

# AMOS Summit

25 June 2025

**The Hon Matt Kean – Chair, Climate Change Authority**

*Check against delivery*



May I begin by acknowledging the Traditional Owners of the land on which the Cairns Convention Centre stands and where we meet today, the Gimuy Walubara Yidinji & Yirrganydji peoples. I would also like to pay my respects to their Elders past, present and emerging, and to Elders of all First Nations communities that visit here.

I'm honoured to address the summit of the Australian Meteorological & Oceanographic Society. My good friend Tony Haymet, Australia's Chief Scientist and a fellow member of the Climate Change Authority, is also looking forward to speaking to you.

The value of your science cannot be overstated and it's great to see so many early-career researchers at this conference. We gather, of course, near one of the world's natural wonders, the Great Barrier Reef.

Last week marked the fiftieth anniversary of two wildly different events, both on June 20. One was the release of the Jaws movie. Its plot and catchline – "Just when you thought it was safe to go back in the water" – arguably set back global marine conservation more than any other cultural phenomenon.

By coincidence, last Friday also marked 50 years since the start of one of Australia's biggest marine conservation efforts: the creation of the Great Barrier Reef Marine Park. The Park Authority was itself the world's first statutory body dedicated to conserving and caring for a coral reef system. We should pay homage to the campaigners who made the Park a reality, and the many who have toiled to protect the reef in the decades since.

But if the threats to the Great Barrier Reef and corals everywhere were set to a musical score, it might well resemble those ominous tones of Jaws. In the past decade, there have been six years when the Reef has been hit by mass coral bleaching. Last summer marked only the second time it had been hit by widespread bleaching over consecutive years. The Climate Change Authority has begun work on a report on the Reef's threats – from ocean warming, acidification and more frequent extreme weather events – and it's clear this natural wonder is at risk. While yet to be finalised, the report's findings won't surprise many here. But they are stark, nonetheless.

In short, carbon emissions from humans burning fossil fuels and clearing land are driving the Great Barrier Reef towards the brink. The Great Barrier Reef hosts 1600 species of fish, more than 450 coral species, and 900 types of algae and seagrass. It is also home to the threatened dugong and six of the world's seven turtle species, many of them particularly valued as totemic species for traditional owners. Without near-term, coordinated international action to reduce greenhouse gas emissions, the window to avoid broadscale loss the Reef's ecosystems is closing, our report will find.

And how broad is "broadscale"?

Should global warming settle at 1.5 degrees Celsius above pre-industrial levels for an extended spell, 70 to 90 percent of the Great Barrier Reef is forecast by scientists to decline. At 2 degrees warming, as much as 99 percent of corals may be lost or fundamentally altered, our report will find. The Paris Climate agreement, you'll recall, also specified warming should be kept to as close as 1.5 degrees, and not more than 2 degrees. Putting it another way, traditional owners, tourists, fishers, and scientists alike – all they may be left with is a vestige of today's Great Barrier Reef.

That's if we don't act with urgency to reduce emissions now.

From an economic perspective alone, thousands of jobs and billions of dollars of activity are in peril. And that's if global warming can be restrained to 2 degrees. The Government's upcoming National Climate Risk Assessment – part of which has already been made public – considers scenarios of as much as 3 degrees warming. International promises to cut carbon emissions have us on track to 2.8 degrees, and that's if commitments are acted on. With the carbon the world is presently emitting, we are on course to smash past that level. No barrier on emissions will mean virtually no Great Barrier Reef – it's as simple as that.

What fragment of the Great Barrier Reef will remain at 3 degrees or more?

Now, Professor Ove Hoegh-Guldberg was among the first to describe the mechanism of misery, and it's pleasing to see him once again playing a prominent role at an AMOS summit. Thank you for your pioneering work, Ove, as distressing it must have been for you over the years. In simplest terms, when reef waters get too warm, corals get stressed. They expel the algae that gives them their iridescent brilliance, and much of their energy. Disease and death can follow.

