Australian Government
Great Barrier Reef Marine Park Authority

POSITION STATEMENT
Climate change

Our position

Climate change is the greatest threat to the Great Barrier Reef. 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. Further impacts can be minimised by limiting global temperature increase to the maximum extent possible and fast-tracking actions to build Reef resilience.

Position snapshot

Climate change is the greatest threat to the Great Barrier Reef (the Reef) and coral reefs worldwide.

Global emissions of greenhouse gases such as carbon dioxide from the burning of fossil fuels, agriculture and land clearing are causing climate change. It is estimated these human activities have driven approximately a 1.0°C increase in global average temperature above pre-industrial levels.[1]

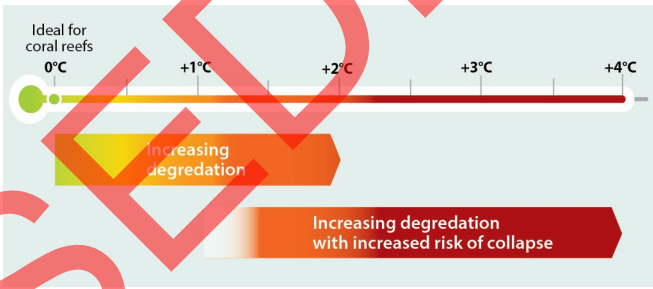
This change in climate is forecast to bring further destructive marine heatwaves due to increased sea temperature. Associated impacts from altered weather patterns — such as more intense storms, tropical cyclones and flood events — ocean acidification and rising sea level also damage coral reef ecosystems.[2]

Strong global action to curb climate change is needed urgently to give the Great Barrier Reef the best chance of survival.

The widespread impacts of climate change are already evident. In the northern two-thirds of the Great Barrier Reef Marine Park (the Marine Park) there were two consecutive years of mass coral bleaching and mortality in 2016 and 2017 with associated loss of marine life. Together with the impacts of 11 severe tropical cyclones since 2005, these events have caused an unprecedented decline in the health of the Reef.

If the current rate of greenhouse gas emissions continues, global average temperature will continue to increase rapidly. This will cause the health of the Reef to continue to decline, with consequential effects on businesses and communities that depend on the Reef.[1,2]

A special report by the Intergovernmental Panel on Climate Change[1] compared the impacts of global temperatures of 1.5°C and 2°C above pre-industrial levels. The report advised coral reefs are projected to decline further at 1.5°C, with even larger losses at 2°C.



Global average temperature increase and what this means for coral reefs

Only the strongest and fastest possible action on climate change will reduce the risks and limit the impacts of climate change on the Reef. Further loss of coral is inevitable and can be minimised by limiting global temperature increase to the maximum extent possible.

The required reduction in global greenhouse gas emissions demands an international and national response to secure a better future for the Reef.

The Great Barrier Reef Marine Park Authority (the Authority) encourages:

- the strongest and fastest possible actions to reduce global greenhouse gas emissions
- partnerships, plans and actions that reduce cumulative impacts on the Reef
- actions that build Reef resilience and protect key species for reef recovery
- actions that enable adaptation and restoration of reef habitats.

The Authority takes a resilience-based approach to managing the Marine Park, which is adaptive and future-focused. We are committed to strengthening partnerships to build the capacity of Marine Park managers, industries and communities to adapt their activities to a changing climate.

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Issue: coral reefs are at the frontline of climate change

Climate change is the greatest threat to coral reef ecosystems worldwide. Global emissions of greenhouse gases such as carbon dioxide from human activities are estimated to have caused approximately a 1.0°C increase in global average temperature above pre-industrial levels.[1] This continuing and rapid increase in global temperature is causing sea temperature to increase, which also increases the likelihood of marine heatwaves.[3]

Coral reef ecosystems are particularly sensitive to changes in sea temperature. Their existence hinges on the health of reef-building coral species, which have limited capacity to endure heat stress. Increased sea temperature can directly cause mass bleaching and mortality.[2]

Bleaching events were observed in the 1980s[4] at temperatures of 0.5°C above pre-industrial conditions. More recently, the world's coral reefs have sustained major damage from recurrent bleaching events associated with the continued increase in global average temperature to date.[5,6] Global analyses show climate change has contributed to a fivefold increase in the frequency of severe coral bleaching events over the past 40 years.[5]

On the Great Barrier Reef, two consecutive years of marine heatwaves in 2016 and 2017 caused severe bleaching and loss of corals along two-thirds of the Reef, where heat exposure was the most extreme.[7,8] In 2016, an average of 30 per cent of shallow-water corals (at depths between two and 10 metres) were lost across the whole Reef, with the majority of mortality occurring in the northern third.[7,9] Bleaching and mortality generally declined with depth, however, severe bleaching and some mortality of corals were also observed on northern reefs along the outer shelf at 40 metres depth.[10,11] In 2017, the spatial extent of severe bleaching was estimated by aerial surveys only. Given the severity of bleaching observed, it is certain that the 2017 bleaching event caused a further decline in coral cover across the northern two-thirds of the Marine Park.[8] A healthy reef is naturally resilient to disturbances, however the rapid rate of increase in sea temperature presents significant challenges for the Reef to adapt to a changing climate.

