

Reef Restoration and Adaptation Program

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Presentation to the National Adaptation Forum session on Nature-Based Solutions for Adaptation

Distinguished Professor Stewart Lockie, James Cook University



*We extend our deepest respect and recognition to all
Traditional Owners of the Great Barrier Reef and
First Nations Peoples globally holding the hopes,
dreams, traditions and cultures of this world*



Right now, the Great Barrier Reef is a major platform for coral reefs R&D and innovation

\$167 million from the Australian Government and Science Partners
– 4 years - Fundamental and Applied Research Partnership

To provide decision-makers with safe, socially acceptable, and economically viable options for intervening at scale on the Great Barrier Reef, and other reefs, to help them recover from, and adapt to, the effects of climate change



Protect

Cool and shade reefs most at risk



Adapt

Strengthen corals tolerance to climate change



Restore

Promote recovery of degraded reefs

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- Reducing greenhouse gas emissions and achieving carbon neutrality remain the top priorities.
 - Maintaining and intensifying conventional management of the GBR Marine Park is critical, including fisheries, water quality and Crown-of-Thorns Starfish control.
 - Even if global warming is limited to 1.5°C, current approaches are not enough to protect the world's coral reefs.
 - Combining a suite of interventions to protect coral reefs and assist their adaptation at scale could reverse the trend for the GBR.

Coral Reefs

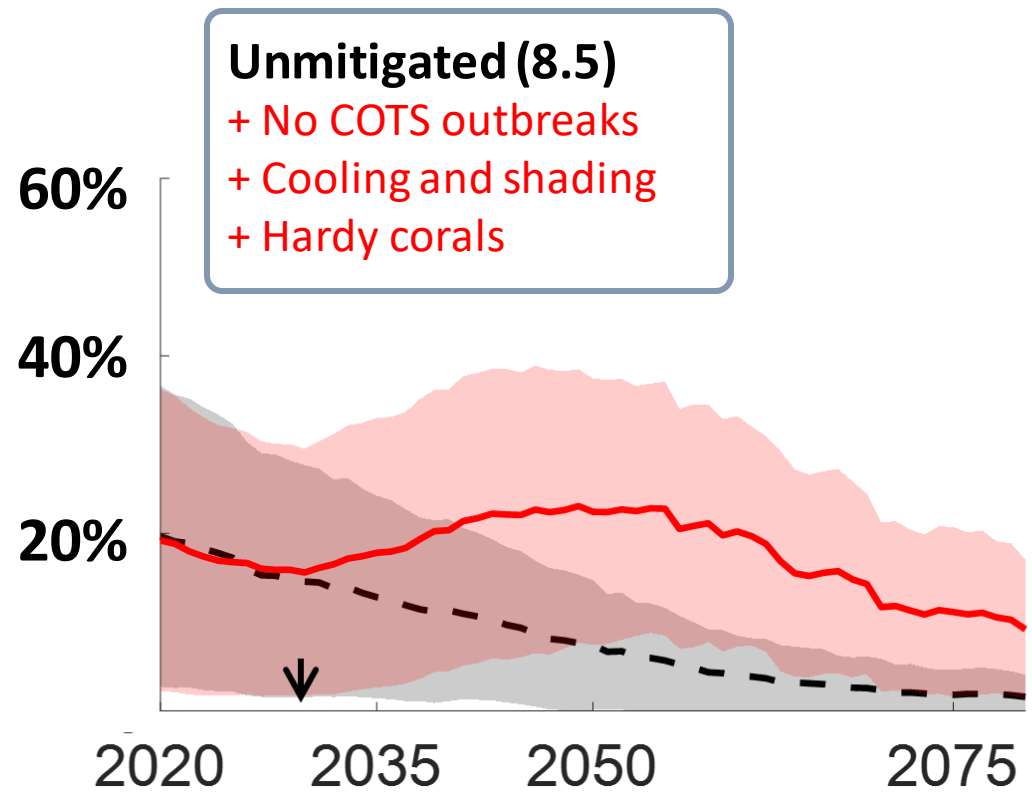
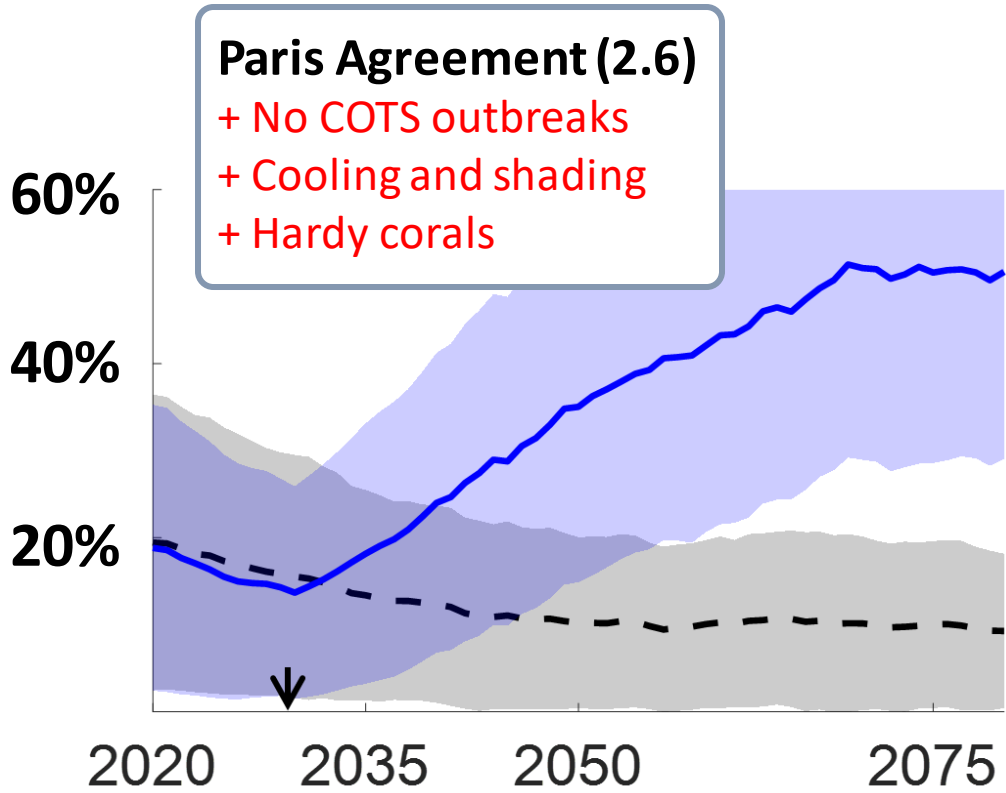
Too important to lose

