



Reef Restoration and Adaptation Program

R1: ENGAGEMENT AND REGULATORY DIMENSIONS

A report provided to the Australian Government by the Reef Restoration and Adaptation Program

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1. PREAMBLE

The Great Barrier Reef

Visible from outer space, the Great Barrier Reef is the world's largest living structure and one of the seven natural wonders of the world, with more than 600 coral species and 1600 types of fish. The Reef is of deep cultural value and an important part of Australia's national identity. It underpins industries such as tourism and fishing, contributing more than \$6B a year to the economy and supporting an estimated 64,000 jobs.

Why does the Reef need help?

Despite being one of the best-managed coral reef ecosystems in the world, there is broad scientific consensus that the long-term survival of the Great Barrier Reef is under threat from climate change. This includes increasing sea temperatures leading to coral bleaching, ocean acidification and increasingly frequent and severe weather events. In addition to strong global action to reduce carbon emissions and continued management of local pressures, bold action is needed. Important decisions need to be made about priorities and acceptable risk. Resulting actions must be understood and co-designed by Traditional Owners, Reef stakeholders and the broader community.

What is the Reef Restoration and Adaptation Program?

The Reef Restoration and Adaptation Program (RRAP) is a collaboration of Australia's leading experts aiming to create a suite of innovative and targeted measures to help preserve and restore the Great Barrier Reef. These interventions must have strong potential for positive impact, be socially and culturally acceptable, ecologically sound, and ethically and financially responsible. They would be implemented if, when and where it is decided action is needed, and only after rigorous assessment and testing.

RRAP is the largest, most comprehensive program of its type in the world; a collaboration of leading experts in reef ecology, water and land management, engineering, innovation and social sciences, drawing on the full breadth of Australian expertise and that from around the world. It aims to strike a balance between minimising risk and maximising opportunity to save Reef species and values.

RRAP is working with Traditional Owners and groups with a stake in the Reef as well as the general public to discuss why these actions are needed and to better understand how these groups see the risks and benefits of proposed interventions. This will help inform planning and prioritisation to ensure the proposed actions meet community expectations. Coral bleaching is a global issue. The resulting reef restoration technology could be shared for use in other coral reefs worldwide, helping to build Australia's international reputation for innovation.

The \$6M RRAP Concept Feasibility Study identified and prioritised research and development to begin from 2019. The Australian Government allocated a further \$100M for reef restoration and adaptation science as part of the \$443.3M Reef Trust Partnership, through the Great Barrier Reef Foundation, announced in the 2018 Budget. This funding, over five years, will build on the work of the concept feasibility study. RRAP is being progressed by a partnership that includes the Australian Institute of Marine Science, CSIRO, the Great Barrier Reef Foundation, James Cook University, The University of Queensland, Queensland University of Technology, the Great Barrier Reef Marine Park Authority as well as researchers and experts from other organisations.

2. EXECUTIVE SUMMARY

Social acceptability, effective community engagement and robust regulatory systems are fundamental requirements for the development and future deployment of prospective interventions. These requirements are critical for ensuring the feasibility and viability of any proposed interventions.

As such, the critical needs of the Reef Restoration and Adaptation Program (RRAP) include understanding the social acceptability (or otherwise) of proposed interventions or specific technologies; assessing how proposed interventions (or non-intervention) may affect the diverse social and cultural values, uses and benefits associated with the Reef; and identifying appropriate ways to engage different groups and interests in the co-design, deployment and evaluation of proposed interventions or technologies over time.

Increasingly, the principles of responsible research and innovation are creating a global impetus for greater levels of public participation in technology research, development and assessment (Stilgoe et al., 2013). When participation builds stakeholder and public trust, understanding and ownership of an initiative, it can lead to increased success or reduced conflict (Reed, 2008). The RRAP will need to adopt engagement processes suited to the general public, to place-based or interest-based stakeholders such as reef communities or reef-dependent industries and with Indigenous Traditional Owners as rights-holders and custodians of the Reef.

Results from a nationally representative survey of Australian and Reef region residents conducted during the concept feasibility program indicate there is strong public in-principle support for science-based intervention to restore the Reef and support adaptation. Survey respondents were also generally accepting or undecided about specific technologies, suggesting cautious support exists for specific interventions. The early stage of RRAP, the still hypothetical status of several interventions and limited information available to survey respondents means caution is required in interpreting these results.

In-depth interviews with Reef stakeholders (e.g. environmental non-government organisations, tourism organisations and local governments in the Reef catchment) expressed greater levels of uncertainty about the restoration and adaptation technologies and raised concerns about ecological and socio-economic risks. Both stakeholders and Traditional Owners strongly assert that for risks to be identified and managed, and benefits to be realised, meaningful participation and transparency in decision-making and in the research and development (R&D) process is required. There was a widely-held view that restoration-based intervention on the Reef was necessary; however, for many stakeholders, the credibility of RRAP also depended on governments addressing direct threats to the Reef such as climate change.

The Reef stakeholder engagement and Traditional Owner context is complex and will continue to evolve over the life of the RRAP R&D Program. Engagement strategies tailored to RRAP R&D needs will require detailed planning, co-design, coordination and trials, and the development of novel models of engagement and techniques to support participation and improve overall program performance.

The existing Great Barrier Reef regulatory and policy environment as it relates to proposed RRAP interventions is robust, but it was not designed for the current context where significant new threats exist for the Reef. As such, it is no longer entirely fit-for-purpose. The current regulatory framework is complex, fragmented and overlapping. Its capacity to assess novel risks and impacts associated with unconventional interventions is limited. Reef restoration and adaptation interventions pose an unprecedented challenge to the capacity of the existing regulatory system to address novel risks and impacts, in the context of high levels of uncertainty and untested mechanisms for observation and monitoring.