As far back as 2011, Ove wrote: "At the current rate of ocean warming, we will soon exceed the critical temperature at which this happens every year, causing the Great Barrier Reef to rapidly degrade." The message that can't be underscored enough, by music or other means: we need accelerated action to cut emissions to maximise the chance of preserving what we can of Australia's and the world's coral systems. Surely, it's our collective responsibility to ensure this beacon of beauty shines long after we're long gone.

Traditional owners are among those experiencing the perils most keenly.

Take Madeina David, a Torres Strait Islander, who hails from Iama in the central island cluster of what she calls "far, far north Queensland". Technically, Iama lies just outside the Great Barrier Reef Marine Park but shares the same threats because, as AMOS members know well, hazards like these don't respect lines on a map. Mass coral bleaching was not known to science before 1979, so it's hardly surprising traditional lore does not feature them. Madeina's first experience with coral bleaching was in 2016. It severely damaged a much-loved nearby reef that has yet to recover its former splendor and abundance of life.

Those living in the Torres Strait, can't ignore another emergent threat: rising sea levels. The regional rise is between 6-8 millimeters a year, or about twice – I repeat, twice - the global average over the past three decades of 3.4mm. For residents on Iama and other islands, that means displacement. So, at times of particularly high tides, such as in 2011, homes get inundated. Madeina remembers dead corals being picked off roofs. Think of it as dispossession for a second time.

Rising seas were a key reason the Bramble Cay Melomys, a Torres Strait animal, became the world's first mammal to become extinct because of human-caused climate change. The Melomys was declared extinct six years ago, and it won't be the last species lost. Madeina, a marine biologist by training, has witnessed turtles losing their key breeding grounds. As many as 50% of eggs have been washed away. There's also the growing threat to turtles and other species subject to temperature-dependent sex determination. High temperatures result in all-female turtle clutches when the eggs hatch.

Changes in the Torres Strait can be more subtle. Seasonal winds from the south-east and then the north-west shift sand one way and then the other. When the south-easterlies prevail or the north-westerlies fail to blow – the case in recent years - precious rock habitat for crayfish or seagrass meadows for dugongs get swamped by sand.

Not surprisingly, climate change is taking its toll on the community.

"It's our whole identity; our culture, our spirituality and our subsistence," Madeina tells us, adding with frustration, "We have one of the smallest footprints for climate change, but we're impacted the most." Madeina's sentiments are visceral and remind us why we must tackle global warming with all the vigour and urgency we can muster.

Treat it like the Jaws drumbeat, amped up, and coming from all directions.

The latest Earth System Science Data, including input from CSIRO and the Bureau of Meteorology, last week noted 2024 was the hottest year on record, 1.52 degrees above the 1850-1900 baseline. Warming, it found, is accelerating, reaching 0.27 degrees per decade during the 2015-2024 period.

That means by the time my three-week old daughter is celebrating her 21st birthday, barely any fragments of this world's wonder may still be alive in the wild - if that pace of warming continues. We need breakneck speed, not bottlenecks, when it comes to climate action.

As a statutory body, the Climate Change Authority's provides governments with robust, expert and independent advice. The work of AMOS members is, of course, a key input. We are, as you may know, preparing advice for the Government on Australia's 2035 emissions targets.

As the home and custodian of the Reef, Australia can play a leading role in accelerating these necessary emissions reductions. That's both in our own cuts but also in rallying and coordinating others. Indeed, should Australia share the hosting rights of the Conference of the Parties summit next year with our Pacific partners, we will have an unmatched opportunity to demonstrate that leadership. COP31 could be the critical turning point for our Great Barrier Reef and for the reefs across the Pacific.

By adopting zero-emissions technologies, Australia can directly cut our own emissions and show the way for others. As the Superpower Institute has argued, Australia could supplant almost 10% of global emissions by 2050 if we provide the green steel, aluminium and other industrial processes using our abundant renewable energy resources.

