

A1: Minimum practice standards apply everywhere

Contributing agencies and partners: Natural Resource Management bodies, Industry, Local government

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
Minimum practice standards are met by all industries and activities.	1.1	Implement minimum practice standards for agricultural industries, which can be met either voluntarily, e.g. through industry-led best management practice (BMP) programs, or as a result of regulation.	On track / Underway		<ul style="list-style-type: none"> • Amendments to the <i>Environmental Protection Act 1994</i> commenced on the 1 December 2019 and roll out over three years, as a suite of measures to improve Reef water quality. The strengthened Reef protection legislation sets pollution load limits for each Reef catchment to target water quality responses; sets or improves minimum standards targeting nutrient and sediment pollution for key industries; sets standards for the provision of advice to regulated producers; establishes a framework to recognise industry best management practice; and seeks to counter additional pollution from new cropping and industrial development. • Since early 2016, the Reef compliance program has focused on increasing the adoption of the soil testing, fertiliser use and record keeping provisions in the <i>Environmental Protection Act 1994</i> initially targeting sugarcane production in the Wet Tropics, Burdekin and Mackay-Whitsunday, for improved Reef water quality outcomes. The Reef compliance program is in the priority regions of the Wet Tropics, Burdekin and Mackay-Whitsunday, targeting sugarcane production with 217 compliance activities undertaken during 2019–2020. A lower number of activities occurred this year due to the Covid-19 pandemic response measures. While non-compliance rates continue to be high (55%) at initial grower meetings, follow-up visits indicate most growers have changed their farm practices after the initial inspection, with non-compliance rates falling to 34%. Compliance activities will expand to banana production in the Wet Tropics and grazing in the Burdekin as minimum practice standards take effect for these commodities from 1 December 2020. • The Queensland Government continues to support voluntary, industry-led BMP programs for cane, bananas and horticulture to assist producers to identify practices that improve long-term productivity, profitability and sustainability of their enterprise. Other activities include the development of management practice standards, partnership projects to demonstrate improved practices, and support to align Queensland and Australian government programs for nutrient use efficiency, sediment and pesticide land management improvements. • The Smartcane BMP Program became the first Recognised Program under the <i>Environmental Protection Act 1994</i>. With BMP modules that align to the regulated standards under the Act and third-party auditing of growers to gain accreditation, producers who are accredited under a recognised program will be deemed to have met the minimum practice agricultural standards through an industry supported pathway. In March 2020, Smartcane BMP accredited its 500th cane farming enterprise. • The Grazing Resilience and Sustainable Solutions program was launched to support producers in the Burdekin, Fitzroy and Burnett Mary regions. The project provides one-on-one extension advice and tailored land management action plans to help producers identify and improve land that is in poor or degraded condition. Since launching in September 2019, 113 action plans have been developed to fine tune management on 866,000 hectares of grazing land. Incentives funding of \$505,795 has been provided to almost 40 projects with producers contributing \$920,000. • Work with Freshcare Ltd, in collaboration with Australian Banana Growers Council is currently underway to establish two formally recognised pathway options for banana growers to demonstrate that they meet the Reef protection regulations that apply to banana producers. • Hort360 BMP Reef certification pathway for growers to demonstrate best practice in horticultural production was endorsed in May 2020, and Growcom has commenced engaging with growers who wish to be part of the program.

	1.2	Ensure that urban, industrial and mining activities comply with requirements under the <i>Environment Protection and Biodiversity Conservation Act 1999, Planning Act 2016, Environmental Protection Act 1994, and Waste Reduction and Recycling Act 2011</i> .	On track / Underway	<ul style="list-style-type: none"> The Australian Government has an active monitoring program that includes inspections and audits to monitor compliance with conditions of approval under the <i>Environment Protection and Biodiversity Conservation Act 1999</i>, as outlined in the Compliance Plan 2019–23, and directed by the Department’s published Compliance Policy (2019). 	<ul style="list-style-type: none"> The Queensland Government continued to build capacity for erosion and sediment control, and urban stormwater quality management through the Erosion and Sediment control capacity building and urban stormwater quality management project. The last reporting period has seen an increase in engagement in activities such as local government workshops, industry field days and training in emerging technologies. The Queensland Government Water Tracking and Electronic Reporting System (WaTERS) captures point source environmentally relevant activities (ERAs) release data within Great Barrier Reef catchments to inform environmental regulation, policy and guidelines in relation to sewage treatment in the Great Barrier Reef catchment. The Point Source Metadata Collection project continued during 2019-20. This project will support ERA assessment through enhancing the accuracy of predicting the nutrient loads from point source activities and identifying which Great Barrier Reef catchments are most potentially affected. A peer reviewed final report will be published in 2020-2021. This information can be used to inform and refine alternative management/treatment strategies for nutrient-related point source activities, resulting in reduced nutrient loads to the Reef.
Minimum practice standards are met by all industries and activities.	1.3	Refine existing standards, regulations and planning frameworks as new information improves knowledge for all industries.	On track / Underway		<ul style="list-style-type: none"> The Environment Protection (Water) Policy 2009 was replaced with the Environmental Protection (Water and Wetland Biodiversity) Policy 2019. Water and wetland environmental values were transferred to the single policy to increase efficiency of decision making. Amendments were made to the wetland environmental values section to clarify the exclusive application of the wetland environmental values prescribed under the policy to wetland biodiversity. As part of the strengthened Reef protection regulations, the Great Barrier Reef River Basins End-of-Basin Load Water Quality Objectives have been finalised for all Great Barrier Reef catchments. These objectives are derived from the end-of-catchment anthropogenic water quality targets set out under the Reef WQIP. The Reef water quality objectives address requirements under chapter 4A of the Environmental Protection Act 1994 to establish annual loads for dissolved inorganic nitrogen and sediment. The objectives are to be achieved and maintained as per s11(4) of the EPP (Water and Wetland Biodiversity), through consideration when assessing new and expanding development within the Great Barrier Reef catchment. New Reef protection regulations have been put in place to require that from 1 July 2021, new or expanded point source ERAs, including sewage and water treatment plants and aquaculture, will need to avoid additional nutrient or sediment releases to ensure that new development does not negatively impact on the water quality improvements made to date. The assessable development trigger map of wetland protections areas was reviewed and updated. The map identifies wetland protections areas for wetlands of ‘high ecological significance’ in Reef catchments. The new map has taken effect through amendments to the Environmental Protection regulation. Nearly 20,000 Queenslanders and businesses had their say on the proposed ban on single-use plastic products. The following single-use plastic products are proposed to be banned from sale or supply in Queensland: straws, cutlery, plates, and stirrers (for example, hot and cold drinks). The ban is part of Queensland’s plan to tackle plastic pollution under the Queensland Plastic Pollution Reduction Plan.

A2: Culture of innovation and stewardship

Contributing agencies and partners: Natural Resource Management bodies, Healthy Land and Water, Industry, Local government, Great Barrier Reef Marine Park Authority

