 years of adaptive management that has responded to all emerging threats to the Reef to deliver innovative, agile, and resilience-based actions. First Nations peoples have an intrinsic connection to the Reef and we acknowledge their inherent rights and interests in the amplification of their voices in relation to climate change.

*The Great Barrier Reef Blueprint for Climate Resilience and Adaptation* (Blueprint 2030) will drive how we adapt our management and help us innovate and evolve how we protect the Reef's resilience and set the gold standard for Marine Park management.

Blueprint 2030 focuses on the entire Reef ecosystem – beyond corals and coral reefs (the focus of Blueprint 2017). It includes five goals that will help us buy time for the Reef, while we encourage and advocate for greater action to mitigate and remove carbon from the atmosphere. We will:

- Protect the Reef's resilience
- Enhance the Reef Authority's capability
- Co-manage Sea Country with Traditional Owners
- Empower others to protect and manage the Reef
- Do our part to reduce emissions

## What needs to be done

In 2015, 195 countries committed to the Paris Agreement to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. Despite this, global greenhouse gas emissions have continued to rise and exceed record levels (NOAA 2023).

The adverse impacts and related damage from climate change will escalate with every increment of global warming. Every bit of warming prevented is critical and may prevent irreversible damage and provide a better possible future for the Reef.

You can take action today to protect the Reef for tomorrow:

1. All emissions matter. Your actions count.
2. Learn about what contributes to climate change and what can be done about it.
3. Talk about climate change, what you're doing and what else can be done with people you know.
4. Reduce your emissions through daily choices such as using renewable energy sources, eating fewer animal products, and choosing low or zero emission transportation.
5. Be a conscious consumer – prioritise sustainability when purchasing or investing.
6. Abide by rules put into place to protect natural environments.
7. Get involved in conservation actions in your local area.

The future of the Reef will be better if we all act together.

**The legacy we leave for future generations is in our hands and the time to act is now.**



## Supporting evidence

Average global warming of just 1.1°C so far has driven or exacerbated many extreme weather events in Australia — such as extreme heat, destructive marine heatwaves, heavy rainfall and coastal inundation, fire weather and drought— and has had large and lasting impacts on the health and wellbeing of our communities and ecosystems (CSIRO and BoM 2022; SoE report 2021).

Globally, the recurrence of severe coral bleaching events has become more frequent, approximately every six years, rivalling required recovery times (Hughes et al 2018b). The mass bleaching event in 2022 was the first recorded during a La Niña year.

The 2019 Great Barrier Reef Outlook Report summarised evidence of reductions in coral diversity, abundance, and recruitment (from Hughes et al 2018, 2019) and widespread habitat loss for reef-dependent fish and invertebrates due to mass bleaching events (Richardson et al 2018, Stuart-Smith et al 2018).

The recent Sixth Assessment report by the Intergovernmental Panel on Climate Change (IPCC) highlighted that the impacts of climate change are escalating at a rate much faster than predicted just a decade ago. This assessment also clearly indicates that to limit global warming to 1.5°C, global carbon dioxide emissions need to peak by 2025, and decline to 43 per cent of 2019 levels by 2030.

Limiting warming to 1.5°C is now only possible with both rapid reductions in global emissions and the removal of carbon dioxide from the atmosphere (IPCC 2021, IPCC 2022).

Global commitments and actions are growing, but are still incompatible with limiting global warming to 1.5°C or even 2°C (IEA 2021, CAT 2022). Today's emissions will contribute to warming for around the next 30 years.

## Literature cited

Australian Bureau of Meteorology (2023) NOAA Extended Reconstruction Sea Surface Temperature Data. NOAA Extended Reconstructed SST V5: NOAA Physical Sciences Laboratory NOAA Extended Reconstructed SST V5

Australian Government Department of Climate Change, Energy, the Environment and Water (2022). Annual Climate Change Statement 2022.

Australian Government Department of Climate Change, Energy, the Environment and Water (2021). 2021 State of the Environment report.

Australian Institute of Marine Science (2022) Long-Term Monitoring Program Annual Summary Report of Coral Reef Condition 2021/22. Annual Summary Report of Coral Reef Condition 2021/22 | AIMS

Climate Action Tracker, 2022. Temperatures. Temperatures | Climate Action Tracker (accessed 10 July 2023).

