



Blueprint for a sustainable Moreton Bay for people and nature (2025-2035)

Developed for The Moreton Bay Foundation

August 2024



The Moreton Bay
Foundation

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Authors: Paul Maxwell, Emily Saeck, Vicki Martin, Jim Binney, Steve Charleton-Henderson, Tracy Schultz, Erin Thompson, Marika Seden

Review: Paul Maxwell, Emily Saeck

Approved: Paul Maxwell

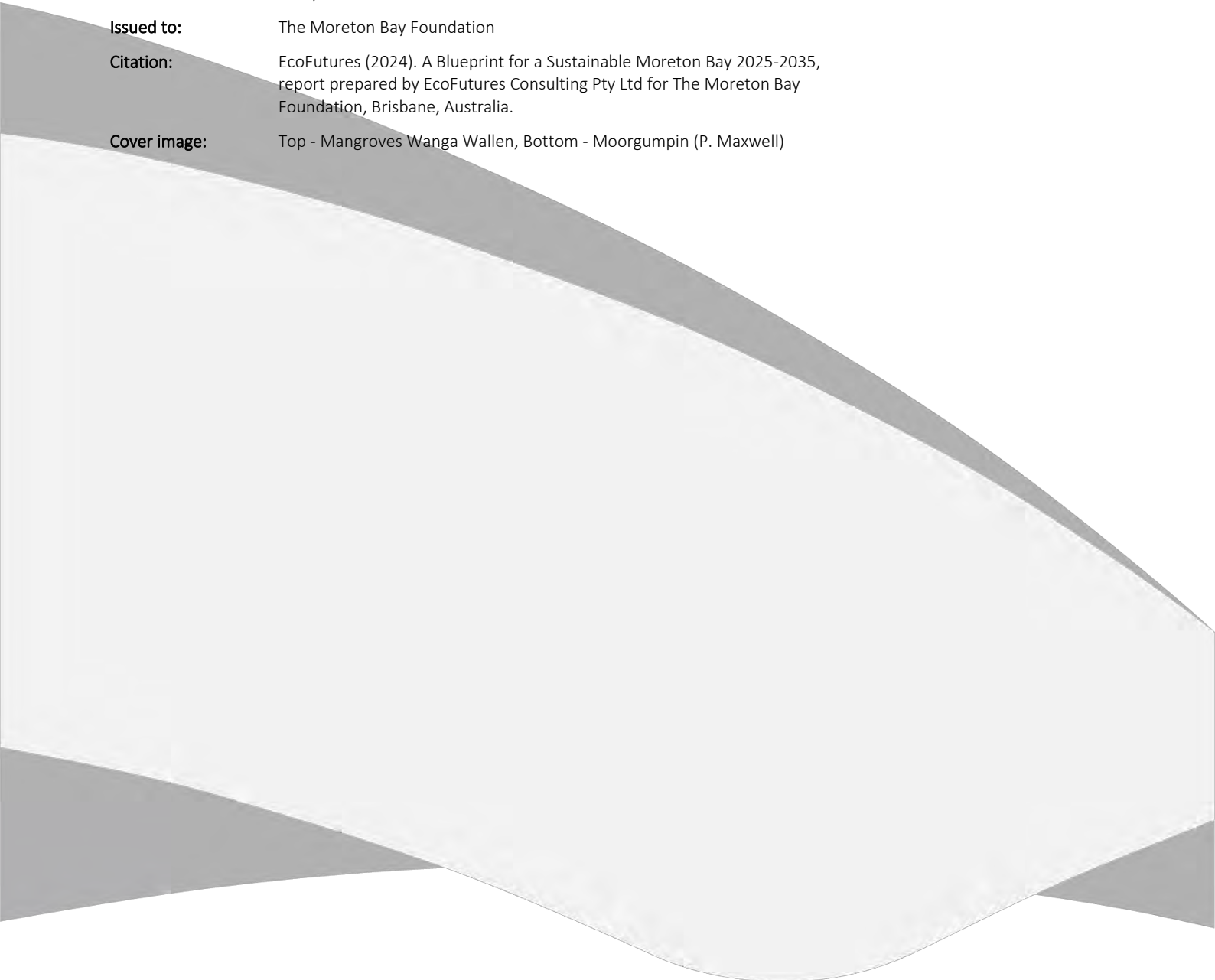
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Cover image: Top - Mangroves Wanga Wallen, Bottom - Moorgumpin (P. Maxwell)



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Acknowledging Country

The Moreton Bay Foundation and the Alluvium Group team acknowledge the Quandamooka, Kabi Kabi and Kombumerri / Yugambeh peoples as the Traditional Custodians of the land and sea encompassed by this plan.

The Quandamooka peoples, comprising the Nunukul, Ngughi, and Goenpul clans, maintain an unbroken connection with this area, as do the Kabi Kabi people in the northern portions covered by the Blueprint, and the Kombumerri / Yugambeh people in the south.

We recognise the cultural, spiritual, social, and economic significance that these lands and waters hold. We pay our respects to past, present, and future Traditional Custodians and Elders, and a commitment to the continuation of cultural, spiritual, and educational practices of Aboriginal and Torres Strait Islander peoples.



Artwork by Melissa Barton. This piece was commissioned by Alluvium and tells our story of caring for Country, through different forms of waterbodies, from creeklines to coastlines. The artwork depicts people linked by journey lines, sharing stories, understanding and learning to care for country and the waterways within. We recognise and acknowledge the unique relationship and deep connection to Country shared by Aboriginal and Torres Strait Islander people, as First Peoples and Traditional Owners of Australia. We pay our respects to their Cultures, Country and Elders past and present.



1 Introduction

1.1 About this report

Moreton Bay's unique natural environment, abundant biodiversity and spectacular land and seascapes are of international importance, contributing to the lifestyles and livelihoods of communities across South East Queensland (SEQ). As our region moves into the next decade, facing unprecedented challenges and opportunities, Moreton Bay requires a blueprint to help guide actions at a sufficient scale to ensure its sustainable management for future generations.

The Moreton Bay Foundation (TMBF) has commissioned the development of this Blueprint to identify priority programs and actions to promote sustainable management of Moreton Bay (the Bay) over the next decade (2025-2053). In particular, TMBF sought to identify gaps in existing legislation, policy and management as well as actions which address key barriers to sustainability. TMBF recognises that there are many current plans and strategies of relevance to the Bay but that an overarching, integrated approach to identifying and prioritising effective actions at scale is lacking.

The results of this work are intended to provide a Blueprint for all stakeholders with an interest in ensuring the Bay's sustainable future as well as informing TMBF's strategic priorities over the next decade and providing a guiding document to support relevant research, action, engagement, communication and advocacy.

The aim of this study was to conduct a holistic review of existing knowledge and activity in the Bay, describe gaps in its understanding and management, and then recommend priority actions to be undertaken over the coming decade to ensure the health and productivity of the Bay is improved by 2035 and beyond.