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
Reef communities are engaged and empowered to improve practices and behaviours beyond minimum practice standard for water quality improvement.	2.1	Support land managers, industries and local governments to adopt improved management practices, e.g. through coordinated extension, education and awareness programs.	On track / Underway	<p>The Australian Government through the Reef Trust program continued to support projects that are delivering extension and education targeted at adopting improved practices, primarily addressing management practice adoption in cane and grazing.</p> <ul style="list-style-type: none"> • The \$443.3 million, six-year Reef Trust Partnership with the Great Barrier Reef Foundation includes a \$201 million Water Quality component, with a strong focus on improving agricultural land management practices beyond minimum industry standards. Detailed annual work plans for delivery of this and other components are available on the Foundation’s website. Implementation to date includes: <ul style="list-style-type: none"> ○ Eleven Early Investment projects totalling \$19.7 million. These projects were designed to provide continuity of funding for ‘no-regrets’ actions to maintain momentum and on-ground delivery capacity pending roll-out of the Reef Trust Partnership Regional Water Quality Programs. Projects are targeted towards reducing fine sediment, dissolved inorganic nitrogen and pesticide runoff from grazing and cane lands. For example, under the ‘Reef Alliance Project Phase 2’ \$3.5 million was provided to continue delivery of a major Reef Trust Phase III project. It involves five NRM organisations and a range of industry groups working in partnership to deliver one-on-one extension support across the GBR catchment to move 462 land holders, managing 209,750 ha, towards best practice. Two of these 11 projects have subsequently been extended in the high priority cane regions of the Burdekin and Wet Tropics and high priority grazing areas of the Burdekin. ○ Three Regional Water Quality programs in the Fitzroy and Mackay Whitsunday NRM regions and the Mary River catchment in the Burnett-Mary NRM region, with funding allocations of \$15.8 million, \$16.9 million and \$9.0 million respectively. Projects will be delivered by a range of on-ground service providers and technical advisors. <ul style="list-style-type: none"> – The Fitzroy program will have a strong focus on gully and streambank remediation, improving soil conservation practices on grains farms and working with Traditional Owners to improve grazing land management on their properties. – The Mackay Whitsunday program will provide agronomy support and incentives to increase the adoption of precision agriculture techniques on sugarcane farms, including on-farm monitoring of performance of improved practices for pesticide and fertiliser management. – The Mary River program will undertake large scale restoration of eroding riverine areas, revegetation work, community engagement activities, Traditional Owner involvement and work with graziers to improve grazing land management on their properties. 	<p>The Queensland Government continued to support landholders to make long-term farm management changes, extension and education services, increased monitoring and large-scale social change programs.</p> <ul style="list-style-type: none"> • The Enhanced Extension Coordination project is delivering better extension services to producers to enable practice change. Regional Extension Coordinators have coordinated extension delivery across the six NRM regions in the Reef catchment by facilitating eleven industry-focused regional extension working groups, made up of active representatives from over 58 extension service provider organisations. With these stakeholders, the coordinators have co-developed seven Regional Extension Plans providing a detailed review of regional water quality projects across the Reef catchments. These plans include situation and gap analyses that identify regional priorities and gaps and barriers to delivery. More than one hundred projects addressing priorities identified in the Regional Extension Plans have been supported and provided funding through the project. In 2019-20 these included 26 small projects addressing local priorities and five larger co-designed collaborative projects. • Farmers across the Burdekin, Mackay Whitsunday, Herbert and Burnett Mary were successfully engaged in one-on-one agronomy support to reduce nitrogen application through tailor-made nutrient management plans. As a result, nearly 300 tonnes less nitrogen was applied across 213 farms in the Burdekin and Mackay Whitsunday regions. • The Grazing Extension Support Project continued to actively engage graziers across the Burdekin, Fitzroy and Burnett Mary catchments. Targeted extension services to improve adoption of information, innovative practices and technology has resulted in enduring practice change while minimising the impact on the Reef. A mix of extension methods were used, with one-on-one support providing the opportunity for graziers to incorporate recommended research and development practices into their business. Six hundred and seventy-one extensive beef business were engaged this year in whole of business activities. Fifty per cent of beef producers engaged in grazing extension support activities intend to make a practice change within twelve months of participation. In 2019, an independent impact assessment of the Grazing Extension Support project found a Benefit Cost Ratio of 3.80 to 1 based on the productivity impact. The environmental and social impact of the project was not calculated, but if included would likely result in an overall project impact ratio in the order of 12 to 1. • The Sustainable Grains Practices project delivered 14 extension and training events to 258 attendees in 2019-20, of which 186 were growers collectively farming over 300 000 hectares of land. Evaluation data indicates attendees were encouraged to make a change in practice (85%), planning to implement a practice change in the next 12 months (50%) and felt more confident to make

		<ul style="list-style-type: none"> • The Reef Alliance – Growing a Great Barrier Reef Project built agricultural extension capacity through the Queensland Farmers’ Federation Pilot project Agricultural Capacity Building. This included training extension staff in Reef regions on agricultural issues such as precision agriculture for grazing management, leadership, people management, and monitoring and evaluation. The project assisted in coordinating extension officers in the Reef regions to foster a link between building capacity and water quality extension activities. The project provided training, extension and on-ground support to agricultural land managers in ‘best practice management’ of their agricultural practices. As of Dec 2019, 1,588 landholders engaged in one-on-one extension, with many developing more sustainable farm business skills, which will contribute to their farm's business long-term sustainability and profitability. • The F11 - Fitzroy sub-catchment gully and stream bank erosion control project is undertaking an integrated catchment approach to sediment reduction associated with gully and stream bank erosion. Over the reporting period, large numbers of people (including high school students) were engaged in volunteer activities including seed collection, plant propagation, porous check dam construction, gypsum application, mulching and seeding. Workshops were held to present the issues around sediment loss and their impact on the Great Barrier Reef, and to present methods to address sediment loss and highlight opportunities to address erosion at a regional community level. This training and involvement in events enhances the community’s understanding of environmental issues and the actions being undertaken to address impacts on the Reef. As of June 2020, 28 community participation and engagement events have been run and 520 volunteers have participated in project activities. • The GRZ'M. Great Barrier Reef Riparian Zone Management - a Mary project, delivered by the Mary River Catchment Coordinating Committee, aims to cost effectively address streambank and drainage line erosion using best available science and in a form that is practical for graziers, canegrowers and dairy farmers to implement. As of June 2020, 35 community events have been held and 64 people have received formal training. <p>Additional programs providing support for adoption of improved management practices included:</p> <ul style="list-style-type: none"> • The Australian Government’s National Environmental Science Program Tropical Water Quality Hub Project 3.1.2 is showing sugarcane growers in the Burdekin how they can reduce their power bills, save water and reduce run-off to the Reef by using new technology to apply the right amount of water, at the right time, in the right crop, to match that crop’s requirements. • The Great Barrier Reef Marine Park Authority’s Reef Guardian Council program was reviewed in preparation for the new local government term of 2020-24. The revised Reef Guardian Council program Terms of Reference (TOR) and Memoranda of Understanding, guide the program to deliver actions against the key Reef threats of climate change, coastal development, land-based run-off and direct use. The protection and management of heritage values has also been included in the TOR to drive Reef Guardian Council actions in this area. The vision for the Reef Guardian Council program for 2020-24 is: A local 	<p>related management decisions (70%). Twelve separate management practice changes on approximately 4500 hectares of cropping land were implemented by 10 grains businesses during the year, principally improved soil conservation and pesticide application practices.</p> <p>The Queensland Government continued to support landholders to make long-term farm management changes, extension and education services, increased monitoring and large-scale social change programs.</p> <ul style="list-style-type: none"> • The Enhanced Extension Coordination project is delivering better extension services to producers to enable practice change. 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	2.2	Empower stewardship leaders to influence peers and the broader community to adopt improved practices.	On track / Underway	<ul style="list-style-type: none"> • Through the Reef Trust Streambank and Gully program, community and landholder workshops and events were held to facilitate peer-to-peer learning across all Great Barrier Reef regions. • The Australian and Queensland governments' 2019 Reef Champion Awards announced in November 2019, enabled networking between participants and highlighted peer achievements. • The Project Uplift Farming Systems Initiative run by Sugar Research Australia, is supporting sugarcane farmers to adopt improved farming practices. As of June 2020, 66 entities have adopted Sugar Research Australia's farming system to minimise soil compaction and reduce farm water run-off, with 17,360 hectares of sugarcane under improved management. • Through the Reef Trust Partnership with the Great Barrier Reef Foundation, \$10 million has been committed to improve the engagement of the broader community in the protection of the Great Barrier Reef World Heritage Area. 	<ul style="list-style-type: none"> • The Queensland Wetlands Program continued to implement the Wetlands in the Reef Catchments Management Strategy including wetland demonstration on-ground case studies, wetland extension with landholders to engage local stewardship leaders, and build capacity in regional Natural Resource Management bodies to facilitate their own workshops to promote the benefits of improved practices. • The Queensland Wetlands Program continues to run the Reef Wetlands Network encouraging peers to learn and share experiences about catchment and wetlands management. • Paddock and sub-catchment water quality monitoring and 14 best practice nutrient and pesticide management use demonstrations with sugarcane growers in the Russell-Mulgrave and Proserpine raised awareness of practices that have the potential to reduce the water quality impacts of pesticides,