Increasing sea temperature is likely to increase the proportion of severe tropical cyclones and the frequency and severity of heavy rainfall events.[12]

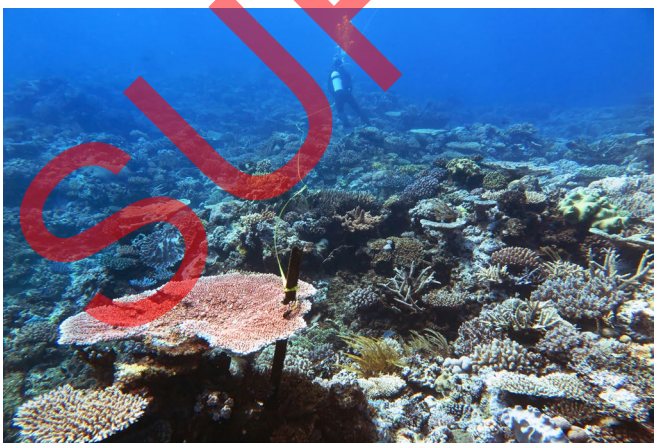
The Great Barrier Reef is a valuable environmental, cultural and economic asset

The Great Barrier Reef Region[22] is listed as a World Heritage Area. This comes with a responsibility to protect the Reef's condition for current and future generations.

The Great Barrier Reef Marine Park Authority manages the Marine Park under the *Great Barrier Reef Marine Park Act 1975.*

The Reef is worth $6.4 billion annually to the Australian economy[23]—a contribution largely derived from the tourism industry—with the Reef attracting nearly two million visitors each year from across the globe.

Traditional Owners have cultural connections with the Reef that extend back thousands of years.[2]



Thetford Reef near Cairns. 2016 before coral bleaching.
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Thetford Reef near Cairns. 2017 after bleaching
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Multiple severe tropical cyclones and floods have had cumulative impacts on the Reef's ecosystem, including seagrass meadows, coral reefs, and dugong and turtle populations.[2] Other impacts, such as rising sea level, are projected to result in increased coastal erosion and inundation of critical nesting habitats, while changes in the patterns of ocean circulation can lead to shifts in the distribution and abundance of species.[2]

Oceans have absorbed about a third of the carbon dioxide from human activities since the industrial revolution, which is making them more acidic.[13] Even relatively small increases in acidity reduce the capability of corals and other calcifying organisms to build skeletons and shells, which in turn leads to a reduction in habitat available to support reef biodiversity.[2] The weakening of skeletons of coral and other reef-builders further affects their capacity to resist and recover from physical damage caused by tropical cyclones.[2,4]

Impact: half a degree matters

Climate-related impacts on the Reef are already detectable. Any additional increase in global average temperature will have further negative impacts on the Reef, with flow-on effects for Reef-dependent activities such as tourism, fishing, recreation and traditional use. These effects are likely to include loss of properties and infrastructure, loss of cultural and regional identity, and unless urgent action is taken, subsequent declines in regional economies. Impacts on communities globally are likely to be significant, as more than 500 million people depend on coral reefs for their livelihoods and food security.[14]

For the Reef and coral reefs worldwide, there is growing recognition that limiting the increase in global average temperature to 1.5°C and ideally less, is critical to minimise significant environmental and societal costs from the loss of reef habitats.[1,14,15] Coral reefs are projected to decline by a further 70-90 per cent at a 1.5°C increase in temperature, with greater losses at a 2°C increase.[1] Due to the greenhouse gas already in the atmosphere, delays in taking strong action to reduce global carbon emissions decrease the likelihood of limiting the temperature increase to below 1.5°C.