CSIRO and BoM (2022) State of the Climate 2022. Accessed at State of The Climate 2022 (bom.gov.au)

Dixon AM, Forster PM, Heron SF, Stoner AMK, Beger M (2022) Future loss of local-scale thermal refugia in coral reef ecosystems. *PLOS Climate* 1(2): e0000004. <https://doi.org/10.1371/journal.pclm.0000004>

Great Barrier Reef Marine Park Authority (2017). Final Report: 2016 Coral Bleaching Event on the Great Barrier Reef, Great Barrier Reef Marine Park Authority, Townsville.

Great Barrier Reef Marine Park Authority (2019). Great Barrier Reef Outlook Report 2019. Great Barrier Reef Marine Park Authority.

Hughes, T.P., Kerry, J.T., Baird, A.H., Connolly, S.R., Dietzel, A., Eakin, C.M., Heron, S.F., Hoey, A.S., Hoogenboom, M.O., Liu, G., McWilliam, M.J., Pears, R.J., Pratchett, M.S., Skirving, W.J., Stella, J.S. and Torda, G. (2018a). Global warming transforms coral reef assemblages, *Nature* 556: 492-496.

Hughes, T.P., Anderson, K.D., Connolly, S.R., Heron, S.F., Kerry, J.T., Lough, J.M., Baird, A.H., Baum, J.K., Berumen, M.L., Bridge, T.C., Claar, D.C., Eakin, C.M., Gilmour, J.P., Graham, N.A.J., Harrison, H., Hobbs, J.A., Hoey, A.S., Hoogenboom, M., Lowe, R.J., McCulloch, M.T., Pandolfi, J.M., Pratchett, M., Schoepf, V., Torda, G. and Wilson, S.K. (2018b). Spatial and temporal patterns of mass bleaching of corals in the Anthropocene, *Science* 359(6371): 80-83.

Hughes, T. P., Kerry, J. T., Baird, A. H., Connolly, S. R., Chase, T. J., Dietzel, A., ... & Woods, R. M. (2019). Global warming impairs stock-recruitment dynamics of corals. *Nature*, 568(7752), 387-390.

Hughes, T.P., Kerry, J.T., Connolly, S.R., Álvarez-Romero, J.G., Eakin, C.M., Heron, S.F., Gonzalez, M.A. and Moneghetti, J. (2021). Emergent properties in the responses of tropical corals to recurrent climate extremes. *Current Biology*, 31(23), pp.5393-5399.

Intergovernmental Panel on Climate Change (2018). Summary for Policy Makers, in *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, eds V. MassonDelmotte, P. Zhai, H.-. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C.

Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor and T. Waterfield, World Meteorological Organization, Geneva, Switzerland.

IPCC (2022) Summary for Policymakers. In: *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA.

McWhorter, J. K., Halloran, P. R., Roff, G., Skirving, W. J., Perry, C. T., & Mumby, P. J. (2022). The importance of 1.5 C warming for the Great Barrier Reef. *Global Change Biology*, 28(4), 1332-1341.

Richardson, L.E., Graham, N.A.J., Pratchett, M.S., Eurich, J.G. and Hoey, A.S. (2018). Mass coral bleaching causes biotic homogenization of reef fish assemblages, *Global Change Biology* 24(7): 3117-3129.

Stuart-Smith, R.D., Brown, C.J., Ceccarelli, D.M. and Edgar, G.J. (2018). Ecosystem restructuring along the Great Barrier Reef following mass coral bleaching, *Nature* 560(7716): 92.

United Nations 2015, Paris Agreement, United Nations Framework Convention on Climate Change.

UNESCO (2022) *Climate Change and World Heritage Report on predicting and managing the impacts of climate change on World Heritage and Strategy to assist States Parties to implement appropriate management response.*

# See the Reef, Love the Reef, Protect the Reef



  
Australian Government  
Great Barrier Reef  
Marine Park Authority



Reef  
Authority

[REEFAUTHORITY.GOV.AU](http://REEFAUTHORITY.GOV.AU)