			<p>Projects will support and enhance people’s capacity to deliver on-ground action that reduces Reef threats and increases Reef Resilience by making it easier for people to get and stay involved in Reef conservation. As of June 2020 \$1.4 million has been provided for 25 community Reef protection projects, including citizen science, local action, local coral reef stewardship and community action plans.</p> <ul style="list-style-type: none"> The Great Barrier Reef Marine Park Authority’s Reef Guardian Schools program facilitated two Future Leaders Eco Challenges in 2020, prior to COVID-19 restrictions, with 71 students and 15 teachers from 15 Reef Guardian Schools and nine partner organisations participating. The 2020 theme was ‘Improving the Outlook for the Reef’ and focused on how the small acts of many people make a big difference. Due to the remaining Future Leader Eco Challenges being cancelled, ten free virtual connections programs connected with over 1,500 students and 100 teachers from 60 schools in the Reef catchment virtually via video conferencing. Two virtual teacher professional development sessions were also delivered about taking actions in their schools and local communities. Across the Great Barrier Reef Catchment, 13 Reef Guardian network meetings were facilitated, connecting Reef Guardian Schools with local partner organisations such as Reef Guardian Councils, natural resource management groups, tourism operators and community groups and aimed to empower local actions in the school’s community. Seven new schools joined the Reef Guardian Schools Program during 2019–20, bringing the total to 291, with over 136,500 students and 8,900 teachers in the Reef catchment. The Reef Guardian Council program included 18 councils between Bundaberg and Cooktown undertaking a range of on-ground and community education projects. In addition to their council actions 10 Reef Guardian Councils participated in eight Great Barrier Reef Foundation (under the Reef Trust Partnership) funded Local Action grant projects to improve water quality entering the Reef. The projects were led by project partners and endorsed through the Great Barrier Reef Marine Park Authority’s Local Marine Advisory Committees. 	<p>herbicides and nutrients used in sugarcane production, and to bring about practice change in these target catchments.</p> <ul style="list-style-type: none"> A tailored leadership and professional development program, Advancing Beef Leaders (ABL) was developed and is currently being piloted in the Burdekin. Next generation beef producers identified the need for ABL to better prepare them for committee and board positions, as well as managing their own business (e.g. governance, big picture, technical and financial issues, communications). The aligned Grazing Resilience and Sustainable Solutions (GRASS) project resulted in 46 Land Management Plans developed and associated incentive funding for on-ground activity to mitigate sediment loss delivered. The Wet Tropics Major Integrated Project supports the development of peer-to-peer networks through cluster groups, structured around the location of landholders, the product farmed, or soil type, to work together on particular water quality or productivity issues. Growers who host farm demonstration sites are also becoming advocates for improved practices and the peer to peer transfer of information from field days and other mechanisms is proving to be valuable. Growers are interested and genuinely invested in demonstration sites, because their questions informed the design of the sites. Additionally, six Traditional Owner Water Quality Monitoring staff have received training through the project and are involved in the collection of water quality monitoring samples. The Burdekin Major Integrated Project has responded to increasing demand from graziers to support a collaborative approach to solving problems, with eight cluster groups now in operation. Each consists of a group of properties working together to improve management across a range of issues, including small scale gully remediation, animal nutrition, weed control and equipment sharing. Two collaborative Meat and Livestock Australia cluster projects have also commenced, comprising four regenerative agriculture properties and six integrated weed management properties. A leading grazier has agreed to host a learning hub on their property to showcase the results of a landscape rehydration trial and share findings with the local community and science partners. Support for facilitated peer-to-peer learning groups through regional extension co-ordinators has reached new, previously unengaged landholders and encouraged them to engage in Reef initiatives such as Best Management Practice programs. Peer-to-peer groups have also been a source of new ideas and innovations that are taken forward through collaboration with the wider extension network. The Enhanced Extension Coordination project (EEC) project has supported 23 producer Peer-to-Peer learning groups to undertake 22 projects in 2019-20.
2.3	Support extension and education providers to deliver effective extension and education programs that reach a broad audience of land managers.	On track / Underway	<ul style="list-style-type: none"> The Australian Government directly funds extension officers through the Regional Land Partnerships program. For Reef catchment regions, six Regional Agricultural Landcare Facilitators are employed to support farmers, industry and community groups (including Landcare Groups) to adopt new and innovative sustainable agriculture practices. 	<ul style="list-style-type: none"> Through the Enhanced Education and Extension program, regional extension coordinators continued and expanded activity to enhance cross regional and industry links in Reef catchments, guided by the regional coordination and extension Plans (known as REPs). More than one hundred projects have received funding and support, which included in 2019-20, 26 small local projects and five larger co-designed collaborations. The projects both enhanced extension capability within extension providers to support land management practice improvements (e.g. facilitating greater adoption of cover

				<ul style="list-style-type: none"> Through the Reef Trust Partnership with the Great Barrier Reef Foundation, 60 FTE agricultural extension officers have been engaged to support the Water Quality Early Investment projects. 	<p>crops, more efficient irrigation practices or improved pasture management) as well as engaging local producers' capability and awareness. This increases their capacity to engaged more fully in reef projects in the future.</p> <ul style="list-style-type: none"> A Training and Capacity Building project targeted towards regional specific needs has been enthusiastically embraced and provided the opportunity for new, and not-so-new, extension practitioners to develop relevant skills and expertise, as well as increase regional capacity. This project has been highly successful in providing eleven training programs, building the capacity and skills of 335 extension practitioners from 80 different organisations. Key elements that have contributed to the success included: establishing a database with contact details for over 300 Reef extension providers; undertaking a comprehensive Training Needs Analysis; providing training opportunities through a range of delivery formats; and creating a Reef Extension Online Discussion group that currently has almost 100 members. The 2019 Agricultural Extension Work Placement Program has successfully completed an additional round with 14 new work ready extension officers graduating in June 2020 after a year working with various Natural Resource Management and agricultural advisory groups. The program through The Rural Jobs and Skills Alliance (led by QFF) in partnership with the Australian Government's Reef Trust, the Great Barrier Reef Foundation and the Queensland Government's Reef Water Quality Program delivered training, mentoring, and networking opportunities to ensure graduates had the skills needed to be competent extension officers as well as support the host organisations enhanced their mentoring capability and business delivery. The program also delivered Reef extension Practitioners Workshops supporting understanding and communicating science effectively.
2.4	Identify and address barriers to change and practice improvement uptake through programs and policy.	On track / Underway	<ul style="list-style-type: none"> The Reef Trust Reverse Tenders are addressing barriers to change by enabling sugarcane farmers across the Wet Tropics and Burdekin regions to implement their own cost-effective approaches for improving fertiliser application on their farms. In addition to providing considerable cost savings for participating farmers, as of June 2020, the program has achieved a reduction of 2,262 tonnes in applied fertiliser. The Reef Alliance through its Growing a Great Barrier Reef project used the Paddock to Reef Projector as an engagement tool to help growers bridge the gap between farm practices and water quality outcomes in a visual and readily understandable format. The Project Uplift Farming Systems Initiative continued to work with cane farmers to adopt Sugar Research Australia's farming system to provide the opportunity for a greater impact and a different engagement point with growers. Outcomes of behaviour innovation reports were shared with a cross section of industry stakeholders and significant growers (approximately 63 influencers). Low sugar prices and the cost of specialist equipment to adopt changes to farm systems are significant barriers to change. To address this, the project offers a combination of interest free loans and small grants to participating enterprises. Over the reporting period, 20 new farmers have joined the Uplift program, bringing the total number of farmers involved to 66. Through the Reef Trust Partnership with the Great Barrier Reef Foundation, \$10 million has been allocated (as a component of the \$201 million for water 	<ul style="list-style-type: none"> Agricultural economists continue to work on projects to addresses critical knowledge gaps in management practice economics and identify opportunities for sustainable economic growth. Expertise and support is being provided to numerous projects including banana nutrient trials, sugarcane BMP harvesting, improved groundcover strategies on grazing lands, enhanced efficiency fertiliser trials, nitrogen rate and application methods in grain cropping systems and cutting edge sugarcane management practices on commercial farms (Project Catalyst). Extension program economists collaborated with industry organisations, government departments and Natural Resource Management groups to evaluate and promote the economics of best management practices within the sugarcane and grazing industries. Key project themes included nutrient and pesticide management practices, improved soil health management, grazing cover management and gully rehabilitation. An economic modelling project commenced to assess the costs and benefits from adopting lower water quality risk land management practices (as outlined in the Paddock to Reef Management Practice Water Quality Risk Frameworks). Economist have engaged with sugarcane and grazing stakeholders across regional Queensland to inform the economic evaluation. The Wet Tropics Major Integrated Project (MIP) is trialling the Practice Improvement Journey approach to gather data to investigate the drivers/barriers to practice change. 	