The major objectives of the project were to:

1. Review existing plans, strategies and regulatory frameworks relevant to Moreton Bay (Section 2.1 and 3.1)
2. Identify and synthesise recognised values (social, economic and ecological) of the Bay, their key threats, condition and trend in condition (Sections 2.2, 2.3, 3.2, 3.3 and Appendix A)
3. Review regulatory, administrative and social barriers to, and opportunities for, implementing actions to improve the health of the Bay (Section 2.4 – 2.7 and 4, and Appendix B and C)
4. Recommend a prioritised list of actions to address gaps (Sections 5)

1.2 Links to First Nations strategic priorities

This Blueprint covers an area of oceans and coasts for which First Nations people have an unbroken connection and hold rights and interests in all aspects of management, use and enjoyment.

The Quandamooka peoples, comprising the Nunukul, Ngughi, and Goenpul clans, maintain an unbroken connection with this area, as do the Kabi Kabi people in the northern portions covered by the Blueprint, and the Kombumerri / Yugambeh people in the south.

The cultural geographic territory of the Quandamooka people spans the central part of the area covered by this Blueprint. The Minjerribah Moorgumpin Elders-in-Council Aboriginal Corporation (MMEIC) is a cultural not-for-profit organisation committed to preserving, recording, communicating and teaching the culture of the Goenpul, Ngugi and Noonuccal First Nations People of Minjerribah (North Stradbroke Island) and Moorgumpin (Moreton Island). The Quandamooka Yoolooburabee Aboriginal Corporation (QYAC) is the Registered Native Title Body Corporate. The concept for the Blueprint was discussed with MMEIC and QYAC. Undertaking this project for the Bay, with the intention to fill current gaps in management, has the general support of these two organisations.

The present document has been developed in a way that recognises First Nations have strategic goals that reflect their long-term past, present and future custodianship of Sea Country and accordingly, the document is situated within these and is grounded with an underpinning principle that the recommendations within this report are developed and delivered in collaborative partnership with First Nations people and organisations including MMEIC and QYAC.

Formal mechanisms for alignment may be the establishment of financial and collaborative partnerships, when invited (see, for example, Action 3.1) and the engagement of MMEIC and QYAC's land and sea ranger program to deliver on-ground projects including restoration, land-management, data collection and research projects.

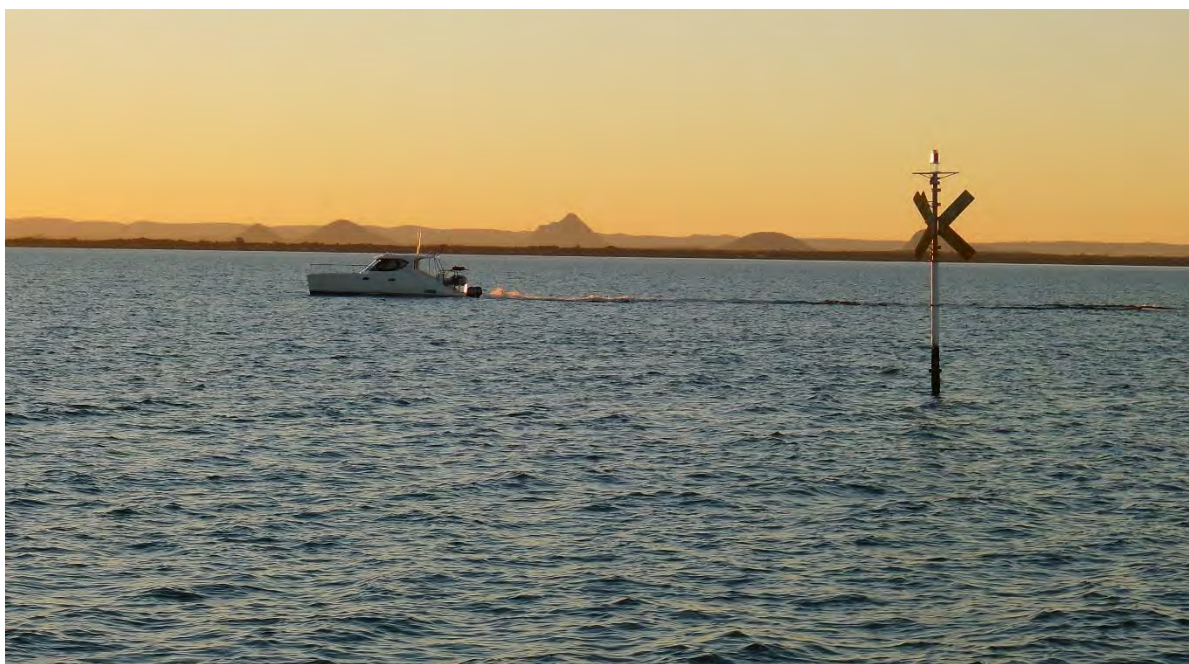
1.3 About Moreton Bay

1.3.1 Physical description

Moreton Bay is defined here as the whole Moreton Bay Marine Park area, including Pumicestone Passage, Southern Moreton Bay and the Broadwater (Figure 1).

The Bay is a semi-enclosed basin, with sand islands to the east and a deltaic coastline to the west. The Bay area is approximately 110 km north to south and 35 km at its broadest point from east to west. The area is hydrologically diverse and includes a diverse network of waterways, including the tributaries of Pumicestone Passage, intertidal and subtidal zones along the western and southern Bay, the estuarine channels in the Broadwater region, sandbanks within the central and northern regions of the Bay and ocean beach habitats on the sand islands that form the eastern boundary of the Bay.

Several large river systems discharge into the western side of the Bay, with a total catchment area of around 22,000 km². These include the catchments of Pumicestone Passage and Caboolture, Pine, Brisbane, Bremer, Lockyer, Logan, Coomera, Pimpama and Nerang Rivers. The lower reaches of these catchments are dominated by rapidly increasing areas of urban, peri-urban and industry while upper catchment areas are dominated by forested and rural landscapes.