Oceans and the life they sustain depend on coral reefs. Without living oceans, humanity cannot survive

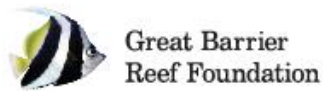
The window to act is closing



Coral Cover



Reef Restoration and Adaptation Program, a partnership:



STAKEHOLDER ENGAGEMENT AND REGULATION

MODELLING AND DECISION SUPPORT

ECOLOGICAL INTELLIGENCE AND RISK

TRANSLATION TO DEPLOYMENT

CROSS-CUTTING
SUPPORT

COOLING
AND
SHADING

RUBBLE
STABILISATION

MOVING
CORALS

ENHANCED
CORALS AND
TREATMENTS

CORAL
AQUACULTURE
AND
DEPLOYMENT

CRYO-
PRESERVATION

RESEARCH AND
DEVELOPMENT

Prezi Overview

<https://prezi.com/view/bK2cGyhGagK7Imx16lla/>

For more information

<http://www.GBRrestoration.org>



Cooling and Shading the Reef

Lead: Daniel Harrison (SCU)

- Cloud Brightening -> Harness natural sea salt spray to increase the amount of sunlight and heat that clouds deflect
- Fogging -> Mimic the effects of sea fog to shade and reduce the amount of sunlight and heat reaching the sea surface
- Assessment of potential for regional and GBR-wide scale-up



Rubble Stabilisation

Leads: Peter Mumby (UQ), Scott Bryan (QUT), Tom Baldock (UQ)

- Formation -> Assess where and why coral rubble is a problem on the Great Barrier Reef and map opportunities for interventions
- Binding -> Understand optimal conditions and develop techniques for cost-effective binding and stabilisation at a range of scales

Moving Corals

Leads: Peter Harrison (SCU), Christopher Doropoulos (CSIRO)

- Spawn Collection -> Scale up automated and passive wild coral spawning slick collection
- Larval Rearing -> Mass coral larvae culture and improvements in thermal tolerance
- Settlement and Deployment -> Scale up deployment and translocation technologies onto targeted reefs



Coral Cryopreservation

Lead: Jonathan Daly (Taronga, UniNSW)

- Technology -> Establish high-throughput coral cryopreservation technologies in Australia
- Aquaculture Support -> Provide genetic and reproductive material to circumvent spawning limitations
- Biobanking -> Secure and preserve genetic diversity and biodiversity

Enhanced Corals

Leads: Line Bay (AIMS), Andrea Severati (AIMS)

- Mapping Reef Genome -> Understand the adaptive capacity of corals to current and future climates
- Enhancements -> Development of breeding methods and treatments to enhance resilience and thermal tolerance
- Determine benefits and trade-offs of enhancing bleaching tolerance



Aquaculture and Deployment

Leads: Line Bay (AIMS), Andrea Severati (AIMS)

- Mass Aquaculture -> Develop technologies and engineer facilities for automation of propagation and mass production of multiple coral species for deployment
- Settlement Devices -> Optimal (biological and physical) design of coral settlement devices compatible with automation and large scale deployment

RRAP Stakeholder and Traditional Owner Engagement Subprogram

Leads: Stewart Lockie (JCU), Bruce Taylor (CSIRO), Karen Vella (QUT)

Understand

Monitor public perceptions of reef restoration and adaptation, analyse the distribution of risks and benefits arising from R&D interventions and deployment, and, identify opportunities to deliver co-benefits.