				<p>quality improvement) to 21 projects that will specifically support system-level change and innovation. This funding is designed to catalyse and accelerate change where it is necessary to maximise impact and to improve the effectiveness, efficiency and sustainability of on-ground actions; to better track the outcomes of investments; and remove barriers to change.</p> <ul style="list-style-type: none"> • The Australian Government National Environmental Science Program (NESP) Program includes: <ul style="list-style-type: none"> ○ Project 2.1.3 looks at the science of social marketing and behaviour change for improved water quality in the Great Barrier Reef. The project uses insights from the science of social marketing and behaviour change to implement (and test the efficacy of) changes to the marketing and engagement strategy associated with programs designed to be rolled out under the Reef 2050 Plan. It aims to change key behaviours, particularly amongst those who have not previously engaged, to improve water quality. ○ Project 2.1.7 is engaging with farmers and demonstrating water quality outcomes to create confidence in on-farm decision-making. This project (known as 'Project 25') will combine recent hotspot identification in the Russell/Mulgrave catchment with targeted sugarcane farmer interaction activities (related to sub-catchment and localised monitoring activities), focusing on emerging monitoring technologies (real-time water quality monitoring) to link farmer on-farm practices with feedback from sub-catchment water quality measurements. The use of both scientific and citizen science monitoring approaches will deliver robust feedback loops to enable farmers to directly link their activities with water quality conditions. 	
	2.5	Provide incentives to support land managers, including Traditional Owners, with practice change.	On track / Underway	<ul style="list-style-type: none"> • The Reef Alliance – Growing a Great Barrier Reef Project provided financial incentives for on-ground and innovative projects across cane, grazing, grains, horticulture and dairy industries to enable more than 1,100 land managers to make the changes required for better on-farm management practices. As of December 2019, over \$11.8 million has been provided to participating landholders, which in return has leveraged more than \$16.7 million of combined cash and in-kind support from the landholders. • The Laura Gullies Project, fix up and skills for the future continued to build the capacity of local Indigenous people to develop new skills and expertise in adaptively managing the landscape for erosion minimisation. Crocodile and Welcome Stations are working pastoral leases that provide jobs and training in agriculture for Indigenous people as part of a group of 14 properties. • The Great Barrier Reef Marine Park Authority, through the Reef Guardian Council program, supported 10 council officers to attend the 2019 International Erosion Control Association Australasian Conference and Stormwater Conference in Cairns. The conference brought together practitioners, academics, and suppliers to network, engage, collaborate and discuss erosion and stormwater in the context of improving land-based run-off to the Great Barrier Reef. • The \$201 million Water Quality Component of the Reef Trust Partnership with the Great Barrier Reef Foundation will include the use of targeted incentives to increase the rate of adoption of improved land management practices. 	<ul style="list-style-type: none"> • The Reef Credit scheme, as a mechanism to fund Reef water quality outcomes, is being supported through the Major Integrated Projects (MIPs). The first Reef Credits for reducing fertiliser losses are expected to be traded in late 2020. • The Banana BMP program is receiving an additional \$1 million from the Queensland Government for incentives and on-ground extension, providing opportunity for banana growers in high-priority areas, primarily in the Wet Tropics and Cape York regions, to undertake actions that will reduce sediment and nutrient run-off. This includes implementing works such as sediment basins, contour banks, waterway/drainage upgrades or constructed wetlands. • Work continued to configure spatially specific credit trading simulations to include supply of water quality credits from different credit sources, together with demand for purchase of water quality credits from buyers. The potential for the supply of water quality credits from practice change in sugarcane farming, restoration of natural wetlands, construction of treatment systems and remediation of large-scale gullies have been quantified. The potential demand for water quality credits generated by tightening licence conditions for point sources (principally sewage treatment plants, aquaculture businesses and urban stormwater) have also been quantified.

				<ul style="list-style-type: none"> ○ For example, the Mackay Whitsunday program Major Grants project will support the delivery of extension projects by providing funding to landholders to implement outcomes and/or the recommendations of the region's extension projects. This will accelerate the implementation of the recommendations from one-on-one extension and the adoption of improved management practices to quickly provide water quality improvements. ○ The Reef Trust Partnership will also explore the use of Reef Credits, a market-based scheme, to establish a water quality improvement market, diversify farm incomes and enable a broader investor base to be developed. ○ 10% of the total grant funding (\$42 million) will be directed to support Traditional Owner led Reef activities, including \$20 million under the water quality component. 	
2.6	Trial and implement innovative monitoring, land management and treatment system solutions that aim to deliver water quality benefits.	On track / Underway	<ul style="list-style-type: none"> ● The Project Uplift Farming Systems Initiative is assisting growers to transition to more efficient farming systems, which will improve on-farm nutrient management and improve the quality of water entering the Reef. As of June 2020, approximately 17,360 hectares of sugarcane land has been converted to the Sugar Research Australia Farming System. ● The Stomping out Sediment in the Burdekin - livestock impact for gully remediation project is trialling a new grazing concept called 'biological carpeting'. This grazing practice, alongside ultra-high-density grazing technique on livestock, is being used to investigate the impact on the land to address gully erosion across a range of regionally representative soil types. As of June 2020, the project has trialled these techniques across six properties covering over 1000 hectares. ● The Reef Alliance – Growing a Great Barrier Reef Project delivered 21 innovation projects (\$2.7 million) across sugarcane, grazing, grains and banana enterprises with the primary purpose of demonstrating the feasibility of new practices. The projects have delivered trials and demonstration activities for a range of new agricultural practices across the commodities. The communication network created by this project has seen approximately 536 people subscribed to receive information about the project and innovation activities. Two of the projects explored efficiencies in nitrogen applications that generated a high level of interest and were included in events such as farm bus tours, roving field days and the Canegrowers Virtual Bus Tour. ● The National Environmental Science Program Tropical Water Quality Hub Project 3.1.2 is supporting innovative science to improve the efficiency of automated irrigation systems in the Burdekin sugarcane catchment. More efficient irrigation results in both improved water quality outcomes for the Great Barrier Reef and improved return on investment for farmers. ● The Reef Trust Partnership with the Great Barrier Reef Foundation includes a \$10 million Water Quality Innovation Program, comprising innovative funding and finance; broad and local scale planning to support future interventions; and technology transformation sub-programs. 	<ul style="list-style-type: none"> ● The Wet Tropics Major Integrated Project (MIP) is trialling a range of catchment repair and treatment systems to investigate their effectiveness at removing pollutants. Seven denitrifying bioreactors have been installed on cane farms, with recent installations modified to suit local landscapes and reduce costs. Three constructed wetlands and one large landscape wetland have been constructed. A high efficiency sediment basin has been retrofitted to a banana farm dam to reduce sediment losses. The project is also investigating if modifying cane drains to promote vegetation can help to treat nitrate. Monitoring data for each treatment system is being analysed to ascertain the effectiveness of the systems and will be available later in 2020. The Wet Tropics MIP has hosted field trips for numerous to showcase the innovative systems being trialled and adapted to suit local conditions. ● The Burdekin Major Integrated Project (MIP) is investigating cost effective solutions to remediate large-scale alluvial gullies. Seven large scale gully sites are being remediated and the team is working with graziers to remediate small-scale gullies, with 16 projects underway. Monitoring at large scale gully sites has shown promising results in terms of improved land condition, reduced run-off and sediment abatement. Cost effectiveness results for a range of sites will be available later in 2020. Graziers in this region have shown an increasing interest in undertaking small-scale gully remediation projects, which represents a significant shift from the start of the Burdekin MIP. ● A series of edge-of-field bioreactors trials across multiple industries such as cane, pineapples and protected cropping proved these treatment systems are cost effective for removing nitrate from groundwater moving into adjacent freshwater and marine environments. Concurrent with these field trials was the creation of an international bioreactor network forum which has been used as a conduit for information transfer and consistency in trial design and analysis on application for agricultural and industrial water quality improvement. ● A three-year project investigating the suitability of denitrifying bioreactors for reducing nitrogen run-off from sugarcane farms in the lower Burdekin was completed. Results from three bioreactor bed trials in the lower Burdekin have been collated detailing the treatment performance, costs, limitations and recommendations for the use of bioreactor beds to improve water quality in the lower Burdekin. This information significantly increases knowledge of 	

					<p>bioreactor treatment technology for pollutant mitigation. It will also be used to develop Queensland bioreactor guidelines and to update the Queensland Government's online treatment system toolbox.</p> <ul style="list-style-type: none"> • Variable rate technology which allows inputs to be applied at different rates across a field, was successfully used on three farms in the Wet Tropics and Burdekin regions to optimise crop development and nutrient use efficiency. Additionally, run-off and sediment modelling has been initiated on one farm to understand the risk of sediment and nutrient transport under irrigation and rainfall events. • Banana Nutrient Rate Trials are now in their second year and during 2019-20 collected intensive on-station trial data on banana plant crop and ratoon crop performance under a range of nitrogen rates. In addition to the work at the South Johnstone Research Facility, three collaborating banana producers are now conducting nitrogen rate comparisons at on-farm trial sites. Regular monitoring that is comparing agronomic differences of nitrogen rates against normal farm operations is underway with findings to assist project stakeholders including Australian Banana Grower's Council and reference group growers in evaluating nitrogen use for productivity, profitability and improved water quality outcomes. • The first potential nitrogen losses data sets were produced this year from monitoring deep drainage leaching in avocado production systems of Burnett Mary catchment; and the use of cover crops during the wet season to increase groundcover, reduce nutrient losses, and enhance soil organic matter in Dry Tropics horticulture systems. These data sets will be added to in the coming years and analysed to provide industry with verified best management practice options for reduced off-farm water quality impacts. • Water quality improvement practice management change by producers from replicated trials for small vegetable production systems in the Burnett Mary catchment shows reductions in conventional rates of pre-plant nitrogen fertiliser improves marketable yield and reduces nitrogen losses to deep drainage. • Grower-led trials in the pineapple industry have shown no difference between high, medium and zero pre-plant fertiliser rates on crop establishment, yield and fruit quality when soil tests show adequate nutrient availability. The outcomes have changed decision making, which avoids soil applied fertilisers and associated nutrient losses to surrounding water bodies for a key Burnett catchment pineapple producer.
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A3: Catchment restoration