Spectacular view looking across Moreton Bay to the Glasshouse Mountains (Photo: E.Saeck)

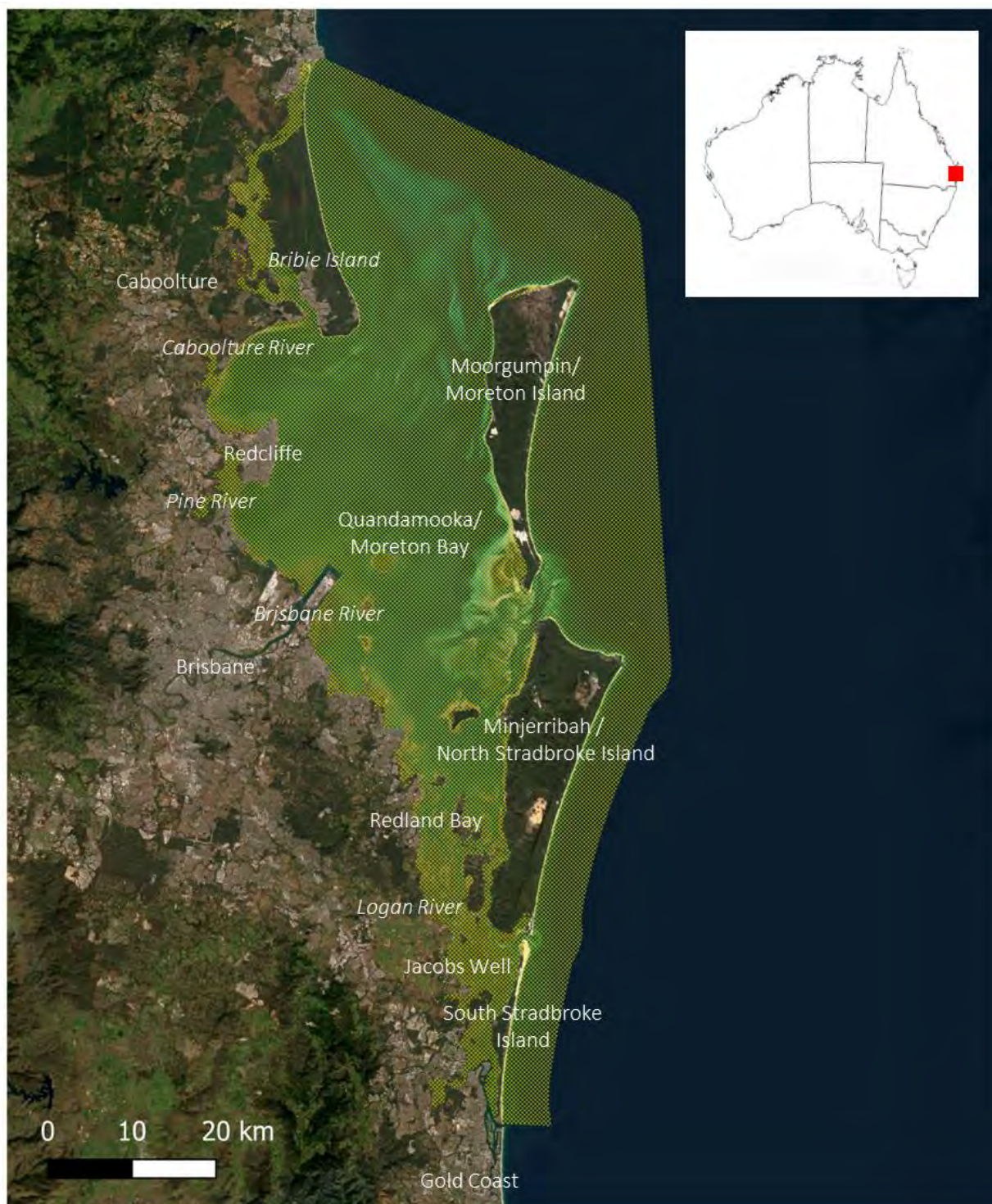


Figure 1 Extent of Moreton Bay as defined in this study, with the seaward boundary aligned with the Moreton Bay Marine Park (yellow lined area), and the landward boundary extending slightly inland of the highest tide boundary.

1.3.2 Key values

The Bay is a unique and complex estuarine ecosystem that supports a wide range of biodiversity. Positioned at an overlap between biogeographical zones, the Bay supports both sub-tropical and temperate species, including many of national and international significance – shorebirds, marine turtles and marine mammals. The Bay includes a wide range of coastal and marine habitats including seagrass meadows, mangrove forests, saltmarshes, sandbanks and mudflats, coral and shellfish reefs and ocean beaches and dune systems.

The Bay sits adjacent to Brisbane and SEQ, an area which has one of the fastest growing urban populations in Australia. Local, national and international visitors are attracted to the Bay for a wide range of recreational activities and the Bay significantly contributes to the Queensland economy through shipping, tourism, commercial fishing and recreational boating and fishing and aquaculture.

First Nations people in SEQ have an intrinsic connection to the islands and water of Quandamooka (Moreton Bay) which is grounded deeply in their cultural and spiritual identity. Owing to dispossession and the rapid urban growth in SEQ, cultural practices and traditional knowledge have been impacted along with sites of cultural significance within the Bay.

The Bay also provides significant ecosystem services to the community including food provision, protection from coastal erosion, treatment and assimilation of wastewater, regulation of the local climate, regulation of greenhouse gases and flood control and storage.

Management of the Bay requires balancing these diverse and conflicting values to ensure the Bay remains a diverse, resilient and productive system that provides sustainable services for the community and economy.



Natural beauty and recreational use are major social values of the Bay (Photo: E. Saeck)

1.3.3 Regional governance

Protecting and managing the many values of the Bay is a collaborative effort in which multiple parties are working under a combination of statutory and non-statutory obligations. There are several Federal, State and local governments policy and planning mechanisms that protect and promote sustainable use and management of the Bay (Appendix C). In addition, there are multiple natural resource management groups, Traditional Owner organisations, private industries, landholders and community groups working towards the protection of the Bay's values through their own planning and on-ground activities. Several key governance mechanisms are described below.

Moreton Bay Marine Park

Moreton Bay was first declared a Marine Park in 1993. The Queensland Government manages the marine park as a multiple-use marine protected area. The Marine Parks (Moreton Bay) Zoning Plan 2019 (under *Marine Parks Act 2004*) allows for a wide range of activities including recreational use, commercial use, and scientific research and for the continuation of traditional activities. The marine park covers 3400 km², with a landward boundary of the highest astronomical tide and seaward boundary as per the limit of Queensland waters. There are areas allocated to general use, habitat protection, conservation park and marine national park (which are designated “no-take” areas). The purpose of the zoning is to support the conservation of biodiversity by setting aside some areas where there are minimal disturbances.



Boat ramp on the edge of the Moreton Bay Marine Park (Photo: E.Saeck)

Ramsar International Convention on Wetlands of International Importance

The Bay is a recognised under the Ramsar Convention as a wetland of international significance¹. Australia has responsibilities to protect Moreton Bay under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Ramsar International Convention³, and Migratory Bird Agreements with Japan, China, and the Republic of Korea². Australia's obligations are to ensure conservation of migratory bird species, in addition to maintaining the site's ecological character (i.e. ecosystem components, processes and benefits to community). Moreton Bay meets all nine criteria for Ramsar listing (Table 1) and the Ramsar wetland site is collaboratively protected and managed by Federal, State, and local governments. The Australian and Queensland Government are also specifically responsible for the ongoing review and reporting on Ramsar wetland site condition³.