The regulatory component of the RRAP R&D Program will work with the relevant regulatory authorities to help inform the development and deployment of a regulatory system that is better able to anticipate and assess the range of risks and impacts associated with unconventional reef restoration and adaptation interventions. Ongoing collaboration with the relevant regulatory bodies will enable the development of an appropriate, fit-for-purpose regulatory framework and policy best practice for reef adaption and restoration.

Achieving such a robust and enabling regulatory environment for reef restoration and adaptation will require focus on the following program areas:

- **Regulatory capacity:** identifying short-, medium- and long-term priorities to improve regulatory capacity to address RRAP interventions.
- **Guidelines and training:** preparing guidelines, and delivering training, to RRAP researchers, to ensure they are fully aware of the regulatory environment pertaining to the Great Barrier Reef.
- **Cooperation between regulators:** facilitating further cooperation between the Great Barrier Reef Marine Park Authority and other relevant regulators, with expert input from RRAP scientists on RRAP interventions involving emerging technologies (e.g. genetic engineering and geoengineering).
- **Permission system:** developing options to improve the permission system for reef restoration and adaptation interventions.
- **Policy and regulatory innovation:** developing options for regulatory and policy innovation.
- **Whole-of-government reef restoration policy:** preparing options for whole-of-government reef restoration policy development.

3. INTRODUCTION

Social acceptability, effective community engagement and robust regulatory systems are fundamental requirements for the development and future deployment of prospective interventions. These requirements are critical for ensuring the feasibility and viability of any proposed interventions and for appropriately balancing the short-term risks to the reef system of intervention actions against the medium- to long-term risks of no action.

Increasingly, the principles of responsible research and innovation are creating a global impetus for greater levels of public participation in technology research, development and assessment (Stilgoe et al., 2013). Participation can include a broad suite of strategies ranging from keeping the public or stakeholders informed, to involving stakeholders in the decision-making process and adaptive learning processes, to empowering the public or stakeholders to co-create decisions. The chosen strategy must carefully match the needs and purpose of the program and community or stakeholder expectations. RRAP will need to adopt engagement processes suited to the general public, to place- or interest-based stakeholders such as reef communities or reef-dependent industries and with Indigenous Traditional Owners as rights-holders and custodians of the Reef.

Work during the concept feasibility program began to address the following:

- Understanding the social acceptability (or otherwise) of proposed interventions or specific technologies
- Assessing how proposed interventions (or non-intervention) may affect the diverse social and cultural values, uses and benefits associated with the Reef
- Identifying appropriate ways to engage different groups and interests in the co-design, deployment and evaluation of proposed interventions or technologies over time.

Methods used to scope responses to the above challenges were:

- In-depth research interviews with 24 Reef stakeholders.
- A representative national survey in mid-2018 of more than 4000 Australians, including a subset of Reef residents (living less than 50km from the coast).
- A sentiment and discourse analysis of Twitter data.
- A review of the suitability of existing engagement arrangements in the Reef.
- A review of international literature on best-practice approaches and principles for engagement in large-scale ecological restoration and geoengineering projects.
- A review of existing information about Traditional Owner processes, values and aspirations related to management and governance of the Reef.

Details are further presented in the technical report ([T1: Stakeholder, Traditional Owner and Community Engagement Assessment](#)).

3.1 Regulatory environment

The regulatory environment (the regulations and the entities involved in the development, implementation, monitoring and compliance of these regulations) plays a key role in establishing safeguards to protect the environment and enable ecologically-sustainable use.

It influences what, where and how to restore, who should be responsible for, engaged in, and benefit from reef restoration and adaptation (Mansourian, 2017). The regulatory environment also enables preconditions of restoration, such as translating scientific knowledge into restoration standards, structuring of community participation, mobilising financial resources and incentivising action (Aronson et al., 2011; Richardson, 2016). Further, regulation may facilitate and support agencies and enterprises responsible for developing and implementing restoration best practice, knowledge and research (Aronson et al., 2011). Conversely, a complex, multi-jurisdictional regulatory environment may adversely affect restoration activities and can create confusion and conflict among stakeholders if it lacks the mechanisms for evaluating restoration success and fails to provide regulatory guidance.

Much of the work on regulatory implications of ecological restoration, to date, has been limited to land-based restoration (Aronson et al., 2011; Mansourian, 2016). The RRAP Regulatory Framework Sub-Program extended the focus of ecological regulation scholarship to the marine environment. Addressing this challenge is a threshold requirement for any intervention program to proceed. In addition, there is growing debate on how best to approach the use of emerging technologies for conservation (e.g. Redford et al., 2014; van Oppen et al., 2017), where the regulatory implications of these technologies are yet to be adequately addressed.

This sub-program examined the regulatory implications of reef restoration and adaptation interventions. This included mapping and analysing the existing regulatory environment in which proposed RRAP interventions would operate, and identifying limitations and gaps in the framework. The key findings of this analysis are summarised in [Section 4.2](#).