Contributing agencies and partners: Natural Resource Management bodies, Industry

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
On-ground interventions are targeted to deliver water quality improvement.	3.1	Use whole-of-system catchment management, planning and information to support prioritisation.	On track / Underway	<ul style="list-style-type: none"> Through a contract with CSIRO, approximately 8100 km² of priority erosion areas are being mapped in the Cape York, Wet Tropics, Burdekin, Fitzroy and Burnett Mary regions using aerial terrain (LiDAR – Light Detection and Ranging). The data captured will help to further prioritise sediment management actions and investment in gully and stream bank erosion remediation. Through the Reef Trust Partnership with the Great Barrier Reef Foundation, projects are being funded to improve planning of interventions, including extracting river and streambank gully erosion data from data held by power companies, advanced hydrodynamic modelling of pile field bank stabilisation works to inform design guidelines and electromagnetic induction soil mapping in the Russell River catchment to inform soil health management actions. These projects are funded under the Innovation and System Change component. 	<ul style="list-style-type: none"> The Queensland River Management Guidelines and Qld Riverine Classification project has delivered a draft guideline that is being scientifically reviewed and made publicly available. This will guide the development of future streambank remediation projects in reef catchments and beyond. Scientific enhancements to the Statewide Landcover and Trees Study (SLATS) continued with the production of high resolution woody extent for the State, development of vegetation age and regrowth monitoring approaches. A BioCondition modelling and mapping framework is also being developed that will provide a measure of the capacity of a terrestrial ecosystem to maintain biodiversity values at a local or property scale. Data and information generated by these programs will inform a range of land management and biodiversity conservation initiatives in Queensland including vegetation management, Great Barrier Reef programs, the Land Restoration Fund, fire management, and planning, and conservation planning. The Queensland Government's Remote Sensing Centre standardised, and published products and metrics as complete data sets, including for the Australian Government's Great Barrier Reef airborne LiDAR data collection for Reef catchment areas. The derived products and metrics include digital elevation models, and vegetation metrics which have the potential to inform erosion studies, on-ground investment, and targeting and monitoring of offsets and other natural capital investments. The Gully Erosion Mapping project has mapped 70% of all Great Barrier Reef catchments, of which ninety-four per cent of high priority catchments (Lower Burdekin, Herbert, Fitzroy, Wet Tropics and Burnett and identified parts of the Normanby) being mapped. The mapping of gully distribution, density, geometry and activity rates has led to improved knowledge of gullies throughout the Great Barrier Reef catchment. This project has improved gully erosion model outputs and the prioritisation of regional program expenditure for the Australian and Queensland Governments. Whole-of-system management approaches delivered through Walking the Landscape workshops are available online as Catchment Stories. Finer scale walking-the-landscape, whole of system management workshops continue to be delivered in collaboration between Regional NRM groups and the Queensland Wetlands Program. A whole of catchment land-and-sea understanding is now possible with intertidal and subtidal ecosystems mapping of Central Queensland and ecosystem types available on Department of Environment and Science WetlandInfo website. This dataset enables better targeting of monitoring of the extent and nature of critical ecosystems (e.g. corals, seagrass) within the mapping extent to understand whether land-based water quality initiatives are successful.

	3.2	Use guidelines, Traditional knowledge and decision support tools to design and inform interventions.	On track / Underway	<ul style="list-style-type: none"> The <u>Reef Alliance – Growing a Great Barrier Reef Project</u> used the Queensland Government’s <u>Paddock to Reef Project Selector</u> (P2R Projector) to inform reporting for sugarcane. The tool enabled delivery partners to estimate the dissolved inorganic nitrogen (DIN) reductions, and extension officers to forecast and communicate the resulting water quality improvement of grower proposed changes. The tool also proved useful as an engagement tool, helping growers to bridge the gap between farm practices and water quality outcomes in a visual and readily understandable format. The tool allowed extension staff and growers to fine tune projects to optimise the water quality benefits and return on investment. Using the P2R Projector, it is estimated that at completion, the project had recorded improved farm management practices contributing to approximately 4.4% (169Kt) reduction in sediment load, 6.9% (366t) reduction of dissolved inorganic nitrogen and a continued reduction in pesticide load generated from broadscale agriculture in priority Reef catchments. 	<ul style="list-style-type: none"> The <u>Queensland Wetlands Program</u> continues to provide policy, governance, tools, information and stakeholder relationships in order to ensure the effective delivery of the <u>Wetlands in the Great Barrier Reef Catchments Management Strategy 2016–21</u>. Key achievements include: <ul style="list-style-type: none"> wetland education modules and further catchment stories published on the WetlandInfo site training Natural Resource Management bodies in catchment story development WetlandInfo updates ensuring stakeholders have relevant up-to-date information to effectively manage wetlands. The Paddock 2 Reef (P2R) Project Selector has been used as part of the Banana BMP Incentives Grant project run by Australian Banana Growers’ Council with funding from the Queensland Reef Water Quality Program, to help select projects to reduce the loss of sediment and nutrients from banana farms in the Wet Tropics. The P2R Project Selector has also been used by proponents under the suite of cane nutrient management projects to assist with project level outcome reporting.
On-ground interventions are targeted to deliver water quality improvement.	3.3	Trial and implement innovation in catchment repair projects to reduce sediment and nutrient delivery to the Reef.	On track / Underway	<ul style="list-style-type: none"> The <u>Stomping out Sediment in the Burdekin - livestock impact for gully remediation</u> project is trialling a new grazing concept called ‘biological carpeting’. This grazing practice, alongside ultra-high-density grazing technique on livestock, is being used to investigate the impact on the land to address gully erosion across a range of regionally representative soil types. As of June 2020, the project had trialled these techniques across six properties covering over 1000 hectares. 	<ul style="list-style-type: none"> The suite of gully remediation design and approaches developed in the Springvale Erosion Management Plan continue to be the basis for projects to reduce sediment flowing into the Normanby River. Activities include the provision of capacity building programs with First Nations peoples and working closely with Traditional Owners to protect their landscapes. Approximately 17.4 hectares of priority gully areas were remediated between 2017 and 2019 at Strathalbyn Station in the Burdekin region. It is estimated the project has prevented over 5000 tonnes of sediment run-off to the Great Barrier Reef per year with the remediation of the last remaining gully in the Northern Gully complex. An extension to the Strathalbyn project with GBRF and Queensland Government funding has built on the success of previous years and is remediating gullies in the Southern Gully complex. The sediment savings are estimated to be 3200 tonnes per annum. With Queensland Reef Water Quality Program funding, Greening Australia is working with the Woorabinda Pastoral Company (WPC) on gully and land management projects on their Mackenzie and Dawson River catchment properties (Fitzroy Catchment). The project has successfully undertaken gully and land remediation works on two degraded paddocks including new fencing and dam wall repair. Sediment savings will also result from the stock management planning currently underway. Greening Australia has also facilitated a training program for 15 Trainee Rangers employed with WPC.
	3.4	Modify existing urban area stormwater management and rehabilitate urban waterways.	On track / Underway		<ul style="list-style-type: none"> The Great Barrier Reef Erosion and Sediment Control Capacity Building Project, being delivered by Healthy Land and Water continues to build the capacity of local governments and industry to deliver improved urban stormwater, and erosion and sediment control practices through a range of events, training and supporting resources. The project provides the opportunity for the industry to learn and share innovations in design and processes together and promote the work that a wide range of partners are undertaking around common issues and leading best practice in designing solutions.

	3.5	Partner with voluntary stewardship groups, Traditional Owner groups, Indigenous Land and Sea Rangers and other organisations to deliver catchment repair projects.	On track / Underway	<ul style="list-style-type: none"> • A core component of the Laura Gullies Project, fix up and skills for the future involves local Indigenous people participating as Indigenous Land and Sea Corporation employees or as Ranger teams to undertake works which is providing cost-effective erosion control and building local capacity. The project is building on effective local Indigenous ranger and corporate capacity to manage erosion threats on Crocodile and Welcome Stations, and the Ang-gnarra Aboriginal Lands Trust in the Cape York region. • Through the Reef Trust Partnership with the Great Barrier Reef Foundation \$20 million has been committed to Traditional Owner-led protection initiatives as part of the \$201 million water quality component, to protect and maintain culture and heritage values of water sources, build capacity and improve inclusion. 	<ul style="list-style-type: none"> • The Queensland Government continues to provide funding and support for the Indigenous Land and Sea Ranger Program. Indigenous land and sea rangers undertake caring for country activities and contribute to protecting Indigenous cultural heritage and improving water quality outcomes for the Great Barrier Reef.
On-ground organisations, land managers, Traditional Owner groups and voluntary stewardship groups implement catchment restoration.	3.6	Support the development of ground up, multi-stakeholder programs for the delivery of catchment repair projects.	On track / Underway	<ul style="list-style-type: none"> • The Reef Trust Partnership with the Great Barrier Reef Foundation continues to build on existing partnerships and initiate new collaborations. The grants will support a range of organisations and landholders in the Reef catchment to change management practices to improve water quality. <ul style="list-style-type: none"> ○ \$10 million has been allocated to a Water Quality Conservation and Protection Program to maintain water quality in less disturbed catchments. ○ \$51.8 million has been allocated for Traditional Owner Reef Protection actions and \$10 million has been allocated for Community Reef Protection actions. A number of water quality improvement projects are currently being delivered through the Traditional Owner and Community Reef Protection components, with further funding rounds planned. • Through the Reef Trust, a program of six coastal habitat restoration and threatened species protection projects covering all six Reef Natural Resource Management regions will be delivered over three years. <ul style="list-style-type: none"> ○ For example, in the Mackay Whitsundays region, the project 'High priority coastal and island restoration for the protection of significant ecological communities and species' will establish island arks, protect iconic, keystone and threatened species, and restore parts of the catchment which are important to improving water quality (e.g. wetlands) and protecting biodiversity (e.g. threatened ecological communities). 	<ul style="list-style-type: none"> • The Queensland Government continues to support the development and strengthening of regional waterway health partnerships for monitoring and reporting local catchment information to the community and stakeholders. • The Wetlands in the Reef Network enables a multi-stakeholder group of land managers to coordinate and collaborate, taking a whole-of-catchment / landscape approach to the restoration of wetlands in the Reef.

