Reef Restoration and Adaptation Program

Real hope for the future of the Great Barrier Reef

A visionary program offers real hope for the Great Barrier Reef in the face of its greatest threat—climate change.

The Reef Restoration and Adaptation Program (RRAP) brings together leading experts from Australia, and around the world, to help protect the future of the Great Barrier Reef, other Australian reefs and coral reefs globally.

An 18-month concept feasibility study, drawing on more than 150 experts from 20 organisations across the globe, found **successful intervention was possible and could double the likelihood of sustaining the Reef in good condition by 2050.** The RRAP R&D Program, which begins in 2020, represents **the world's largest effort to help an ecosystem survive climate change.** The mission—to create an integrated group of reef interventions that is safe, acceptable, and at a scale to be effective. This is likely to include:

- cooling and shading to help **protect** the Reef from the impacts of climate change
- assisting reef coral species to evolve and **adapt** to the changing environment, to minimise the need for ongoing intervention
- supporting natural **restoration** of damaged and degraded reefs.

The resulting interventions would need to be used **in tandem with reducing global greenhouse gas emissions and continued best-practice reef management.**

This ambitious undertaking will require not only our best minds working in partnership across many organisations and fields of expertise, but importantly the involvement and support of Traditional Owners, Reef communities and industries and the wider Australian public. These groups will be meaningfully engaged, with the opportunity to participate in program decision-making.

Deploying these interventions will be a change in the way we manage our Reef; but modelling shows the risk of not acting is now greater than the risk of intervention.

If we succeed, the environmental, social and economic benefits for Australia and the world are likely to be enormous.

Photography by: Juergen Freund

Reef Restoration and Adaptation Program, a partnership helping the Great Barrier Reef resist, repair and recover:

Australian Government

Great Barrier Reef Foundation

Australian Government
Great Barrier Reef Marine Park Authority

CSIRO

QUT

Australian Institute of Marine Science

James Cook University Australia

Southern Cross University

The University Of Queensland Australia

Why do we need to help protect the Reef from climate change?

Climate change is the most significant threat to the Great Barrier Reef. Impacts include:

- more frequent and severe coral bleaching
- more severe weather events, such as cyclones and floods
- ocean acidification.

Existing efforts to protect the Reef focus on reducing environmental pressures such as improving water quality (managing fertiliser, pesticide and sediment flows into the Reef from catchments) and controlling the impact of the predatory crown-of-thorns starfish. This decades-long effort was overwhelmed in a few short weeks of sustained, unprecedented, high sea temperatures in 2016, and again in 2017 which caused major back-to-back coral bleaching events. The scale and severity of these events highlighted the critical threat climate change poses to the Great Barrier Reef, and all reefs.

If the world remains on its current emissions trajectory, reefs globally are projected to suffer catastrophic decline by mid to late century. Global temperatures are already 1°C above pre-industrial levels and pushing the limits of corals' resilience. Even if the world can stabilise global warming at 1.5°C above pre-industrial levels, mass bleaching events are still predicted to increase in frequency and severity in the coming decades.

The Reef's resilience may already be significantly impaired with recent research showing coral recruitment and recovery are now taking longer.

Sophisticated modelling of future scenarios out to 2075 shows that **even in the best-case emissions reduction scenarios, these proposed interventions would almost certainly be required to help the Reef recover from and adapt to the changing climate.**

An investment to keep Australia's options open, and lead the world

In 2018, the Australian Government provided $6M for RRAP to undertake a study into the feasibility of developing a toolkit of effective interventions that could be implemented if, when and where it was decided action was needed.

The RRAP Concept Feasibility Study specifically assessed:

- were new interventions likely to be needed?
- if they were developed, could they assist in maintaining high-value Reef functions, and what would be the ecological, economic and social benefits and risks?
- were interventions at the required scale technically feasible, and what would be the likely cost to deploy them?
- what was the social acceptability of at-scale reef intervention, and how should stakeholders be engaged in development and decision processes?
- what would be the design and cost of an R&D program to assess and develop new interventions such that they could be deployed if required?
- what would be the required governance framework and global partnerships to deliver the R&D program?

The analysis concluded **effective RRAP intervention strategies would almost certainly be needed to sustain reef health and values. Combined with best-practice conventional management, they could double the likelihood of sustaining the Reef in good condition to 2050.**

Under best-case emission-reduction scenarios, RRAP interventions could help protect and retain the important environmental, social and economic values of the Great Barrier Reef indefinitely.

In a high-emissions future, RRAP interventions could help protect and retain core environmental, social and economic values of the Reef for another 20-30 years, buying time for Reef survival.