4. ANALYSIS AND FINDINGS

4.1 Engagement

There are several key findings from the engagement study:

1. There is strong public in-principle support for science-based intervention to restore the reef and, on average, cautious support for specific interventions. However, the datasets revealed complexities and attitude differences towards reef restoration by different groups:
 - The Australian public and Reef residents surveyed were generally accepting of the types of technologies and interventions proposed in RRAP (Figure 1). Some proposed technologies for cooling and shading (surface films and cloud brightening) and genetically-modified, heat-resistant (enhanced) corals were considered to be more risky than the others ([T1: Stakeholder, Traditional Owner and Community Engagement Assessment](#), section 5.1.7).
 - When interviewed, Reef stakeholders (e.g. local government, tourism industry and non-governmental organisations) had more complex attitudes towards reef restoration. Some were sceptical about government motives behind restoration-focused investment and were unsure about the likely effectiveness of interventions. They also identified several ecological, economic and social/psychological risks of the program including unintentional impacts on the food-web, pest potential, changes to local weather patterns, bio-cultural implications for Traditional Owners and moral conflict on the need for intervention.
 - Addressing carbon emissions and other threats to the Reef, while outside the scope of RRAP, were important to the perceived credibility of the program.
 - When reef restoration interventions were discussed on Twitter, sentiment was negative in the context of climate change or bleaching but positive when highly innovative technologies were discussed in the context of protecting, repairing and preventing damage to the Reef (in non-Australian tweets). Reproduction- and recruitment-related strategies were associated with the highest positive sentiment.
 - Focusing on positive and observable action, there is opportunity to mobilise significant public support for Reef restoration.
2. Belief about the need to help the Reef, and trust in science and reef managers, were important for social acceptance:
 - People's beliefs about the need for direct intervention to help repair, restore and build the resilience of the Reef, and public trust in reef managers, authorities and research institutions were strong predictors of acceptance of reef restoration.
 - Overall, the Australian public and Reef residents and stakeholders perceived the Reef to be facing significant threats (from pressures such as climate change, environmental pests and water quality) and there was general agreement on the need to prevent further degradation through restorative actions and supporting adaptation.
 - Public trust in the science community and the Great Barrier Reef Marine Park Authority was high relative to state and federal governments and other groups. This suggests the science community and reef managers are well-placed to lead engagement activities.

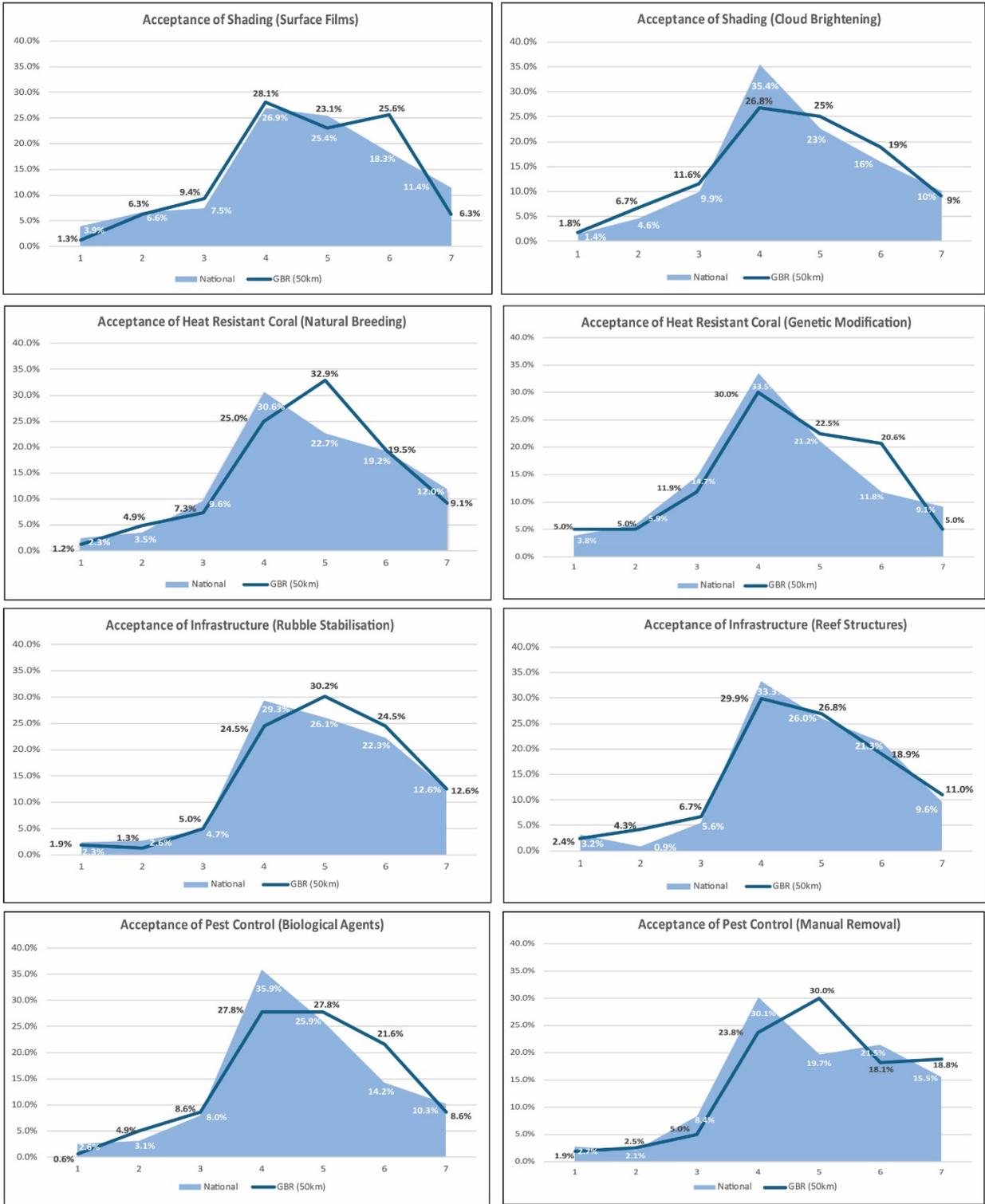
3. Participation is central to realising the benefits of RRAP:
 - Stakeholders expressed a strong desire to participate and partner in any future R&D program. This needs to be factored into program management and governance processes.
 - Stakeholders and Traditional Owners strongly asserted that the opportunity to co-design the program was necessary to create and realise potential future benefits (economic, ecological, social and cultural).
4. The Reef stakeholder engagement and Traditional Owner context is complex. Engagement strategies tailored to RRAP R&D needs require detailed planning:
 - There are more than 100 different organisations, forums or mechanisms that facilitate the involvement of stakeholders and citizens in Reef-related issues, for example local marine advisory committees, regional organisations of councils, industry and peak body processes, education, citizen science and volunteer networks. When multiple cases of the same type of structure (e.g. local councils) are counted, there are more than 380 in total.
 - There are more than 70 identified Traditional Owner groups with custodial interests in caring for land-sea country across the length of the Reef. There are several significant forums or processes that support Traditional Owner management and governance of the Reef (such as formal advisory and expert committees, country-based planning and Traditional Use of Marine Resources Agreements). Existing co-research and knowledge management protocols¹ (and some under development) to guide scientists in working with Traditional Owners and Indigenous peoples are highly relevant to RRAP implementation. They must be embedded into the program management practices.