¹ Department of Environment, Science and Innovation, Queensland (2019) Moreton Bay Ramsar internationally important wetland — facts and maps, WetlandInfo website, accessed 21 May 2024. Available at: <https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/ramsar-wetland-moreton-bay/>

² Department of Climate Change, Energy, the Environment and Water, Australia (2024) Migratory birds: bilateral migratory bird agreements, accessed 14 June 24. Available at: <https://www.dcceew.gov.au/environment/biodiversity/migratory-species/migratory-birds>

³ Secretariat of the Ramsar Convention, 2023. Ramsar Sites Information Service: Moreton Bay [WWW Document]. URL <https://rsis.ramsar.org/ris/631> (accessed 1.5.24).

Table 1 The nine criteria for Ramsar Sites – all are met by Moreton Bay as outlined in detail the Ramsar Information Sheet for Moreton Bay³

No.	Ramsar Convention on Wetlands – Site Criterion
1	Representative, rare or unique natural or near-natural wetland types
2	Rare species and threatened ecological communities
3	Biological diversity
4	Support during critical life cycle stage or in adverse conditions
5	>20,000 waterbirds
6	>1% waterbird population
7	Significant and representative fish
8	Fish spawning grounds, etc.
9	>1% non-avian animal population

Native Title

Quandamooka People have recognised Native Title rights and interests over 544 km² of land and sea in the Moreton Bay area. Under Native Title, rights include the right to: conduct ceremonies; maintain places of significance, teach on the area about the physical and spiritual attributes; and to take, use, share and exchange traditional natural resources and seawater for any non-commercial purpose⁴. The Quandamooka Aboriginal Corporation (QYAC) is the Registered Native Title Body Corporate⁵. QYAC continues to implement the Naree Budjong Djara (My Mother Earth) Management Plan with Queensland Parks and Wildlife Service, continuing strong protections for the natural and cultural values on Quandamooka Country. Through the Indigenous Land Use Agreement, QYAC has a memorandum of understanding with the State Government over the Marine Park areas, grants of Aboriginal Land Act land as freehold, Land Use Planning Studies towards living on Country, management of reserves, rights over commercial activities and permits to keep, use, take and interfere with cultural and natural resources.

SEQ Natural Resource Management Plan

The SEQ Natural Resource Management Plan, which includes the area of Moreton Bay and catchment, contains a set of targets designed to maintain the region's natural assets and quality of life, specifically under the themes of healthy land, healthy water, nature conservation, local landscapes, coastal/marine, community, sustainable urban design, air/atmosphere and First Nations⁶. The purpose of the plan is to complement and inform planning, policy and investment by government and non-government entities. The plan is also used by state and local government to advise on assessment of development applications and activities. Development, review, and delivery of the SEQ NRM Plan is the responsibility of the region's NRM body, Healthy Land and Water. While non-statutory, the SEQ NRM Plan is recognised through the SEQ Regional Plan, ShapingSEQ, and Healthy Land & Water provides plan implementation updates to the Queensland and Australian Governments on a regular basis.

SEQ Regional Plan

ShapingSEQ is Queensland Government's long-term vision and plan to accommodate future population growth, sustainably enhance communities, and maintain SEQ. It sets out broad objectives and priorities for development and land use in the region. The plan covers the region's 12 local governments. The goals, elements, strategies, and sub-regional

⁴ Fischer M, Burns D, Bolzenius J, Costello C, Low Choy D. 2019. Quandamooka Country: The role of science and knowledge in Traditional Owner-led land and sea management. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

⁵ Quandamooka Yoolooburrabee Aboriginal Corporation (2022) QYAC Strategic Plan 2022-2026., accessed 21 May 2024. Available from: <http://www.qyac.net.au/>

⁶ Healthy Land and Water (2024) SEQ NRM Plan website, accessed 21 May 2024. Available at: <https://hlw.org.au/seq/nrm-plan>

directions outlined in the SEQ Regional Plan are implemented through local government planning schemes, and where appropriate, in other plans and programs. The five goals of the SEQ Regional Plan⁷ are to: 1) sustainably accommodate a growing population, 2) prosper as a competitive economic powerhouse, 3) move people, products and information efficiently, 4) promote ecological and social sustainability, and 5) living in better designed communities. The 2023 plan update specifically includes a vision for the catchments of SEQ being the best managed in the world and to sustain existing biodiversity. Specific to Moreton Bay, there is a vision for a world heritage listing of Moreton Bay (Quandamooka), a healthy “Ramsar wetland of international importance”, and sustaining SEQ’s way of life by protecting cultural, environmental, economic and recreational value of the bay and islands.

1.4 Why does Moreton Bay need a blueprint?

1.4.1 Previous Bay-wide plans

In the late 1990s and early 2000s, local, state and federal government worked closely with various industries and universities to develop the South East Queensland Regional Water Quality Monitoring Strategy (SEQRWQMS)⁸. The strategy was developed in recognition that no single organisation had sole jurisdiction for management of the Bay, and for any management actions to have a demonstrable impact on the Bay’s values would require widespread collaboration at a regional scale. The SEQRWQMS reviewed available information and delivered a staged approach to actions designed to improve the Bay’s ecosystem health.

Since the development of the strategy, numerous entities (including state and local governments) have developed and implemented action plans specific to their jurisdictions, which have contributed to the improvement of the Bay. More recently, the interest in improving the state of the Bay has grown with numerous initiatives and projects emerging. However, the Bay hasn’t been the focus of a dedicated investment and implementation plan since the SEQRWQMS was superseded in 2007. This means that many of these initiatives and projects are implemented in isolation, without contributing to a common vision and strategy for the Bay.

1.4.2 Key challenges

Climate change

Climate change poses a threat to many of the Bay’s environmental, social, cultural and economic values, as increases in the frequency and intensity of extreme weather events, rising temperatures, altered rainfall patterns and sea level rise, will have direct and indirect impacts on these⁹. For example, more frequent and more extreme rainfall events, will increase catchment pollutants (sediment, nutrients, contaminants) to the Bay, degrading long-term water quality and benthic habitat conditions across the Bay. More frequent extreme rainfall events also reduce the length of time for recovery (before another event hits)¹⁰ for species and habitats, affecting the long-term condition and survival of seagrass and reef habitats. Shifts in rainfall patterns alters hydrology and groundwater flows, with consequences for groundwater dependent ecosystems, including freshwater wetlands. Temperature shifts may lead to migration of animals that bite and sting (e.g. box jellyfish) from the north, impacting how the community can use the Bay.

⁷ Department of State Development, Infrastructure, Local Government and Planning, Queensland (2023) Draft Shaping SEQ – South East Queensland Regional Plan 2023 Update. State of Queensland. Queensland, Australia.

⁸ Lloyd, T, P. McMahon, B. Gibbes, C. Collier. 2000 South East Queensland regional water quality management strategy. *Water* 27 (6) 42–47.

⁹ Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A. (2019) Moreton Bay Quandamooka & Catchment Past, present, and future. The Moreton Bay Foundation, Brisbane, Australia. Available from: <https://moretonbayfoundation.org/news/books-and-research-papers/>

¹⁰ State of Queensland 2019. Climate Change in the South East Queensland Region. Department of Environment and Science.