Cost-benefit analyses showed potential returns to the nation (economic activity, jobs, community development and capacity-building), would be many times greater than the required investment, including direct benefits to, and involvement of, regional economies and Traditional Owners.

Estimates of undiscounted damage avoided (or benefits achieved) from implementing new interventions, compared with continued, best-practice conventional management, ranged from a conservative $10.7B to between $200B and $773B over 60 years. The outcome would depend on the climate trajectory, the response of the Reef to the changing conditions and the extent of interventions deployed to support it.

The RRAP concept feasibility study also found:

- the longer we wait, the more expensive and difficult it will be to successfully intervene at any scale, and the greater the risk the window of opportunity will close
- the solution will not be a single intervention, rather the deployment of a range of methods that work together to provide compounding benefits, along with ongoing best-practice reef management
- it will be vital to work closely with Traditional Owners, and engage different community groups and interests in the co-design, deployment and evaluation of proposed interventions or technologies.

The RRAP R&D Program will establish Australia as the global leader in coral reef adaptation and restoration. It will open opportunities to create new industries, partner internationally and export our know-how to other countries whose reefs face similar challenges.

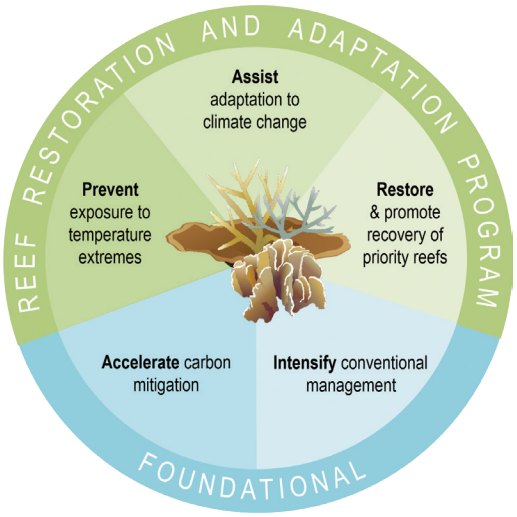
How will RRAP deliver these outcomes?

The RRAP R&D Program is designed to be responsive to the range of possible climate outcomes and the range of the Reef's ecological responses to this changing environment. It aims to strike a balance between minimising risk and maximising opportunity to save Reef species by:

- driving early deployment of smaller-scale interventions as soon as feasible, to help protect high-value reefs
- quickly identifying and focusing on interventions with the highest likelihood of success
- reducing uncertainty around the benefits, risks and costs of interventions
- managing resources in a flexible and cost-efficient way
- engaging with stakeholders in a meaningful way in decision and development processes.

During the first five years, the R&D program will focus on delivering the underlying cross-cutting research sub-programs that underpin the success of all, or groups of interventions, as well as moving smaller-scale interventions to deployment stage.

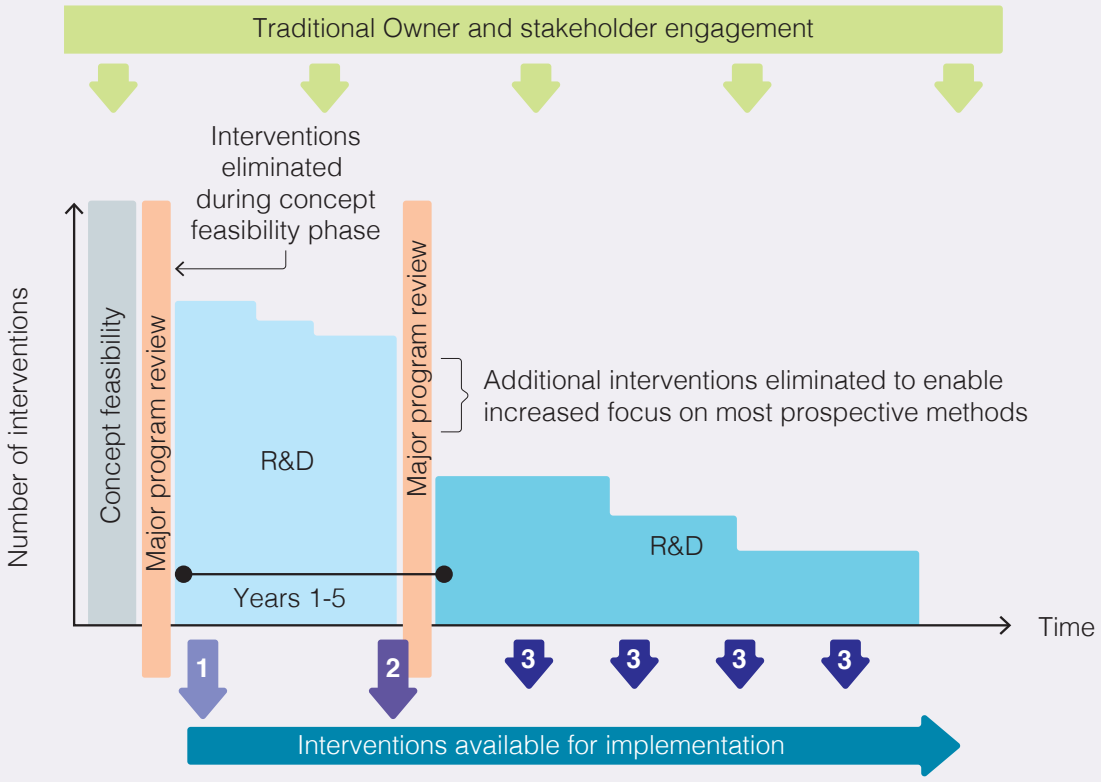
As the program progresses, focus would shift to deployment of larger-scale interventions. This R&D program evolution is depicted in the figure below, including the progressive elimination of intervention options as research findings improve knowledge of feasibility, risks, efficacy, social acceptance and regulatory compliance.