The above findings highlight the size and diversity of the engagement context for the R&D program and the strong desire for co-design and consultation. Table 1 summarises some of the risks this context presents and the treatments planned under the R&D program.

¹These include but are not limited to: (i) guidelines for collaborative knowledge work between Indigenous and non-Indigenous people (see Austin et al., 2017); (ii) Indigenous Engagement and Participation Strategy produced by the NESP Tropical Water Quality Hub, to ensure meaningful two-way engagement that recognises the interests, rights and ecological knowledge of Traditional Owners; and (iii) RIMReP Data Sharing Agreements (DMS4) with Traditional Owners of the Reef (under development at time of writing).

Table 1: Risks and proposed treatments arising from the engagement context for the R&D program

Risk	Proposed treatment
Public credibility of program mission	Continue to communicate restoration as part of the solution that includes reducing critical pressures (e.g. emissions reduction).
Legitimacy of decisions and actions	Ensure stakeholders and rights-holders participate in transparent and inclusive decision-making at governance and operational levels.
Incomplete identification of risks and benefits	Engage communities, stakeholders and rights-holders in participatory risk assessment and co-design of interventions.
Low observability of R&D activities	Provide appropriate opportunities for co-design, citizen science, accessible demonstration sites, pilots and awareness raising. Where appropriate, link with existing local restoration efforts.
Operational and institutional complexity	Investment in novel engagement processes tailored to the needs and expectations of different groups. Undertake early and ongoing coordination with existing engagement processes.



X axis: Level of acceptance or rejection with rated scale from 1 (not at all) to 7 (very much so), midpoint = 4.
 Y axis: response percentages from each total number of group data (National and GBR_50km).

Figure 1: 2018 National survey of Australian and Great Barrier Reef residents—acceptance of specific reef restoration interventions by geography (local and national, n=2743 and n=1293, respectively).

4.2 Regulatory dimension

4.2.1 Regulatory environment

The regulatory environment of the Great Barrier Reef consists of an intricate network of arrangements (international treaties, domestic laws, policies, plans and decision-making processes) and entities spanning multiple levels. In summary, four layers of governance have overlapping roles:

- **International:** Australia has obligations under multiple international treaties, particularly the *World Heritage Convention*.
- **Australian Government:** Multiple government departments and agencies have a regulatory role, particularly the Great Barrier Reef Marine Park Authority and the Department of the Environment and Energy.
- **Queensland Government:** Involving multiple departments including the Department of Environment and Science and the Department of Agriculture and Fisheries.
- **Local government:** There are 39 local governments within the Great Barrier Reef catchment.

These four layers are directly or indirectly linked by intricate regulatory arrangements.

International agreements

While the Australian and Queensland Governments are the most important for regulating activities in the Great Barrier Reef, many international agreements are relevant. These are given effect through national and state laws. Further, the Great Barrier Reef Marine Park Regulations 2019 requires the Great Barrier Reef Marine Park Authority to consider any relevant international agreement to which Australia is a party when assessing permit applications for activities within the marine park. The *World Heritage Convention* is the preeminent international treaty pertaining to the Great Barrier Reef. The outstanding universal value of the Great Barrier Reef World Heritage Area is recognised and protected by its inscription on the World Heritage List under this convention. In accordance with the *Operational Guidelines for the Implementation of the World Heritage Convention* (UNESCO, 2017), the Australian Government regularly informs the World Heritage Committee of developments that may impact on the outstanding universal value of the Reef.

Australian Government

The Great Barrier Reef Marine Park Authority, an independent statutory authority of the Australian Government, has primary responsibility for the marine park. However, under an intergovernmental agreement, it shares the responsibility for the day-to-day planning and management of park activities (including compliance) with relevant Queensland Government agencies. The authority administers the *Great Barrier Reef Marine Park Act 1975*, under which a multiple-use zoning system² and a permit system are in place. The permit system entails joint permit assessments and approvals by the authority and Queensland Parks and Wildlife Service when proposed activities involve both jurisdictions.

² See Great Barrier Reef Marine Park Zoning Plan 2003 at http://www.gbrmpa.gov.au/_data/assets/pdf_file/0015/3390/GBRMPA-zoning-plan-2003.pdf

The Department of the Environment and Energy administers the *Environment Protection and Biodiversity Conservation Act 1999*, which regulates new developments likely to significantly impact on the environment, both within and outside the Great Barrier Reef World Heritage Area, outstanding universal values of the area or other matters of national environmental significance, such as listed threatened species. The department also administers the *Environment Protection (Sea Dumping) Act 1981*, which may be relevant to RRAP projects that involve installing structures, including artificial reefs, outside the three nautical mile state limit. While the department administers the Sea Dumping Act nationally, for the purposes of the Great Barrier Reef Marine Park, this Act is administered by the Great Barrier Reef Marine Park Authority³.