Coastal inundation and sea level rise

Coastal communities and habitats throughout the Bay are at risk from open coast erosion and regular or permeant inundation, as a result of development, climate change and sea level rise¹¹. Coastlines naturally erode and accrete periodically over time, driven by sediment supply, tidal currents and waves. Development too close to the shore, climate change, sea level rise and changes in sediment supply can affect these natural processes. Coastal Hazard Adaptation Strategies developed for local government areas (e.g. City of Moreton Bay¹², City of Gold Coast¹³, Redlands City Council¹⁴) have identified current and increasing future risks to homes, businesses, infrastructure, utilities networks, places for walking, exercising and recreation, and environmentally significant locations (such as turtle nesting habitat).

Moreton Bay's coastal communities have a relatively good level of resilience to present day storm tides, erosion and tidal inundation for all but the scenario of a low tracking cyclone causing extreme waves and storm tide. Hard protection structures around developed areas of the Bay offer protection to key areas. However, hard protection structures are not a feasible long-term solution for delivering the required level of protection to deal with the increasing tidal and storm tide inundation that is predicted with sea level rise.

Sea level rise is also predicted to affect mangrove and saltmarsh habitat distributions. Saltmarsh has declined by 64 % since 1955, and continues to decline¹⁵, predominantly due to human development or mangrove encroachment into saltmarsh habitats as a result of climate change¹⁶. There is limited available habitat for saltmarsh migration along the shorelines of the Bay¹⁷, which in many cases is being squeezed against increasing urban development along the coastline.



Hard protection structures protect coastal infrastructure but are increasingly under threat from sea-level rise (Photo: E.Saack)

¹¹ Moreton Bay Regional Council (2023) Moreton Bay's Living Coast Plan 2023; Redland City Council Coastal Hazard Adaptation Strategy (2021) Report by Alluvium for Redland City Council.

¹² Moreton Bay Regional Council, 2023. Moreton Bay's Living Coast Plan 2023.

¹³ City of Gold Coast, 2022, Coastal Adaptation Plan.

¹⁴ Redland City Council Coastal Hazard Adaptation Strategy. Report by Alluvium for Redland City Council, 2021.

¹⁵ Healthy Land and Water, 2021. South East Queensland Natural Resource Management Plan: Story Map 2021 [WWW Document]. URL <https://storymaps.arcgis.com/stories/ad1933bb9fef4c2297f40747a33e7dd0> (accessed 1.9.24).

¹⁶ Kovacs EM, Tibbetts HL, Baltais S, Lyons M, Loder J, Roelfsema C. 2019. Wetland and benthic cover changes in Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

¹⁷ Bennion, V., Dwyer, J.M., Twomey, A.J., Lovelock, C.E. (2024) Decadal Trends in Surface Elevation and Tree Growth in Coastal Wetlands of Moreton Bay, Queensland, Australia. Estuaries and Coasts. <https://doi.org/10.1007/s12237-024-01325-y>; McSweeney, S., Stout, J., Savage, T. (2021) Basin infill increases seaward sediment delivery in small, tide-dominated estuaries. Estuar Coast Shelf Sci 258. <https://doi.org/10.1016/j.ecss.2021.107441>

Population growth

The population of SEQ is quickly rising¹⁸. By 2046 the population is expected to reach about six million, representing an additional 2.2 million people and a need for 900,000 new homes¹⁹. As the population rises, old use and management patterns and practices for the Bay cannot be sustained without undermining its health.

Urban development

The anticipated expansion of our urban and regional footprint for new homes and infrastructure represents significant direct and indirect pressure on regional biodiversity, catchment condition and waterway and bay health. Associated land clearing fragments wildlife corridors and increases susceptibility to sediment erosion and run-off. Urban development using conventional approaches alters the natural water cycle and manifests as increased sediment, nutrient and toxicant pollutants to the Bay. Coastal urban development also threatens the Bay's habitats, directly by clearing of vegetation (mangrove, saltmarsh) and indirectly by increasing human-wildlife interactions (e.g. recreationists and dog walkers disturbing roosting and feeding migratory shorebirds).

As the population increases, the demand for sewage services increases, placing pressure on existing wastewater treatment infrastructure. The Bay and associated estuaries are the receiving environment for wastewater from the region's wastewater treatment plants. If not managed effectively, it is almost certain that the increase in nutrients will result in declines in estuarine and bay water quality. Historically poorly managed wastewater inputs resulted in algal blooms and loss of seagrass in the western side of Moreton, which was the catalyst for the Bay-wide water quality management strategy in the late 1990s and early 2000s²⁰.

Catchment runoff and pollutants

Catchment derived sediment represents one of the most significant threats to the values of the Bay, smothering near coastal habitats like seagrasses, shellfish and coral reefs and sandy intertidal zones and creating poor water quality which impacts the types of plants and animals that can inhabit the Bay as well as impacting the amenity and tourism values of the Bay²¹.

Extensive clearing in the catchments that drain to the Bay since European settlement has led to significant sediment erosion which ends up discharging into the Bay following rainfall events and flooding²². Regionally focussed organisations like Healthy Land and Water, Seqwater and the Council of Mayors along with local governments, utilities and the Port of Brisbane have been implementing sediment projects across SEQ.

¹⁸ Australian Bureau of Statistics, 2024. Population [WWW Document]. URL <https://www.abs.gov.au/statistics/people/population> (accessed 4.25.24).

¹⁹ Department of State Development, Infrastructure, Local Government and Planning, Queensland (2023) Draft Shaping SEQ – South East Queensland Regional Plan 2023 Update. State of Queensland. Queensland, Australia.

²⁰ Saeck, E.A., O'Brien, K.R., Weber, T.R., Burford, M.A., 2013. Changes to chronic nitrogen loading from sewage discharges modify standing stocks of coastal phytoplankton. *Mar Pollut Bull* 71, 159–167. <https://doi.org/https://doi.org/10.1016/j.marpolbul.2013.03.020>

²¹ Saeck E, Udy J, Maxwell P, Grinham A, Moffatt D, Senthikumar S, Udy D, Weber T. 2019. Water quality in Moreton Bay and its major estuaries: Change over two decades (2000-2018). In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

²² Lyons M, Phinn S, Roelfsema C. 2019. Moreton Bay and catchment urban expansion and vegetation change. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>



Clean-up of Moreton Bay following the 2011 flood - major rainfall events increase with climate change, delivering extreme levels of catchment sediments, nutrients and litter to the Bay (Photo: E.Saeck)

1.4.3 Emerging opportunities

In recent years, several region wide initiatives have emerged representing opportunities that, if coordinated successfully, could lead to significant improvements to the management and health of waterways and Moreton Bay. These opportunities should be leveraged to help fill the gaps in the current management of the Bay and to ensure the sustainable and long-term funding that is required to protect, enhance and restore the unique biodiversity values of the Bay.