B1: Applying the best available science and knowledge

Contributing agencies and partners: Natural Resource Management bodies, Industry

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
Gaps in science and knowledge to underpin evidence-based decision making are filled.	4.1	Identify, prioritise and fill knowledge gaps through the Reef 2050 WQIP Research, Development and Innovation (RD&I) Strategy.	Completed	<ul style="list-style-type: none"> • The five-year Reef 2050 Water Quality Research, Development and Innovation Strategy 2017-2022 (RDI Strategy) was developed in 2018. It is a joint action of the Queensland and Australian governments. <ul style="list-style-type: none"> ○ The strategy identifies the knowledge needs through the 2017 Scientific Consensus Statement, the previous Research, Development and Innovation strategies and consultation with science, policy and on-ground management experts refined and prioritised the knowledge needs for the next five years through engagement with over 100 science, policy and on-ground management experts and stakeholders at the 2017 Synthesis Workshop and through expert working groups to support the Reef 2050 Water Quality Improvement Plan. ○ As an outcome of the strategy, priority research gaps are being addressed through several funding programs: <ul style="list-style-type: none"> – The Queensland Reef Water Quality Program <ul style="list-style-type: none"> ➢ \$1 million for Human Dimensions research grants were awarded to research organisations in early 2020 to address the high priority knowledge gaps in the fields of social science and economics. While still in early stages of development, the expected research outcomes will help fill the recognised gaps in understanding the social and economic dynamics to achieve effective and timely water quality outcomes. The projects will be delivered by a consortium of 12 research organisations and up to 40 experts from a diverse range of fields including social and behavioural science, economics, governance, and marketing and communications. – Advance Queensland Fellowships <ul style="list-style-type: none"> ➢ A fellowship grant awarded to Dr Fernanda Adame from Griffith University working in collaboration with the Department of Environment and Science investigating nitrogen processing in coastal tropical wetlands and their contribution to improving water quality for the Great Barrier Reef. • National Environmental Science Program (NESP) Tropical Water Quality Hub <ul style="list-style-type: none"> ○ The outcomes of a range of research projects, funded in the later Rounds of the NESP program, address identified RDI knowledge gaps to better understand and manage sediment and nutrient runoff, land remediation benefits, impacts of poor water quality and cumulative pressures on marine organisms and the ecological relevance of water quality targets. 	
	4.2	Integrate forms of knowledge including science, policy, management, Traditional Owner and community through regular synthesis workshops and theme-specific working groups to support consistent communication messages and guidance for managers.	On track / Underway	<ul style="list-style-type: none"> • The fourth Great Barrier Reef Water Quality Science Synthesis Workshop was held in November 2019. The event provided an opportunity for science, government and industry practitioners to interact, share ideas and insights, and collaborate to support improved delivery and implementation of Reef water quality management activities. The workshop was the last in a series of four and was an opportunity to share successes and find new and better ways of delivering the Reef 2050 Water Quality Improvement Plan (Reef 2050 WQIP) • The Sediment Working Group met in November 2019 to provide an update on sediment management projects being delivered in reef catchments and a forum for government, research and natural resource management practitioners to share and collaborate. The group also discussed approaches to assessing the cost effectiveness of gully remediation projects and to identifying and prioritising gullies requiring remediation within catchments. • The Human Dimensions working group have worked with the Office of the Great Barrier Reef to refine the research needs and reporting opportunities for the social monitoring data. The working groups has representatives from CSIRO, QUT, Great Barrier Reef Marine Park Authority, Great Barrier Reef Foundation, DAF, UQ, Australian Banana Growers Council, NRMs, CQU, Australian Government Department of Agriculture, Water and the Environment and Canegrowers. • The Pesticide Working Group’s science sub-group met in November 2019 to provide an update on the scientific advances and project outcomes that had occurred over the last year and to discuss pesticide changes in the catchments and the monitoring and modelling of pesticides in the inshore marine area. 	<ul style="list-style-type: none"> • The Djabugay Bulmba Rangers, in partnership with Queensland Indigenous Land and Sea Ranger Program, hosted the 2020 Indigenous Ranger Conference on 10-12 March. Around 100 Indigenous rangers from across the state came together to share knowledge, skills, experience and to broaden understanding of conservation approaches. Rangers also participated in workshops on caring for Country through Indigenous-led research, and managing rangers’ broad roles within community.

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
					<ul style="list-style-type: none"> The third Queensland Indigenous Women Ranger Network (QIWRN) was held on 13 March 2020 in Cairns. Focussing on mentoring and leadership, 28 women rangers came together to support, learn and grow the Queensland arm of the network.
Science and new knowledge are accessible and used to support policy, programs and practical on-ground management to improve water quality outcomes.	4.3	Deliver decision support tools, communication and education products tailored to specific audiences.	On track / Underway	<ul style="list-style-type: none"> Outcomes from the National Environmental Science Program Tropical Water Quality Hub research are documented on the Hub website and shared via e-newsletters and social media platforms. Commonwealth Government-funded scientists engaged in the Marine Monitoring Program continued to publish peer reviewed research papers, and technical reports and to share new knowledge and understanding of water quality science with key stakeholders including industry, land managers and the community. 	<ul style="list-style-type: none"> The Reef 2050 Communication Network face-to-face meeting in Mackay in September 2019 was attended by 25 people to facilitate communication and coordination of water quality activities across the Great Barrier Reef catchments. Teleconferences were held in December 2019 and April 2020. The Australian and Queensland governments partnered with the Reef Alliance to run the Reef Champion Awards, recognising farmers, extension officers, young people and community groups who have taken action to improve the quality of water entering the Great Barrier Reef. The winners were announced at the Synthesis Workshop in November 2019. The Paddock to Reef Project Selector (P2R Projector) prioritisation tool supports groups working with farmers to improve their water quality. It assists with the process of assessing and prioritising projects for funding. The projects propose changes in agricultural management practices for key industries in the Great Barrier Reef region. Major revisions are expected to be delivered in late 2020 to improve functionality for users and reflect the updated Water Quality Risk Frameworks and new modelling outputs. New online economic decision support tools have been developed for the sugarcane and grazing industries measuring farm profitability and planning. The Farm Economic Analysis Tool (FEAT) and Breedcow Dynama assist producers' profitability of existing farming systems and determine economic impacts from proposed practice changes. Other features include assessing options and potential risks to guide decision-making and monitoring the impact of changes. These tools are hosted online at www.featonline.com.au and www.breedcowdynama.com.au Queensland Government scientists continued to publish peer reviewed research papers, technical reports and guidelines and participate in Regional Science Forums to share new knowledge and understanding of water quality science with key stakeholders including industry, land managers and the community.