Of particular concern are projections that the Reef could be affected by bleaching events twice per decade by about 2035 and annually by about 2044 if greenhouse gas emissions continue to increase at the current rate.[16] If bleaching becomes more frequent and more intense, there will not be enough time for reefs to recover and persist as coral-dominated systems in their current form.[3]

Impacts of increasing temperatures on turtle hatchlings

Climate change is causing the rapid feminisation of green turtles, as the sex of turtle hatchlings is determined by temperature. In a recent study, only about one per cent of juvenile turtles from warmer nesting beaches in the northern Great Barrier Reef hatched male, compared to 31-34 per cent from cooler southern nesting beaches, raising concerns about viability of future populations.[24]

Turtle hatchlings, © Commonwealth of Australia (Great Barrier Reef Marine Park Authority), photographer: M. Turner

Together with the impact of other pressures such as poor water quality from land-based run-off and outbreaks of crown-of-thorns starfish, climate change adds to the cumulative impacts on the health and resilience of the Reef.[2]

Ecosystems of the Reef are already undergoing fundamental changes and will be very different in the future.[7] Resilient reefs can regenerate after a disturbance if given sufficient time to recover and can continue to support a high variety of species, even if they do not return to their original condition. However, more frequent and more intense bleaching allows less time for coral reefs to recover and adapt, and reduces their ability to withstand other impacts such as disease.[5,17] Loss of corals leads to a reduction in the fish and associated species they support.[18] These reef-associated species and the community benefits derived from them are directly and indirectly vulnerable to the impacts of climate change.

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Actions and outcomes: immediate and strong action to reduce greenhouse gas emissions

There is an urgent need to accelerate actions to decrease global greenhouse gas emissions if we are to secure a better future for the Reef and the communities and businesses that depend on it. Even with immediate and strong action to reduce global emissions, increasing temperatures will continue to affect the Reef due to the greenhouse gas already in the atmosphere. Further impacts on the Reef can be minimised by limiting global temperature increase to the maximum extent possible under the Paris Agreement[19] (and ideally less). The Paris Agreement aims to strengthen the global response to climate change by keeping the global temperature increase this century to well below 2°C, while pursuing efforts to limit the increase to 1.5°C. The Authority actively highlights the impacts of climate change on coral reefs to influence global discourse on greenhouse gas emissions.

> *"Coral reefs globally, including the Great Barrier Reef, are deteriorating from the impacts of climate change. Immediate national and international action is required to reduce global greenhouse gas emissions to levels that maintain the ecological function of coral reef ecosystems. The Great Barrier Reef underpins significant social, cultural and economic benefits for Australia and we have an ongoing responsibility to show leadership in continuing to reduce global emissions"*
>
> *Ian Poiner, Chairperson of the Great Barrier Reef Marine Park Authority*

The Authority recognises the scale and challenges associated with global reduction of greenhouse gas emissions, and the transformative policy and cooperation required across multiple levels of government, both nationally and internationally.

While the world takes action to reduce greenhouse gas emissions, protecting the Reef requires an innovative and multi-disciplinary approach. Actions in the Marine Park and throughout the Reef region that strengthen Reef resilience, reduce cumulative impacts, and protect and enhance habitats with carbon storage potential are critical to help the Reef cope better with the changing climate. The *Reef 2050 Long-Term Sustainability Plan*[20] provides an overarching framework for managing the Reef. The Authority also recognises the critical importance of strong and effective implementation of all government programs, policies and tools supporting action on climate change.

Reef Blueprint

The Authority's management approach is adaptive and focused on building the resilience of the Reef ecosystem, promoting Reef recovery, and protecting and restoring critical Reef habitats. Guided by the *Great Barrier Reef blueprint for resilience 2017,*[21] the Authority supports a range of initiatives in the Marine Park, such as enhancing compliance, protecting key species, crown-of-thorns starfish control and investigating options for Reef restoration and adaptation. Without collective action to reduce global greenhouse gas emissions, these management actions can only partially offset widespread loss of reef habitat and biodiversity from the impacts of climate change over the coming decades.

Australia is also a founding member of the International Coral Reef Initiative (ICRI), which was established to raise the profile of impacts on coral reefs locally and internationally. Through ICRI, the Authority will continue to highlight the need for urgent action to reduce global greenhouse gas emissions. More information on ICRI can be found at www.icriforum.org.

Care of the Reef is a shared responsibility. Through its partnerships, education and stewardship activities, the Authority empowers people and builds the capacity of Marine Park managers, industries and communities to adapt their activities and deliver on-ground actions to benefit the Reef. Actions everyone can take can be found at www.gbrmpa.gov.au and www.environment.gov.au.

In summary

Climate change is the greatest threat to the Great Barrier Reef. If we are to secure a future for the Great Barrier Reef and coral reef ecosystems globally, there is an urgent and critical need to accelerate actions to reduce global greenhouse gas emissions. This must happen in parallel to taking actions to build the Reef's resilience.

This position statement is endorsed by the Great Barrier Reef Marine Park Authority Board. For the evidence underpinning this position statement, refer to the Great Barrier Reef Outlook Reports and supporting references.

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