Brisbane 2032 Olympic Games

Brisbane and the SEQ region are hosting the 2032 Olympic Games. The Games have been identified as a substantial opportunity for the region to coordinate the regionwide improvements to natural environments, with a focus on the waterways and Moreton Bay. Elevate 2042²³ outlines the aspirations of the Games Delivery Partners and the community, prioritising what is considered important for the futures. Legacy 2042 recognises the opportunity that the Games provides to protect and enhance the region's environment by actively conserving and building the resilience of habitats and biodiversity. The Games are an opportunity to generate the resources required for management interventions to have an impact on the environment at a much greater scale than what has been experienced in the past.

SEQ City Deal

City Deals are a national initiative enabling an alignment between all levels of government and the private sector to work together to plan and deliver transformative outcomes for Australian cities. In 2022, the SEQ City Deal was signed by the Federal Government, Queensland Government and SEQ Council of Mayors. The deal is a package of investments designed to support the rapid growth in the region. One of the investment packages aims to deliver a healthy, sustainable and liveable region through investment in urban amenity and blue and green environmental assets. Forty million dollars have been allocated for the Resilient Rivers Initiative to invest in works to improve the health of the region's catchments, waterways and Moreton Bay.

²³ State Government of Queensland 2023. Elevate 2042: Brisbane 2032 Olympic and Paralympic Games Legacy Strategy. Department of Tourism, Innovation and Sport. Website <https://q2032.au/plans/games-legacy>

National and International commitments

Australia has many international commitments to biodiversity management and protection. The protection and restoration actions that are recommended within this report would contribute towards Australia meeting many of these international and national commitments with respect to Moreton Bay.

- *Commonwealth Blue Charter*²⁴, where Australia has commitments related to reefs, mangroves, ocean plastics, marine parks, climate change, acidification, ocean observation and aquaculture
- *Ocean Action Agenda: Transformations from The High Level Panel for A Sustainable Ocean Economy*²⁵
- *2022-2032 Threatened Species Action Plan: Towards Zero Extinctions*²⁶
- Bi-lateral migratory bird agreements with: Japan (JAMBA), China (CAMBA), and the Republic of Korea (ROKAMBA)²⁷
- *Australian Government's Wildlife Conservation Plan for Migratory Shorebirds (2015)*²⁸
- *International Single Species Action Plan for the Conservation of Far Eastern Curlew*
- *Recovery Plan for Marine Turtles (2017-2027)*²⁹
- *Nature Positive Plan*³⁰ (including bioregional plans), which is the Australian Government's response to the independent review of the *Environmental Protection and Biodiversity and Conservation Act 1999*. The government has committed to protect 30% of Australia's land and seas by 2030, create a nature repair market, establish an independent Environment Protection Agency (EPA) and work in partnership with First Nations people, including to develop standalone cultural heritage legislation.

Nature Repair Market

The Nature Repair Market scheme (Nature Repair Act 2023) establishes a marketplace, to be opened in 2025, where individuals and organisations can undertake nature repair projects to generate a tradable certificate. This scheme may represent an opportunity to generate income for undertaking projects that deliver biodiversity benefits in Moreton Bay.

Taskforce on Nature-related Financial Disclosures (TNFD)

Seeking to shift global financial flows away from nature-negative outcomes and toward nature-positive outcomes, the TNFD has developed a framework of disclosure mechanisms that enable businesses to report and act on their nature-related dependencies, impacts, risks and opportunities. The framework seeks to provide recommendations and guidance on nature related risks and opportunities relevant to a wide range of corporate and financial institutions so they can better understand how their organisations impact and rely on natural resources. Biodiversity is an essential characteristic of nature that is critical to maintaining the quality, resilience and quantity of ecosystem assets and the provision of ecosystem services that business and society rely upon.

Since nature positive targets for the corporate marketplace emerged during negotiations over the Convention on Biological Diversity's Global Biodiversity Framework in 2020, it has been enthusiastically embraced by industry, governments, financiers and the conservation sector. 90 world leaders have signed the Leaders' Pledge for Nature, which

²⁴Commonwealth Secretariate (2021) Commonwealth Blue Charter Shared Values, Shared Ocean A Commonwealth Commitment to Work Together to Protect and Manage our Ocean. Available at: <https://thecommonwealth.org/bluecharter>

²⁵ High Level Panel for a Sustainable Ocean Economy (2023) Transformations for a Sustainable Ocean Economy: A Vision for Protection, Production and Prosperity. Available at: <https://oceanpanel.org/the-agenda/>

²⁶ Department of Climate Change, Energy, the Environment and Water, Australia (2022) The Threatened Species Action Plan (2022-2032). Available at: <https://www.dcceew.gov.au/environment/biodiversity/threatened/action-plan>

²⁷ Department of Climate Change, Energy, the Environment and Water, Australia (2023) Migratory birds. Available at: <https://www.dcceew.gov.au/environment/biodiversity/migratory-species/migratory-birds>

²⁸ Department of Climate Change, Energy, the Environment and Water, Australia (2021) Wildlife Conservation Plan for Migratory Shorebirds – 2015. Available at: <https://www.dcceew.gov.au/environment/biodiversity/publications/wildlife-conservation-plan-migratory-shorebirds-2016>

²⁹ Department of Climate Change, Energy, the Environment and Water, Australia (2017) Recovery Plan for Marine Turtles in Australia 2017. Department of the Environment and Energy, the NSW Government and the Queensland Government. Available at: <https://www.dcceew.gov.au/environment/marine/publications/recovery-plan-marine-turtles-australia-2017>

³⁰ Department of Climate Change, Energy, the Environment and Water, Australia (2023) Nature Positive Plan: better for the environment, better for business. Available at: <https://www.dcceew.gov.au/environment/epbc/publications/nature-positive-plan>

calls for a nature-positive future to be achieved by 2030, and 11 of the global Fortune 100 companies have already revealed aspirations to contribute to nature positive. This represents an emerging opportunity for the Bay's management organisations to work with the commercial sector to establish the information and approaches required to maximise the outcomes for the Bay.



The Bay supports 28 migratory shorebirds, including the critically endangered Eastern curlew (Photo: C. Walker)



Seagrass communities are one of many ecosystem values of the Bay (Photo: P. Maxwell)

2 How did we develop this Blueprint?

To develop this Blueprint, we reviewed existing plans and regulatory frameworks identifying key values, policies and management actions relevant to Moreton Bay. We then identified gaps in the current management of Moreton Bay's unique values to determine the programs and actions recommended in this Blueprint (Figure 2). Details of our approach are provided in this chapter.