Queensland Government

The Department of Environment and Science is the principal Queensland Government agency with direct responsibilities for the protection and management of the Great Barrier Reef. It administers the *Marine Parks Act 2004*, which establishes the Great Barrier Reef (Coastal) Marine Park⁴. Within the department, the Queensland Parks and Wildlife Service has responsibility for managing the Great Barrier Reef (Coastal) Marine Park. The Queensland Parks and Wildlife Service and the Great Barrier Reef Marine Park Authority, through a joint field management program, deliver surveillance, compliance and enforcement activities under the *Marine Parks Act 2004* (Queensland) and *Great Barrier Reef Marine Park Act 1975* (Commonwealth). The Department of Agriculture and Fisheries is responsible for Reef fisheries management under the *Fisheries Act 1994*. Within that department, the Queensland Boating and Fisheries Patrol enforces fisheries laws.

Local government

Within the Reef catchment, 39 local governments have a major role in planning for development, particularly on land. They are responsible for planning schemes, which regulate development (other than mining and petroleum activities) within their local government areas. Further, local governments are the assessment manager under the *Planning Act 2016* (Qld) (addressed below) for 'prescribed tidal works'⁵, such as the installation of pontoons within 50m of the shore adjacent to a local government area.

4.2.2 Regulatory requirements

Proposed RRAP interventions may involve different regulatory requirements depending, primarily, on:

- Whether they occur within the marine park/coastal marine park and/or on land
- The nature of the activities. Many activities within the marine park, including those in the airspace up to 915m, require approval under the Commonwealth *Great Barrier Reef Marine Park Act 1975*.

³ See <http://www.environment.gov.au/marine/publications/factsheet-dumping-wastes-sea>

⁴ The Great Barrier Reef Coastal Marine Park runs the full length of the Commonwealth Great Barrier Reef Marine Park, providing protection for Queensland tidal lands and tidal waters.

⁵ Defined in s15 of the Coastal Protection and Management Regulation 2017 (Qld). See generally the code for prescribed tidal works available at https://www.ehp.qld.gov.au/coastal/development/tidal-land/prescribed_tidal_works.html

Overall, permit applications are assessed in terms of the nature and scale of the activities proposed, and the acceptability of the potential impact of these activities on the environment (Great Barrier Reef Marine Park Authority, 2014). The *Guidelines for permit applications for restoration/adaptation projects to improve resilience of habitats in the Great Barrier Reef Marine Park* (GBRMPA, 2018) provide an indication of the regulatory requirements and assessment approach to be adopted for interventions similar to the proposed RAAP interventions. As noted, interventions involving both national and state jurisdictions would require a joint permit issued by the Great Barrier Reef Marine Park Authority and the Queensland Parks and Wildlife Service.

Certain interventions would require additional assessment and approval under other regulations. For example:

- Interventions that may cause a significant impact⁶ on the environment of the marine park or other *matters of national environmental significance* require assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
- Interventions involving fishery resources (including corals) and activities interfering with fish habitats and marine plants and algae require permission under the Queensland *Fisheries Act 1994*.
- Interventions involving placing structures (e.g. artificial reefs) in the marine park require assessment under the Commonwealth *Environment Protection (Sea Dumping) Act 1981*.
- Interventions involving genetic engineering require permission under the Commonwealth *Gene Technology Act 2000*.
- Interventions involving biodiscovery research are regulated under the Queensland *Biodiscovery Act 2004*⁷ and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
- Interventions involving a new use of land or construction of new facilities or those involving tidal works may require approval under the Queensland *Planning Act 2016*.
- Workplace health and safety aspects of RRAP interventions are generally regulated under the Queensland *Work Health and Safety Act 2011*.

4.2.3 Regulatory implications

Proposed RRAP interventions ([R2: Intervention Summary](#)) feature different levels of regulatory complexity. Surface films and misting involve regulatory requirements mostly under the Commonwealth *Great Barrier Reef Marine Park Act 1975*, while genetic engineering options involve requirements under multiple acts. Further, Great Barrier Reef Marine Park Authority guidelines⁸ for *permit applications for restoration/adaptation projects to improve resilience of habitats in the Great Barrier Reef Marine Park* (GBRMPA, 2018) establishes different levels of risk (low to high) to different reef interventions. Overall,

⁶ For the purposes of the *Environment Protection and Biodiversity Conservation Act 1999*, a significant impact is defined as "...an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts".

⁷ See <https://www.ehp.qld.gov.au/licences-permits/plants-animals/biodiscovery.html>

⁸ These guidelines have recently been jointly agreed with the Queensland Government (Parks and Wildlife Service) and re-released as joint guidelines in 2019.

interventions considered to be medium risk or higher may require proof-of-concept, or supporting rationale, for likely success in the marine park. They may also require:

- A pilot study (considered as a research activity) involving tailored assessment and may require a deed of agreement. If such a pilot study is regarded as successful, a non-research focused permit to deploy the intervention can be sought.
- A Tailored or Public Information Package assessment, deed/bond, public advertising and/or an environmental management plan, subject to the scale and risk involved.

The feasibility and viability of RRAP interventions will critically depend on the regulatory environment in which they are developed and deployed. The existing Great Barrier Reef regulatory and policy environment was designed to address a different risk environment. As it relates to proposed RRAP interventions, it is robust; however, not unexpectedly, it is not entirely fit-for-purpose for the envisaged future environment. The current framework is complex, it is both fragmented and overlapping and its capacity to assess novel risks and impacts associated with unconventional interventions (e.g. genetic engineering) is limited. These interventions pose an unprecedented challenge to the existing regulatory system to address novel risks and impacts, high levels of uncertainty and untested mechanisms for observation and monitoring.