B2: Coordinating and prioritising investment

Contributing agencies and partners: Natural Resource Management bodies, Industry

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
Water quality activities are boosted beyond government funding through coordination and alignment of resources and funding across all sources.	5.1	Identify opportunities for innovative financing mechanisms to amplify funding for water quality outcomes.	On track / Underway	<ul style="list-style-type: none"> Through two Reef Trust projects designed to <u>restore priority Great Barrier Reef wetlands</u>, Greening Australia continued to leverage funding to match the Australian Government investment. The <u>Reef Funding Program</u> through the Clean Energy Finance Corporation (CEFC), is a \$1 billion debt and equity investment fund financing clean energy investments and businesses in the reef catchment area that support delivery of the Australian Government Reef 2050 Plan. To date, total CEFC commitments of over \$390 million across approximately 420 transactions can be attributed to the Program, in projects with a total value of \$1.2 billion. CEFC finance has supported several diverse smaller-scale projects which have a positive co-benefit for water quality, including energy and water efficient irrigation systems such as centre pivot and lateral move systems. The <u>Reef Trust Partnership with the Great Barrier Reef Foundation</u> is funding a pilot program to develop Reef Credits, a market-based water quality trading scheme to diversify farm income and investment streams. 	
	5.2	Identify opportunities for co-investment or alignment of funds and resources with industry, research organisations, philanthropists, Natural Resource Management bodies, community and corporate organisations to achieve water quality objectives.	On track / underway	<ul style="list-style-type: none"> Under the <u>Reef Trust Partnership with the Great Barrier Reef Foundation</u> the Foundation has developed a <u>Collaborative Investment Strategy</u>, which has set a target of attracting an additional \$300 to \$400 million from private donors and partner organisations to complement the government's investment. This target is across all Partnership components, including water quality, over a six-year timeframe. The <u>Reef Alliance – Growing a Great Barrier Reef</u> project, through its unique cross-regional and cross-industry platform, enabled a collaborative approach to improve management practices and water quality in Reef regions. It has provided a practical opportunity for Reef Alliance partners to be funded and work as a group towards the common goal of improving water quality outcomes in the Reef. The project has led to a strengthening of networks between regions and commodities as well as building capacity of staff and extension delivery partners which will allow for a more informed collaboration in future projects. 	
Investment is prioritised to ensure interventions are effective and cost-efficient and delivery mechanisms are appropriate.	5.3	Prioritise investment across Reef catchments according to catchment priorities and targets.	On track / Underway	<ul style="list-style-type: none"> Through the <u>Reef Trust Partnership with the Great Barrier Reef Foundation</u>, Alluvium Consulting was engaged to revise and expand on earlier work designed to guide investment and actions for prioritising Reef water quality improvement investments. The resulting work was published in June 2019 on the Foundation's website (Effective and efficient pathways for investment in improved water quality in the Great Barrier Reef). The Foundation used this information to develop the Reef Trust Partnership Investment Strategy and prioritise investment under the its <u>Annual Work Plans</u>, which are available on the Foundation's website. 	<ul style="list-style-type: none"> The Queensland Water Modelling network with the Office of the Great Barrier Reef engaged Truii to build the Reefonomics tool which is a web-based platform to couple water quality and economic models to guide prioritisation of investment in on-ground actions across the Great Barrier Reef catchments. Scenarios can be run to identify the most cost-effective set of actions spatially across the Reef catchments to achieve water quality targets or meet an investment budget. The tool can also estimate the water quality benefit of a user-defined portfolio of investment actions.

	5.4	Identify the benefits and appropriate applications of different investment mechanisms.	On track / Underway	<ul style="list-style-type: none"> • <u>National Environmental Science Program Tropical Water Quality Hub</u> research is providing innovative research for practical solutions to maintain and improve tropical water quality from catchment to coast. A number of projects are underway including: • <u>Project 2.1.4 - Demonstration and evaluation of gully remediation on downstream water quality and agricultural production in Great Barrier Reef rangelands</u> – provides a cost-benefit analysis of erosion remediation strategies and demonstrating the benefits of best-practice erosion control to graziers, with a focus on Queensland’s Burdekin region. • <u>Project 2.1.2 - Scoping options for low-lying, marginal sugarcane land to reduce dissolved inorganic nitrogen in priority Wet Tropics catchments</u> – explores alternative land use options to reduce nitrogen losses from marginal sugarcane land in priority Wet Tropics catchments, co-funded by the Queensland Government. 	
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B3: Governance to support coordinated decision-making and accountability

Contributing agencies and partners: Natural Resource Management bodies, Industry

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
Governance arrangements are progressively and continuously adapted, improving coordination between partners and structures at all levels.	6.1	Collaborate and coordinate between the Queensland and Australian governments, in line with the Reef 2050 Plan governance structures.	On track / Underway	<ul style="list-style-type: none"> The Joint Secretariat continues to collaborate with all levels of Reef 2050 governance (Directors-Managers, Executive Steering Committee) including the Advisory bodies (Reef Advisory Committee and Independent Expert Panel) through regular meetings, and reports to the Great Barrier Reef Ministerial Forum. 	
	6.2	Ensure program design aligns with water quality priorities.	On track / Underway	<ul style="list-style-type: none"> Continued delivery of Reef Trust projects aligned with Reef 2050 Water Quality Improvement Plan priorities. Projects delivered under the Reef Trust Partnership with the Great Barrier Reef Foundation aligned with the Reef 2050 Plan and Reef 2050 Water Quality Improvement Plan priorities. 	<ul style="list-style-type: none"> Queensland Reef Water Quality Program aligned with Reef 2050 Water Quality Improvement Plan.
	6.3	Ensure accountability of investment to outcomes in the Reef 2050 WQIP.	On track / Underway	<ul style="list-style-type: none"> The Reef Trust Partnership with the Great Barrier Reef Foundation Investment Strategy was published in 2018 and Annual Work Plans have been published for 2019-20 and 2020-21. The Foundation publish annual Year in Review Reports, including financial reports and progress of the Reef Trust Partnership with the Great Barrier Reef Foundation grant. 	<ul style="list-style-type: none"> The 2018-2019 Queensland Reef Water Quality Program Annual Investment Report was published. The 2019-2020 Queensland Reef Water Quality Program Annual Investment Plan was published.
	6.4	Include all stakeholders including local organisations, communities and Traditional Owners in decision-making and priority setting.	On track / Underway	<ul style="list-style-type: none"> Under the Reef Trust Partnership with the Great Barrier Reef Foundation, the Foundation is implementing its Communication and Engagement Plan. 	<ul style="list-style-type: none"> The Reef 2050 Advisory Committee meets regularly to provide strategic advice on the implementation of Reef 2050 actions, stakeholder priorities, and highlight any emerging cross sectoral issues that need to be addressed.

B4: Evaluating performance

Contributing agencies and partners: Natural Resource Management bodies, Industry

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
Progress towards Reef 2050 WQIP targets is assessed.	7.1	Monitor and model management practice and water quality improvements through the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program (Paddock to Reef).	On track / Underway	<ul style="list-style-type: none"> • The Paddock to Reef program involves approximately 20 organisations including Australian and Queensland government agencies, industry bodies, regional NRM bodies, landholders and research organisations. It is jointly funded by the Australian and Queensland governments, and has continued to improve in terms of scope, methodology and application over 10 years. • For the first time the Reef Water Quality Report Card results were available through a newly designed interactive report card and reported at a finer scale. <ul style="list-style-type: none"> ○ The surface and groundwater monitoring network delivered by Department of Natural Resources, Mines and Energy (DNRME) provides timely and reliable flow and ambient water quality data that underpins modelling tools and loads reporting within the Paddock to Reef program. DNRME collects high resolution satellite imagery within Reef catchments that allows estimation of changes in land cover, land use change and changes in the extent of wetlands. DNRME continues to invest in high quality, high resolution satellite imagery for the state, which is instrumental in Great Barrier Reef catchment monitoring and disaster mapping. ○ The catchment models were rebuilt with the most up-to-date data sets including new management practice adoption data, land use, ground cover and gully maps to provide improved confidence in the modelled load reduction estimates for the 2020 Reef Water Quality Report Card. This ensures the best estimate of modelled loads and associated reductions in loads using the latest science and input data sets. ○ Regional NRM groups support the Paddock to Reef program through a targeted project that includes activities such as data collection, management and reporting, regional liaison, and regional communications. This component includes funding for cross-regional Reef coordination. Achievements include: <ul style="list-style-type: none"> ▪ annual provision of management practice adoption data ▪ collection of annual fertiliser and pesticide use data for relevant regional industries ▪ lead annual Regional Science Forums and produce regional communication products to disseminate Paddock to Reef and other local research results with local stakeholders. ○ The Great Barrier Reef Catchment Loads Monitoring Program monitors sediments, nutrients and pesticides in Great Barrier Reef catchments to help track long-term trends in water quality entering the Great Barrier Reef lagoon. The program adopts a regionally based citizen science sampling approach where water quality samples are collected by over 30 regionally based and partner organisations, including Indigenous partners, agricultural industries, natural resource management bodies, land holders and regional councils. During 2019-20 total suspended solids and nutrients were measured at 46 sites across six natural resource management regions and pesticides were measured at 29 sites across five natural resource management regions. ○ The Great Barrier Reef Catchment Loads Monitoring Program commenced using real-time monitoring sensors to provide more timely water quality data to stakeholders. Currently, 52 real-time water quality sensors are deployed with an additional 40 sensors planned for installation in the next 12 months. In addition, the program has transformed their traditional pdf based reports into digital interactive web based story maps providing stakeholders with an interactive water quality journey, all results are published on the reefplan website and feed into the Reef Report Cards with data also informing regional report cards. ○ The roll-out of finer-scale water quality monitoring in high risk catchments commenced during 2019-20 with the purchase of lower cost nitrate sensors and deployment of sensors in the Burnett Mary Region. Planning and stakeholder consultation are underway for further deployments during 2020-2021. A real-time web-based map will be produced that growers can access to see nitrate and sediment levels and rainfall data. This expansion of the water quality monitoring network supports the call for open, transparent data with agricultural communities, landholders, and industry and extension staff able to access their local, real-time water quality results on demand. ○ The Land Condition Assessment Tool (LCAT) was developed for the Paddock to Reef program, as an app for mobile devices. The LCAT provides consistent monitoring of the pasture and soil attributes which define the land condition at a site. From 2020-21, the LCAT will be an important element of monitoring and evaluation for any Reef 2050 WQIP investment in grazing lands. ○ The Wetland Condition Monitoring Program developed Wetland Tracker, a rapid assessment method for monitoring freshwater wetlands in northern Australia, additional wetlands were incorporated into the program and wetland monitoring intensified in the Fitzroy Basin enabling Fitzroy regional wetland condition reporting. 	