RRAP interventions are likely to be an integral part of a multi-pronged strategy to protect the Reef. Graphic by Blue Bay Design. Coral image courtesy of IAN.

The substantial risks of intervening would be managed using more sophisticated reef modelling, targeted ecological research to fill knowledge gaps and a bespoke decision support system that will be fully integrated into the wider Reef decision support systems.

The updated Reef 2050 Plan incorporates support for innovative approaches to reef restoration, protection and management. The RRAP mission would add a critical new set of strategy options to the Reef 2050 Plan; options that could build resilience under climate change.



1 Site scale interventions that could be fully operational within three to five years (assuming immediate investment in the necessary infrastructure, operational systems and supporting R&D)

2 Additional interventions available for implementation, most likely in the small to medium scale range

3 Interventions at large scale

Traditional Owner and stakeholder engagement

Engaging Traditional Owners and stakeholders will be a key element of the R&D program, to ensure wide participation in, and support for, program decisions.

RRAP acknowledges the ongoing spiritual and cultural connection of Traditional Owners to the Great Barrier Reef, their native title and the diversity of values, rights, interests and aspirations. Traditional Owners have a unique and critical role in the formulation and implementation of intervention options. They are recommended to have a prominent place in the program governance structure, to ensure these communities are included in decision-making involving restoration or adaptation activities on their sea country.

A national survey of the broader Australian public in 2018 suggests early, in-principle support for large-scale reef restoration and adaptation (71%). While general public support is evident, stakeholders and Traditional Owners have raised important concerns, as well as seeing potential benefits from the program. Ongoing engagement and monitoring of community attitudes and issues is essential to maintain this support, especially as proposed interventions develop and move closer to deployment. A stakeholder sub-committee is proposed to advise the program steering committee which will lead program implementation.

Photography by: Tristan Simpson

Tailored engagement activities will support transparency and co-design of interventions, identify co-benefits from the program and explore the broader trade-offs and uncertainties associated with future reef states.

A consortium of partners

The RRAP R&D Program will be delivered by a consortium of partners—each bringing unique and complementary capabilities. These partners will include the Great Barrier Reef Foundation, the Australian Institute of Marine Science, CSIRO, James Cook University, the University of Queensland, Queensland University of Technology and Southern Cross University.

Successful delivery of this challenging program will require the expertise and innovation of many other organisations and individuals and there is the opportunity for further partners to join as the program progresses.

The first stage of the RRAP R&D Program, scheduled to begin in early 2020, will be funded through $100M allocated for reef restoration and adaptation science as part of the $443.3M partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation.

The collaboration that will deliver the RRAP R&D Program will operate as an unincorporated joint venture, governed by a board with an independent chair, supported by an independent peer review panel and a Traditional Owner advisory sub-committee.

Within the collaboration, the Great Barrier Reef Foundation, as the principal investor, will have specific obligations for integration across the broader Reef Trust Partnership portfolio as well as third-party fundraising and governance of the investments.

The Australian Institute of Marine Science, with its mandate to undertake R&D in support of the Great Barrier Reef, will be the managing entity for the collaboration.

Given its primary regulatory role, the Great Barrier Reef Marine Park Authority, which provides for the long-term protection and conservation of the Reef, will act as an observer and advisor to the collaboration.

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For more information: www.GBRrestoration.org