5. RECOMMENDATIONS

5.1 Engagement

The engagement component of the RRAP R&D Program will need to address the following recommendations:

1. The current engagement architecture is generally suitable to support RRAP access to trusted networks to socialise the program, scope interests and values and plan for future engagement. However, additional, fit-for-purpose engagement activities will be required to meet the more challenging demands of:
 - Deliberation on specific technologies
 - Representation/participation in RRAP decision-making, which needs to be codified into the RRAP governance model
 - Supporting transparency and co-design of interventions
 - Identifying co-benefits from the R&D program
 - Exploring broad trade-offs and uncertainties around future Reef states.
2. It is essential RRAP empowers Traditional Owners to exercise their unique rights and responsibilities. There is also opportunity for improved coordination in this area. This will require developing approaches to: Traditional Owner involvement in RRAP governance; resource involvement in R&D activity through co-research or subcontracting field research; and exploring education and accreditation opportunities during the R&D program, among others. Progress to date on these strategies has not been sufficient. More work is required to mainstream involvement and engagement of Aboriginal and Torres Strait Islander peoples across RRAP.
3. The complexity and novelty of RRAP, combined with its high dependence on the participation of diverse groups, requires a robust governance model and the close involvement of social scientists and engagement specialists with expertise in designing, facilitating and evaluating transdisciplinary (co-delivered) research and development processes that support responsible innovation.

The overarching goal of the engagement research and development strategy is to achieve interventions and decision-making that are socially and culturally responsible, acceptable and legitimate to stakeholders, rights-holders, managers and the public. The proposed development program has two components:

1. A transitional program.
2. A research and development program.

The transitional program will establish operational requirements, frameworks and capacities for stakeholder and Traditional Owner engagement, underpinned by expert social science capacity. It will identify the objectives of the program in operational terms, clarify how the program will coordinate with other social science and engagement efforts external to RRAP and how information will be used internally to inform technology decisions. The Engagement

Framework R&D Sub-Program will advance the evaluation of technology options through five broad activity areas:

1. Demonstration sites and citizen science.
2. Monitoring public attitudes and social license.
3. Participatory Technology Assessment Panels (citizen panels).
4. Co-benefit agreements.
5. Coordination, synthesis and strategy setting.

5.2 Regulatory environment

The regulatory component of the RRAP R&D Program aims to help develop a robust and enabling regulatory environment for reef restoration and adaptation. This includes reviewing, updating and enhancing the capacity of the regulatory system, where needed, to assess and address a different class or range of risks and impacts associated with unconventional reef restoration and adaptation interventions, and developing a fit-for-purpose regulatory framework and policy best practice for reef adaptation and restoration.

A robust and enabling regulatory environment for reef restoration and adaptation would require greater integration, adaptation, agility and oversight to address a rapidly-changing environment. Focus on the following program areas is recommended:

1. **Regulatory capacity:** Identification of short-, medium- and long-term priorities to improve regulatory capacity to address RRAP interventions.
2. **Guidelines and training:** Preparation of guidelines, and delivery of training to RRAP researchers, to ensure they are fully aware of the regulatory environment pertaining to the Great Barrier Reef.
3. **Cooperation between regulators:** Facilitation of cooperation between Great Barrier Reef Marine Park Authority and other relevant regulators, with expert input from RRAP scientists on RRAP interventions involving emerging technologies (e.g. genetic engineering and geoengineering).
4. **Permission system:** Development of options for improving the permission system for reef restoration and adaptation interventions.
5. **Policy and regulatory innovation:** Development of options for regulatory and policy innovation.
6. **Whole-of-government reef restoration policy:** Preparation of options for whole-of-government reef restoration policy development.

5.3 Strategy and plan

5.3.1 Engagement

Table 2: Major activities and objectives for engagement in the R&D program.

Program Area	Objectives
Detailed project plan	<ul style="list-style-type: none"> Clarify objectives and links between engagement activities. Assess human capital and capacity development needs.
Monitoring, evaluation and learning strategy	<ul style="list-style-type: none"> Develop frameworks and methods to evaluate restoration and adaptation research and development.
Stakeholder reference group	<ul style="list-style-type: none"> Scope needs, opportunities and potential models for stakeholder involvement in RRAP governance.
Transition phase engagement	<ul style="list-style-type: none"> Provide opportunities for stakeholders to participate in the co-design of the detailed engagement project plan, monitoring, evaluation and learning strategy and governance arrangements. Ensure the detailed project plan reflects stakeholder and community aspirations and needs. Maintain continuity of engagement through the transition phase and reduce risks of disengagement.
Demonstration sites and citizen science program	<ul style="list-style-type: none"> Existing models of citizen science suitable for reef restoration and adaptation interventions identified and, where needed, modified. A meaningful platform for stakeholder involvement in reef restoration and adaptation activities created.
Monitoring attitudes and social license	<ul style="list-style-type: none"> Opportunities to align R&D with community aspirations and values identified. Intervention implementation risks identified and managed. Attitude and disposition changes monitored throughout the life of RRAP. RRAP communication strategies informed.
Participatory Technology Assessment	<ul style="list-style-type: none"> Processes to integrate citizen knowledge and values in intervention design and evaluation developed and tested.
Co-benefit agreements	<ul style="list-style-type: none"> Social and economic impacts likely to arise from restoration and adaptation R&D and implementation assessed. The negotiation of co-benefit agreements between reef stakeholders and RRAP informed.
Coordination, synthesis and strategy development	<ul style="list-style-type: none"> Monitoring, evaluation and learning strategy implemented. Outcomes of monitoring, evaluation and learning strategy reflected in communications, governance and integration of research activities.