Intermediate outcomes	Id	Actions	Status	Australian Government	Queensland Government
				<ul style="list-style-type: none"> The Ground Cover Monitoring Program delivered ground cover and seasonal data and information, with the seasonal ground cover data informing water quality models. The program continued to provide data and information through FORAGE online reports and VegMachine, as well as open data access via the Terrestrial Research Network (TERN). 	
Effectiveness and efficiency of program and project design is analysed and the lessons are understood	7.2	Assess management of all industries through stewardship and management practice frameworks.	On track / Underway		<ul style="list-style-type: none"> Adoption of agricultural management practices were assessed against the industry management practice frameworks through the Paddock to Reef program. This informed progress towards the Reef 2050 WQIP land management practice target as reported via the Reef Water Quality Report Card 2017 and 2018, released in 2019. This helps assess the impact of significant investment in improved land management by the Australian and Queensland governments.
	7.3	Assess the water quality and human dimensions outcomes of projects within a consistent evaluation framework.	On track / Underway		<ul style="list-style-type: none"> Several projects have reported across the six social indicator questions through the Paddock to Reef Program. This information reported in future Reef Report cards but in the meantime, it provides valuable insight to projects to adapt their engagement with producers in order to achieve greater water quality and productivity outcomes.
	7.4	Evaluate the effectiveness of programs, governance mechanisms and adaptations.	On track / Underway	<ul style="list-style-type: none"> Projects contributing towards the Reef 2050 Water Quality Improvement Plan continue to report through the Monitoring, Evaluation and Reporting Tool (MERIT). The impacts of these projects is also modelled through the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program which focuses on the impacts of improved water quality. This is jointly funded by the Australian and Queensland governments, and delivered through the collaboration of governments, industry bodies, regional natural resource management bodies, landholders and research organisations. The program's models are based on the uptake of agricultural management practices, catchment indicators, catchment loads and Great Barrier Reef health indicators provided by the Marine Monitoring Program. The Reef Trust Partnership with the Great Barrier Reef Foundation is evaluated in line with the published Reef Trust Partnership Monitoring and Evaluation Plan, which includes independent biannual reviews. 	<ul style="list-style-type: none"> The Queensland Reef Water Quality Program evaluation identified areas of improvement in terms of effectiveness, efficiency, appropriateness, program management, and legacy. The short-term recommendations have been actioned, and work is underway to address the longer-term recommendations. Work has begun on conducting the next annual evaluation. Reef regional report card partnerships have been evaluated reflecting the 2018 and 2019 calendar years. The evaluation produced a report card on the reef regional report card partnerships that gave an overall score of B for all five partnerships. Partnerships received strong scores for cohesive staff, credible science and relevance to stakeholders. The evaluation identified areas of improvement for resilient organisation and effective outreach indicators. A set of recommendations to each individual partnership on how to improve their partnership have been actioned. The intent is for this evaluation to occur every two years. An independent review of the Wetlands in the Reef Catchments Management Strategy 2016-2021 is being undertaken. Information boards summarising the status of activities as they address the goals of the Strategy for governance groups and the independent reviewers, will be provided as part of a tracking, monitoring and reporting database. Information gaps will also be identified.
Program and project designs are modified to build on lessons learned from implementation.	7.5	Report progress towards targets, objectives and outcomes.	On track / Underway	<ul style="list-style-type: none"> The Reef Water Quality Report Card 2017 and 2018 was released in August 2019, assessing progress toward the Reef 2050 Water Quality Improvement Plan targets and objectives. While many landholders were found to have improved their land management practices, the results reflect the scale of change still required to meet the water quality targets. The Reef Water Quality Report Card 2019 has been developed for release and will be available from the Reef 2050 Water Quality Improvement Plan website. Reporting against objectives for coral and seagrass were published in 2017 and 2018 Marine Monitoring Program annual technical reports. 	

	7.6	Communicate regionally relevant information for management decisions and local communities.	On track / Underway	<ul style="list-style-type: none"> • Reef Regional report cards released for Wet Tropics, Townsville Dry Tropics, Mackay Whitsunday Isaac, Gladstone and Fitzroy. • Support provided for Regional Report Card Partnerships to produce regional report cards • Regionally relevant information on coral, seagrass and water quality were published in 2017 and 2018 Marine Monitoring Program annual technical reports • A new Urban Stewardship Framework covering water management activities relating to greenfield and brownfield development, sewage treatment plants, and operating and maintaining sewage networks, that may contribute to sediment and nutrient loads entering the Great Barrier Reef lagoon, was piloted in Townsville City Council, Cairns Regional Council and Whitsunday Regional Council. The intent is for the Urban Stewardship Framework to be undertaken across all the reef regions and reported by the Regional Report Card Partnerships. • The Queensland Government has continued monitoring regional ecosystems (ambient) health for Reef catchments for input into regional report cards. A comprehensive water quality data set was collected for Mackay, Wet Tropics and Dry Tropics (Black/Ross Basins only) estuaries. An estuary pesticide monitoring program was initiated in partnership with Reef Catchments. Arrangements are well advanced to start collecting water quality and other data in streams and estuaries in the Black Basin area north of Townsville. • Continued monthly water quality monitoring estuaries and freshwater streams with data informing the 2019 Wet Tropics, Dry Tropics, Mackay-Whitsunday and Fitzroy regional report cards. • Provided data on the extent and any changes to wetland and riparian habitat for regional report card estuaries. • Modelled freshwater fish species for the Wet Tropics, Dry Tropics and Mackay Whitsunday 2019 regional report cards. • Completed sampling of fish communities at 119 sites distributed across nine of eleven basins reported in Wet Tropics and Dry Tropics report cards. Results were used as the basis for ecological assessment of the condition of freshwater fish communities in those areas. • Regional Science Forums were held by the Reef Natural Resource Management groups as part of the Paddock to Reef program to communicate regionally relevant results to inform local management outcomes. This includes land and catchment management information, water quality monitoring and modelling data and inshore marine condition information from the Reef Water Quality Report Card and other local research projects.
Program and project designs are modified to build on lessons learned from implementation.	7.7	Make data and information publicly available through a range of communication products.	On track / Underway	<ul style="list-style-type: none"> • The Reef Water Quality Report Card was re-designed based on consultation with a range of stakeholders into an interactive visual platform in 2019 to enable reporting of data and information to the public, stakeholders and management users at a range of scales. Using digital technology enables the results to be interrogated in multiple ways with interactive visualisations to suit different audiences from summary highlights to drill downs for detailed information and the underpinning data. Results can be viewed at the whole of the Great Barrier Reef catchment scale, regional scale, catchment and major sub-catchments scales across a range of land and catchment management and water quality data. Information on inshore marine condition and wetland condition is also displayed. • Updates on the projects contributing towards the Reef 2050 Water Quality Improvement Plan are routinely published through the Department of Agriculture, Water and Environment's social media channels. • Ongoing delivery of the Great Barrier Reef Marine Monitoring Program communications strategy — key outputs including, updating the Marine Monitoring Program webpages on the GBRMPA website, external e-newsletters, social media posts highlighting monitoring methods, research partnerships and internal information sharing with the Reef Joint Field Management Program and QPWS rangers. • Catchment loads monitoring results from the Paddock to Reef program are also available via interactive Story Maps. • The Queensland Water Modelling Network (QWMN) continued to support Reef related activities including the development of communication tools to explain Queensland water plan climate risks and the underlying methodology and responding to the Critical Review of Climate Change in water models in Queensland. The QWMN supported five projects contributing new knowledge and tools towards Reef and landscape restoration including: <ul style="list-style-type: none"> ○ Improved modelling of stream bank erosion in Reef catchments, leading to a new initiative, the development of Queensland River Management Guidelines and Classification Framework. ○ Addressing uncertainty in linked catchment and receiving water models using machine learning. ○ Development of a gully erosion framework for Queensland. ○ Visualisation of coupled economic and Queensland water quality models. ○ Development of a data portal to deliver catchment modelling data to end users.