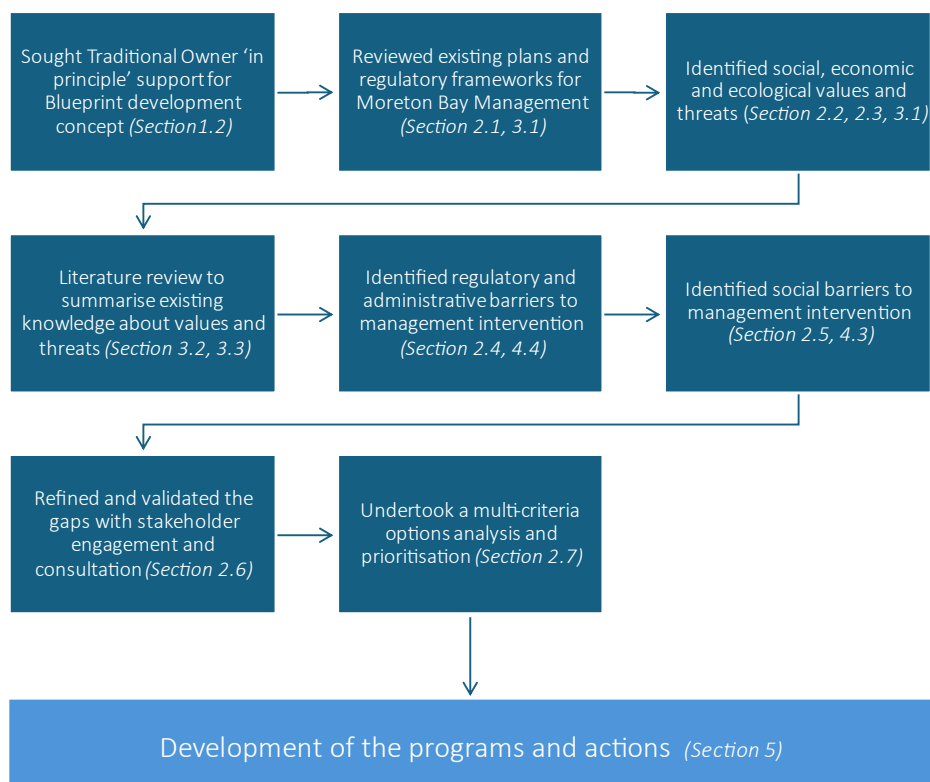


Figure 2. Steps followed to develop this Blueprint

2.1 Determining values

Many existing plans and activities occur in the region that seek to manage the values of the Bay. Numerous local and state government plans and strategies, include programs and actions are relevant to protecting and managing the values of the Bay. There are also other regional organisations such QYAC, Healthy Land and Water, the SEQ Council of Mayors and the Moreton Bay Foundation, who have developed plans and strategies that identify priorities for the Bay, the catchment and community. Most of these plans and strategies were developed following extensive stakeholder and community consultation to identify important values.

We reviewed sixteen key plans and strategies to collate a list of the Bay's values (Table 2). This integrated list of values represents the priorities of a broad range of the Bay's stakeholders and the community of SEQ. Stakeholder engagement activities were also undertaken to validate, refine and finalise the list of values presented. A gap analysis of every species, habitat and ecosystem service was beyond the scope of this assessment so identified values were collated into themes (Table 3). The themes selected were based on a synthesis of the value themes that were identified in key regional strategies and plans which included:

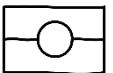
- *The SEQ Natural Resource Management Plan (2009-2031)*
- *Quandamooka Yoolooburrabee Aboriginal Corporation Strategic Plan 2022-2026*
- *SEQ Council of Mayors Resilient Rivers Initiative (2024)*

- *The Ramsar Information Sheet (2023)*
- *The Moreton Bay Marine Park Zoning Plan (2019) and User Guide (2023)*

Table 2. The key plans and strategies reviewed to collate a list of the Bay's values

Responsible organisation	Plan or strategy
Brisbane City Council	• Brisbane Vision 2031 • Coastal Hazard Adaptation Strategy
City of Moreton Bay	• Living Coast Plan 2023 • Environment and Sustainability Plan 2042 • Total Water Cycle Management Plan • Coastal Hazard Adaptation Strategy
Gold Coast City Council	• Our City Vision, Council Plan 2022-2027 • Coastal Adaptation Plan
Healthy Land and Water	• SEQ Natural Resource Management Plan
International	• Secretariat of the Ramsar Convention: Ramsar Sites Information Service - Moreton Bay • United Nations: Sustainable Development Goals
Quandamooka Yoolooburrabee Aboriginal Corporation	• QYAC Strategic Plan 2022-2026 • Research priorities – version 2 (2019)
Queensland Government	• Draft Shaping SEQ – SEQ Regional Plan 2023 Update. • Resilient Rivers Initiative: SEQ Waterways and Wetlands Investment Strategy
Redlands City Council	• Bays and Creeks Plan 2021-31 • Coastal Hazard Adaptation and Biohazard Strategy
The Moreton Bay Foundation	• TMBF Strategic Plan

Table 3. Value themes in Moreton Bay identified through a review of existing plans and strategies

Value themes	Description	Values assessed
 <i>Resilient natural & unique ecosystem</i>	The Bay is valued as a natural, unique and biodiverse ecosystem. The Bay includes one of the most extensive intertidal areas of seagrass, mangrove and saltmarsh communities on the eastern coast of Australia, and is valuable for supporting fisheries resources, waterbirds (Ramsar) and marine megafauna of conservation significance.	Marine turtles, shorebirds, marine mammals, IUCN listed species, fish communities, open coastlines, mangroves, saltmarsh, seagrass, mudflats, coral reefs, shellfish reefs³¹
 <i>Coastal living</i>	A healthy Moreton Bay offers significant benefits to communities living along its coastline. There is the physical appeal and natural beauty of the Bay that is highly valued by many. There is also the benefit of protection of housing and infrastructure from storm tides, erosion and tidal inundation.	Natural beauty (amenity), Coastal community protection
 <i>Traditional Owner cultural values</i>	Natural and cultural resources of Quandamooka Country are fundamental to continuing Quandamooka's living culture and supporting a vibrant, thriving economy and healthy community. First Nations people in SEQ have an intrinsic connection to the land and water, grounded deeply in their cultural, spiritual and historical identity. Dispossession and rapid urban development have broken their engagement with sea country, restricting their cultural practices and decision-making power. This has led to changed ecosystems, loss of traditional knowledge and impacts on sites of cultural importance. This study is an opportunity to collaborate with First Nations people to increase their participation in and the incorporation of their traditional knowledge and practices into sea country management in SEQ. A priority for community is to care for the natural environment on Country and to gather, sustain, share and grow the Quandamooka cultural knowledge and identity.	Not analysed
 <i>Community connection & stewardship</i>	Communities value the Bay through a connection with this natural space, feeling an emotional bond. It is valued for the contribution to wellbeing and sense of identity for individuals and the local community. For Traditional Owners the Bay holds spiritual and cultural significance, representing ancestral connections and traditional practices. The Bay is also valued as a place of exploration, discovery, and learning. Communities who are connected with natural spaces have a heightened sense of its value and increased stewardship towards its protection. Here we define stewardship as: the willingness and capacity for "individuals, organisations and industry to actively manage and value the Bay; to remove, avoid or minimise negative impacts and proactively restore or conserve ecological health of associated waterways, wetlands and aquatic and marine environments".	Community connection, community stewardship, wellbeing and identity, exploration, discovery for young people
 <i>Sustainable use of ecosystems</i>	Sustainably managing and 'using' the Bay's resources is critical for the protection of the social, economic, and cultural values that it provides. This is especially important as the population of SEQ quickly rises and old use and management patterns and practices cannot be sustained. Traditional-owners have long standing spiritual and cultural obligations and tradition law and customs in respect to lands and waters, and the protection and sustainable use of the natural resources is highly valued.	Fisheries, eco-tourism, wastewater treatment cycle
 <i>Access & recreation</i>	Access to the Bay is a strong lifestyle value for the local community, including recreational fishing, boating, swimming, walking, enjoying nature and spending time with friends and family. Access and some forms of recreation can lead to unsustainable use; however access and recreation is also positive for creating community connection and stewardship towards environmental protection.	Recreation (boating, fishing, diving/snorkelling), swimming, nature-based experiences