5.3.2 Regulatory context

Table 3: Major activities and deliverables for regulatory context in the R&D program

Program area	Deliverables
Regulatory capacity	<ul style="list-style-type: none"> • Priorities to improve regulatory capacity identified.
Guidelines and training	<ul style="list-style-type: none"> • Specialised training needs of RRAP scientists assessed. • Training to relevant regulators and RRAP scientists designed and delivered. • Guidelines on regulatory implications of a reef restoration and adaptation agenda developed.
Further cooperation between regulators	<ul style="list-style-type: none"> • Workshops with relevant regulators facilitated to consider mechanisms for further cooperation, workforce capacity and technical requirements for consideration of emerging technologies.
Permission system	<ul style="list-style-type: none"> • Fragmentation and duplication of the permission system assessed. • Measures to address fragmentation and duplication identified. • Assistance provided in developing measures to streamline relevant permission arrangements.
Policy and regulatory innovation	<ul style="list-style-type: none"> • Regulatory and policy innovation in the Reef governance landscape, and in coral reef governance internationally, analysed. • Options to enable regulatory and policy innovation for reef restoration and adaptation in the Great Barrier Reef developed.
Whole-of-government reef restoration policy	<ul style="list-style-type: none"> • Relevant senior officials engaged in the imperative for a whole-of-government Reef restoration policy. • Policy preferences of relevant stakeholders identified. • Options to improve the permission system and regulatory and policy innovation assessed. • Findings with relevant stakeholders validated.

6. INVESTMENT REQUIREMENTS

6.1 Capability and funding required to support proposed strategies and plans

Below is the budget for the Engagement and Regulatory Sub-Program. These expenditure requirements, along with the other RRAP R&D sub-program investment areas, are to be managed as a combined program. Details of the full RRAP R&D Program investment requirements are in [R4: Research and Development Program](#).

Table 4: Budget for the first five years of the Engagement and Regulatory Frameworks R&D Sub-Program, 2019–24.

Sub-program	Total cost (2019–24) (\$M)	2019/20 (\$M)	2020/21 (\$M)	2021/22 (\$M)	2022/23 (\$M)	2023/24 (\$M)
Engagement and Regulatory	12.9	2.1	2.8	2.7	2.7	2.6

Table 5: Budget for the second five years of the Engagement and Regulatory Frameworks R&D Sub-Program, 2024–29 and the total costs for the full 10 years, 2019–29.

Sub-program	Total cost (2024–29) (\$M)	2024/25 (\$M)	2025/26 (\$M)	2026/27 (\$M)	2027/28 (\$M)	2028/29 (\$M)	Total cost (2019–29) (\$M)
Engagement and Regulatory	7.3	1.7	1.4	1.4	1.4	1.4	20.2

7. RISK MANAGEMENT PLAN

7.1 Engagement

Table 6: Risks and treatments related to the engagement program.

Risk	Treatment
Intervention research proceeds at timescales not suited to engagement, or in a fragmented way that inhibits stakeholder involvement (moderate risk).	Aligning timeframes and resources for engagement activity with the staging of intervention R&D activity.
Engagement activity becomes fragmented from developments in regulatory and governance spheres of RRAP leading to perceptions of tokenistic participation (moderate risk).	RRAP governance, regulatory and engagement activities develop clear processes and principles for articulated and responsive decision-making.

7.2 Regulatory context

Table 7: Risks and treatments related to the regulatory context program.

Risk	Treatment
Willingness of regulators and scientists to collaborate (low risk).	Early engagement, frame outputs and outcomes to be of salience and importance to regulators and scientists.
Availability of regulators and scientist to collaborate (low risk).	Plan and communicate activities in advance.

8. LINKS

8.1 Engagement

Key areas for integration between engagement activities and other RRAP components leading into, and during, the next R&D program include:

- Linking engagement strategy development with formal program governance arrangements.
- Linking engagement strategy development with that of the regulatory R&D group.
- Progressing practical links with intervention R&D programs and with economic assessment of implications of changes in reef values and condition.

8.2 Regulatory context

A robust and enabling regulatory environment for reef restoration and adaptation is critical to the majority of (if not all) proposed RRAP interventions. The RRAP regulatory team will work in a facilitative and collaborative way with relevant regulators and RRAP scientists to maximise the capacity of the regulatory system to assess the range of risks and impacts associated with unconventional RRAP interventions, and enable timely development of effective, world-leading regulatory and policy best practice for reef adaptation and restoration.