As an island continent, we are famously girt by sea, but by extension, exposed to perils from all points on the compass. The unusual ocean warmth that triggered the latest bout of bleaching wasn't confined to waters off Queensland. Waters in the Australian region have been the warmest or second-warmest on record for every month since last July, the Bureau of Meteorology tells us.

Off north-western Australia, sea-surface temperatures soared to as high as 4 degrees above average. That's a shocking departure from the norm, as oceans tend to heat or cool much slower than temperatures over land. The Ningaloo Reef began bleaching too, the first time this western reef has bleached in synch with the Great Barrier Reef. Both, of course, are World Heritage sites for their outstanding universal values. The damage to areas such as the Rowley Shoals, a so-called "hope spot" for their prior resilience, is reportedly severe.

Researchers returning to the mainland are distraught – and we should be too.

Scientists have long understood that our oceans act as a giant thermometer when it comes to tracking global warming. After all, oceans absorb about 93 percent of excess heat being trapped by our planet – and just as well, imagine the heatwaves on land if they didn't.

Those living near the South Australian coast have been warned to tread carefully along the beaches or avoid them altogether because of huge algal blooms, following a big marine heatwave last September. These blooms have created vast dead zones, starved of oxygen, smothering marine life in vast toxic blankets. *Jaws*, as you may know, was partly filmed in South Australian waters known for their white pointers. Now, sharks are washing up dead, along with dolphins, rays, little penguins and many other species.

Observing oceans and how they interact with the atmosphere is, of course, core business for AMOS. Your services are becoming increasingly important, whether for alerting about reef bleaching risks or other threats.

Along with most of the extra heat, oceans also absorb about 30% of extra carbon dioxide emissions we pump out. As the Authority's reef report will note, that amounts to about 3 billion tonnes of CO<sub>2</sub> being added to the marine environment each year. Think of the pollution of 650 million combustion-engine cars, or about seven times Australia's annual carbon emissions.

Acidification looms another peril, one that is perhaps just as pernicious for corals as heat stress. Corals already struggling to recover from heat stress use minerals in seawater to rebuild and recover – but will have less access to these materials because of the increase in ocean acidity. The same challenge for adaptation exists for other animals that use calcium minerals in the ocean to build their skeletons and shells.

Authorities that set aside ocean reserves to give fisheries and other species sanctuary and hope of recovery deserve great credit, as David Attenborough so brilliantly demonstrates in his new *Ocean* documentary. But when it comes to the creeping warming and acidification of our seas, there's sadly few places to hide.

As the people in this room know better than anyone, oceans play a big role in determining our weather. As the atmosphere gets ever more energised from that additional trapped heat, weather extremes are likely to get wilder. For the Great Barrier Reef, that means more intense tropical cyclones that can cut swathes through the coral reefs. Their powerful winds and storm surges also batter the coastal mangroves that help stabilise the coast. Those tempests can also carry more rain to dump since the atmosphere holds about 7 percent more moisture per degree of warming.

As our upcoming Reef report notes, back-to-back cyclones in north Queensland in late 2023 and early 2024 triggered 700-kilometre-long flood plumes along the coast. Ecosystems were swamped with sediment. Cyclones

are also expected to be sustained further south as waters warm. They need minimum sea-surface temperatures of 26.5 degrees to get going, and such areas are only likely to expand on our present heating path.

Governments and emergency authorities will need to adjust to these trends. Cyclone Alfred spinning into the coast just north of Brisbane was one wake-up call, but so too was Cyclone Seroja four years ago. It crossed the West Australian coast as a category-3 strength storm at a similar latitude to Brisbane.

A separate Authority report out last week, Home Safe, looked at how exposed Australian homeowners are to climate change. One takeaway was the need to examine whether the regions of the coast covered by cyclone construction codes need to be expanded. In Queensland, the so-called Category C zone that requires structures to be cyclone-resistant now only extends southwards towards Bundaberg. That's about 300 kilometres north of Brisbane and the Gold Coast with their rapidly growing populations.

It's not surprising that the upcoming federal Government's National Climate Risk Assessment earmarks the oceans as directly driving half of the 10 key threats.