Involve

Design, pilot and implement novel or best-practice engagement opportunities for GBR communities and the public.

Learn

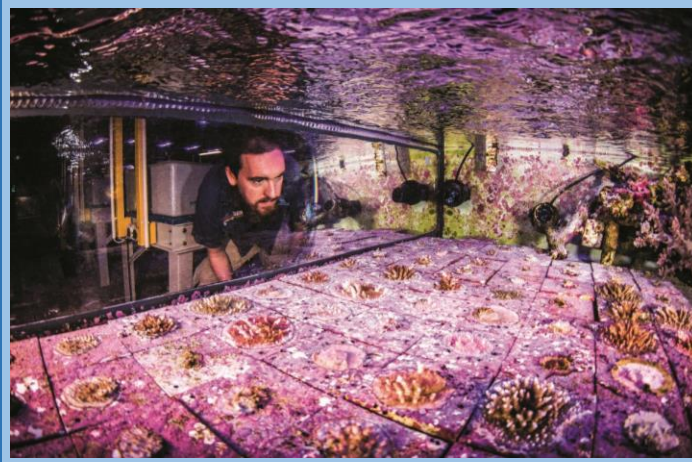
Involve stakeholders, GBR Traditional Owners and communities in co-design, evaluation and adaptive management of the RRAP.

Post 2024 – Focus on early deployment (parallel versus sequential approach)

- Ecosystem under **increased pressure**
- Modelling showing that **adapting a healthy ecosystem** is by far the more cost-effective option
- Third-party **funders seek visibility and material impact**, alongside long-term scientific research
- Several interventions could be ready by 2025:
 - Mass aquaculture and seeding of thermally-adapted corals
 - In-field assisted spawning and resettlement
 - Preventative local-scale fogging
- RRAP is establishing a new **Translation to Deployment** subprogram:
 - Refocusing the Integrated Logistics and Automation team on the delivery of promising interventions
 - **Establishing Critical Path** and coordinating inputs from R&D teams towards clear on-ground targets
 - Planning and activating **transition to industry and local communities**, including Traditional Owners

Targeted Intervention on the Reef

- Scaling-up existing technologies, building on RRAP co-investment and advances in the design, piloting and modelling of interventions
- Initial early intervention focus on growing and seeding corals with improved thermal tolerance, larval resettlement and fogging
- Seeding up to 1 million corals yearly from 2025-26 across priority reefs, propagating benefits over 30-40 years to wider areas of high tourism, ecological and cultural value
- Linked to \$85M funding announcement in the Billion Dollar Reef Package and aiming to activate new sources of funding through impact investment and valuation of biodiversity and ecosystem services



Activating industry and communities



- Intervention pilots provide a platform for building capacity and initiating industry uptake:
 - Cairns Port-Douglas Reef Hub
 - Reef Islands and Boats4Coral
 - Sea Ranger programs...
- Opportunity to leverage the significant existing RRAP investment in Traditional Owner participation to support Indigenous workforce and business development in the emerging reef restoration industry.
- Interventions will require regional land and sea infrastructure and capabilities, creating significant employment opportunities in communities most affected by the loss of coral reefs.
- Australia can play a leadership role in the region, build on best-practice governance and park management to maximize return on investment and promote reef resilience and climate adaptation in the globally.

RRAP is a Public Good program with global impact

- The **intrinsic diversity of the GBR**, geographically (latitudinal range, coastal and offshore) and biologically, means that RRAP R&D outcomes will have applications across many international sites
- RRAP discoveries will be **applicable across different contexts**, not all requiring advanced infrastructure or deployment strategies
- RRAP and RRAP Partners are actively **engaging with international groups** and contributing to global initiatives:
 - Coral Research & Development Accelerator Platform (CORDAP) and Global Fund for Coral Reefs (GFCR)
 - NOAA and DARPA
 - International Nature Framework Development Group (Biodiversity Credits)
 - International Coral Reef Initiative (ICRI), Coral Restoration Consortium (CRC), Coral Triangle Initiative (CTI), Reef Resilience Network, Resilient Reefs Initiative
 - Pacific Islands Countries and Territories, Small Island Developing States



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Australian Government



Great Barrier
Reef Foundation



THE UNIVERSITY
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OF MARINE SCIENCE



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