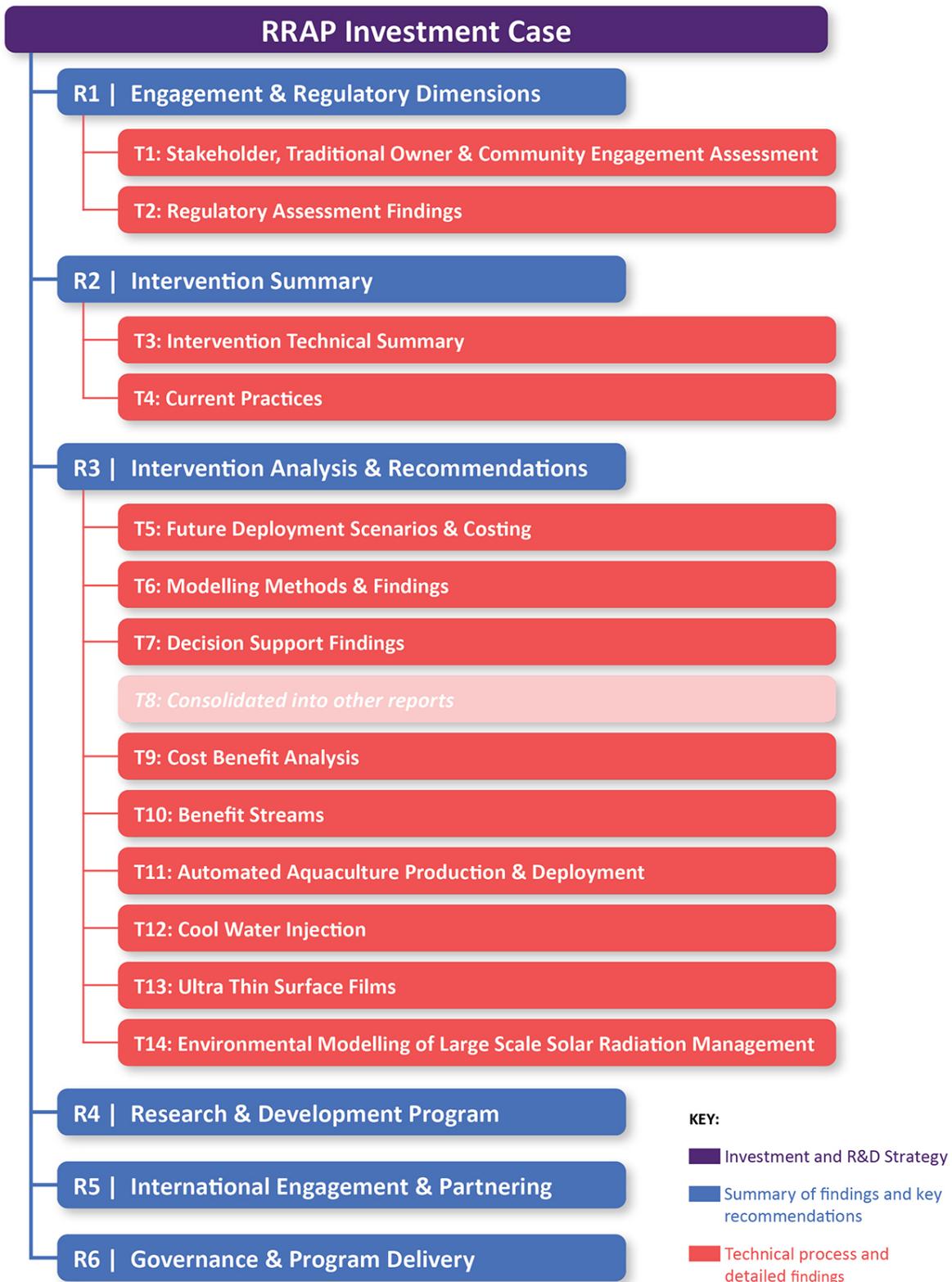
REFERENCES

- Aronson J, Brancalion PHS, Durigan G, Rodrigues RR, Engel VL, Tabarelli M, Torezan JMD, Gandolfi S, de Melo ACG, Kageyama PY, Marques MCM, Nave AG, Martins SV, Gandara FB, Reis A, Barbosa LM, Scarano FR (2011) What role should government regulation play in ecological restoration? Ongoing debate in São Paulo State, Brazil. *Restoration Ecology* 19: 690-695.
- Austin B J, Robinson C, Lincoln G, Mathews D, Oades D, Wiggins A, Bayley S, Edgar J, King T, George K, Mansfield J, Melbourne J, Vigilante T, with the Balanggarra, Bardi Jawi, Dambimangari, Karajarri, Nyul Nyul, Wunambal Gaambera & Yawuru Traditional Owners (2017) Guidelines for collaborative knowledge work in Kimberley saltwater country final report of project 1.5.2 the Kimberley Indigenous Saltwater Science Project (KISSP). Prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institute. Perth, Western Australia, 23pp.
- Great Barrier Reef Marine Park Authority (2014) Great Barrier Reef region strategic assessment: Strategic assessment report. Great Barrier Reef Marine Park Authority, Townsville.
- Great Barrier Reef Marine Park Authority (2018) Permit applications for restoration/adaptation projects to improve resilience of habitats in the Great Barrier Reef Marine Park. Great Barrier Reef Marine Park Authority, Townsville.
- Mansourian S (2016) Understanding the relationship between governance and forest landscape restoration. *Conservation and Society* 14: 267-278.
- Mansourian S (2017) Governance and forest landscape restoration: A framework to support decision-making. *Journal for Nature Conservation* 37: 21-30.
- Redford KH, Adams W, Carlson R, Mace GM, Ceccarelli B (2014) Synthetic biology and the conservation of biodiversity. *Oryx* 48: 330-336.
- Reed MS (2008) Stakeholder participation for environmental management: a literature review. *Biological Conservation* 141: 2417-2431.
- Richardson BJ (2016) The emerging age of ecological restoration law. *Review of European, Comparative and International Environmental Law* 25: 277-290.
- Stilgoe J, Owen R, Macnaghten P (2013) Developing a framework for responsible innovation. *Research Policy* 42: 1568-1580.
- UNESCO (2017) Operational guidelines for the implementation of the World Heritage Convention. UNESCO World Heritage Centre, Paris.
- van Oppen MJH, Gates RD, Blackall LL, Cantin N, Chakravarti LJ, Chan WY, Cormick C, Crean A, Damjanovic K, Epstein H, Harrison PL, Jones TA, Miller M, Pears RJ, Peplow LM, Raftos DA, Schaffelke B, Stewart K, Torda G, Wachenfeld D, Weeks AR, Putnam HM (2017)

Shifting paradigms in restoration of the world's coral reefs. *Global Change Biology* 23: 3437-3448.

APPENDIX A – RRAP DOCUMENT MAP

Reef Restoration and Adaptation Program



Reef Restoration and Adaptation Program, a partnership

Reef Restoration and Adaptation Program

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