AMOS scientists, of course, have been studying these perils for years, including your busy secretary, Ben Hague, a Bureau of Meteorology scientist. Some of Ben's work stood out for me, particularly his team's research into how riverine flooding combined with high tides to inundate much of Ballina during the 2022 floods. I was the Treasurer of NSW at the time, scrambling to fund a recovery from the most-costly floods in the state's history. Ballina, with 46,000 people, has no officially defined flood thresholds even though it suffers frequent tide-driven minor floods. Much of the town sits just above high tide levels. The 2022 inundation damaged thousands of homes and businesses, and triggered hundreds of emergency rescues.

Ben also led researchers in a 2023 paper that examined present-day extremes for 37 tide gauges around Australia. Its sobering projection: with a less than 1-metre rise in sea levels, 85% of locations can expect centennial extremes to occur 30 days per year. In media parlance, that shift would be written up as "once-in-a-century" events becoming "once in a fortnight". Flood-hit communities already know that insurance premiums are soaring – sometimes out of reach.

Many of these climate challenges are coming to a beach or estuary near you.

It's been said that because Australia contributes about 1% of world's emissions, cutting our carbon emissions won't make much difference. Australia, though, is exposed to 100% of climate change impacts.

Critics might say, where are Australia's glaciers and ice sheets? I'm glad they asked because it gives me the opportunity to recognise our brave and hardy Antarctic scientists, some of whom are here today. Your work is pioneering, sometimes dangerous, and yet vital to our understanding of what's coming. We claim about 42% of the icy continent – an area equal to Australia minus Queensland.

The fact is, we still have so much to learn. For instance, there's the Denman Glacier, which sits in Australia's region, and holds enough ice to lift global sea levels by 1.5 metres alone. Prof Matt King, head of the Australian Centre for Excellence in Antarctic Science, says nobody had done serious research until Australia sent its new icebreaking research vessel there this past February to May. Cook Glacier, which has enough ice for 3-4 metres of sea-level rise, has never had research done on its coast and seafloor. These are unobserved places on the earth, King says.

And there's the Antarctic Circumpolar Current, the world's strongest ocean current, moving 100 times the water of the Amazon River or five times the Gulf Stream's. It's also slowing, so more warm water is going to reach Antarctica's ice sheets. Sadly, the science that's revealing nature's secrets and their implications for our climate and weather is itself under threat.

And it's not just Prof King's centre, which has a bit over a year's funding left. There's the flotilla of Argo floats that have transmitted more than 2 million salinity and subsurface observations since 1999. These are roughly half-funded by the US, and the Trump administration is threatening to slash funding. Australia stumps up about 10% of the Argo funding and has benefitted greatly from the investment. Other US services, from coral reef monitoring to satellite observations, are likewise at risk.

Australia can't fill the US void alone, and I'm sure many of the AMOS members are busy trying to identify possible gaps and how to fill them. The potential disruption must serve as a call to arms for sustained support for science, here and elsewhere.

Indeed, the role of science will only grow in importance. For example, we're going to need your smarts when it comes to climate adaptation given the scale and wide range of possible outcomes. Knowledge sharing is going to be important, too, but we must strive to generate new knowledge to share. Better policy needs better science. Decision-makers – in government, business and the investment community – need clear and unambiguous information about the real and growing risks we face in a changing climate.

To end on a personal note, I know many of you will visit the Great Barrier Reef during your visit to Cairns. I would love to join you, but I have a young family to head home to. I was inspired by the glories of the Reef in my youth, and I hope you will be too. Indeed, I fervently want my children, including my three-week-old daughter Zoe to experience the same wonder and joy I had.

May you return with fresh vigour and intent. After all, we can't let the Reef or other treasures of nature wither from our neglect.

Science at its best delivered medical advances miraculous to our ancestors, put a Man on the Moon and figured out how to harness our sunshine. Love for our planet is one renewable source of hope, but another is your talent and determination. We're going to need both in abundance!

Thank you for listening.