³¹ Moreton Bay hosts other species and communities not listed here. Listed are species and communities specifically referred to in existing plans and strategies and identified as priority values by stakeholders as part of this study.

2.2 Condition assessment of key values

Current condition, and trends in condition, were assessed for each of the key values in each value theme (see Appendix A for further details). We determined the condition and trend for each value based on a review of primary and grey literature as well as expert opinion (established through the stakeholder consultation).

The condition and trend for each value was assigned a qualitative category that enabled a comparison between values and to aid in identifying gaps in management (Table 4). The condition category for each value was determined using availability of data (e.g. where data or research were available to determine the condition) and defines the condition of the value as approaching, below, or well below reference or benchmark condition. Where possible, only data that considers the whole of Moreton Bay was used for the condition assessment, however some values are assessed based on information from representative locations/populations across the Bay.

The trend category for each value was determined by deviation from a baseline, i.e. is either above, at, or below, a defined baseline. Baselines (e.g. pre-clearing, 1980, 2011) vary between values, as consistent baselines are not available for all values. Further details on our approach is provided in Appendix A.

Table 4. The qualitative categories used to describe the condition and trend of each value

Status of condition / trend in condition category	Description of category
Unknown or no data	Where no data is available and/or no baseline information is available to determine current condition or trend in condition.
Poor/declining	- Condition of the value is much lower than its reference condition or benchmark. - The value delivers limited ecosystem services. For example, modified and disturbed ecosystem that does not resemble pre-disturbance structure and function. - Condition is declining from a defined baseline or from any previous assessments.
Fair/stable	- The condition of the value is between degraded and reference condition or benchmark. - The values deliver some ecosystem services but are likely to be variable over time. For example, modified and disturbed ecosystems that have limited elements that resemble pre-disturbance structure and function. - Condition is not changing (neither improving or declining) from defined baseline or from previous assessments.
Good/improving	- The value is in a similar condition to reference or benchmarks. - The values deliver the majority of ecosystems services expected. For example, ecosystem may be disturbed and slightly modified but still resembles remnant ecosystems in structure and has many of the same ecological functions. - Condition is improving from a defined baseline or from previous assessments.

2.3 Determining threats to key values

Current and future threats for assessment in the gap analysis were identified through the review of existing plans and strategies. Threats were then collated into themes (Table 5).

Table 5. Key threats to values identified through the review of existing plans and strategies

Threat theme	Description	Threats assessed
<i>Pollutants</i>	Catchment-derived pollutants are one of the most significant threats to the values of the Bay. Sediment smothers coastal habitats like seagrasses, shellfish and coral reefs and sandy intertidal zones and creating poor water quality that impacts the types of plants and animals that can inhabit the Bay, as well as impacting the amenity and tourism values of the Bay. Nutrients and toxicants change the productivity of the Bay's ecosystem and have been linked to algal blooms and fish kills. Pollutants come from both point sources (e.g. wastewater discharge locations) and diffuse sources (e.g. catchment erosion, urban stormwater runoff)	Catchment runoff – sediments, nutrients, toxicants, current water quality (representing an ongoing chronic threat to Bay values), litter and microplastics
<i>Ecosystem modification</i>	Ecosystem modification are changes to the structure and function of the ecosystem beyond what would be considered natural in its reference or benchmark state. Changes to habitat extent, the introduction of pests and weeds and intensifying coastal erosion are modifying how the Bay's ecosystem functions, reducing its ability to recover from extreme events like flooding.	Coastal erosion, incursions of weeds/pests/disease, reduction of habitat area width/extent, fragmentation/habitat connectivity
<i>Climate</i>	Climate change represents the largest future threat to the Bay's values. Increasing sea levels and sea temperatures are likely to increase coastal erosion and damaged or destroy the habitats in the Bay as well as the biodiversity that inhabit them. Increasing extreme events like more intense and regular flooding will further exacerbate the current impacts associated with catchment run off.	Sea level rise, increasing temperature, increase in extreme events and flooding,
<i>Population growth</i>	SEQ is one of the fastest growing regions in Australia. By 2046, the population of the region is expected to increase by 2.2 million people to approximately 6 million. Increasing population leads to development and urbanisation along the coast which in turn leads to increases in artificial coastlines, increasing recreation and commercial activity in the Bay which increases disturbances of flora and fauna, and an increase in the use of the Bay's natural resources.	Coastal development/ artificial coastlines, human & domestic animal disturbances / overuse, harvesting/ overfishing/ extraction
<i>Stewardship</i>	Social survey and research has shown that perceived community apathy or lack of knowledge of the Bay's unique values is a major barrier to legislative change or increased funding for restoration or protection activities in the Bay. For individuals, instilling a willingness to change behaviour, advocate for change, or act in ways to protect an ecological asset like Moreton Bay requires a high degree of connection and pride in the value of the asset.	Low levels of community connection, low levels of community awareness, low levels of community stewardship
<i>Research and Development</i>	A lack of data or knowledge was identified as a significant threat to the management of many of the Bay's values. In many cases, the condition or trend of the value is unknown, has minimal data, or the data is not widely known or available to the Bay's stakeholders and management organisations.	Lack of data and knowledge pertaining to the Bay's values

2.4 Identifying regulatory barriers to action

There are many existing pieces of legislation that work towards protecting the values of coastal zones like Moreton Bay. Legislation is enacted for many reasons which has resulted in a complex suite of sometimes overlapping provisions that can make managing a natural area like Moreton Bay complicated. Understanding the regulatory context within which rights and obligations for natural asset owners and users are governed and decisions are made that impact on the Bay provides vital context for development of the programs and actions recommended within this report. This assessment reviewed thirty-six federal, state and local government legislation that pertained to the values list generated for the Bay. The review of each piece of legislation was collated into a table in Appendix C. Figure 3 summarises the key legislation reviewed and outlines any links to regulations, plans and policies and guidelines or plans that sit below them. A description of the relevant provisions that have influence on the listed values was included in the review along with a brief synopsis of the barriers, limitations and gaps that could be addressed by actions recommended in this report.

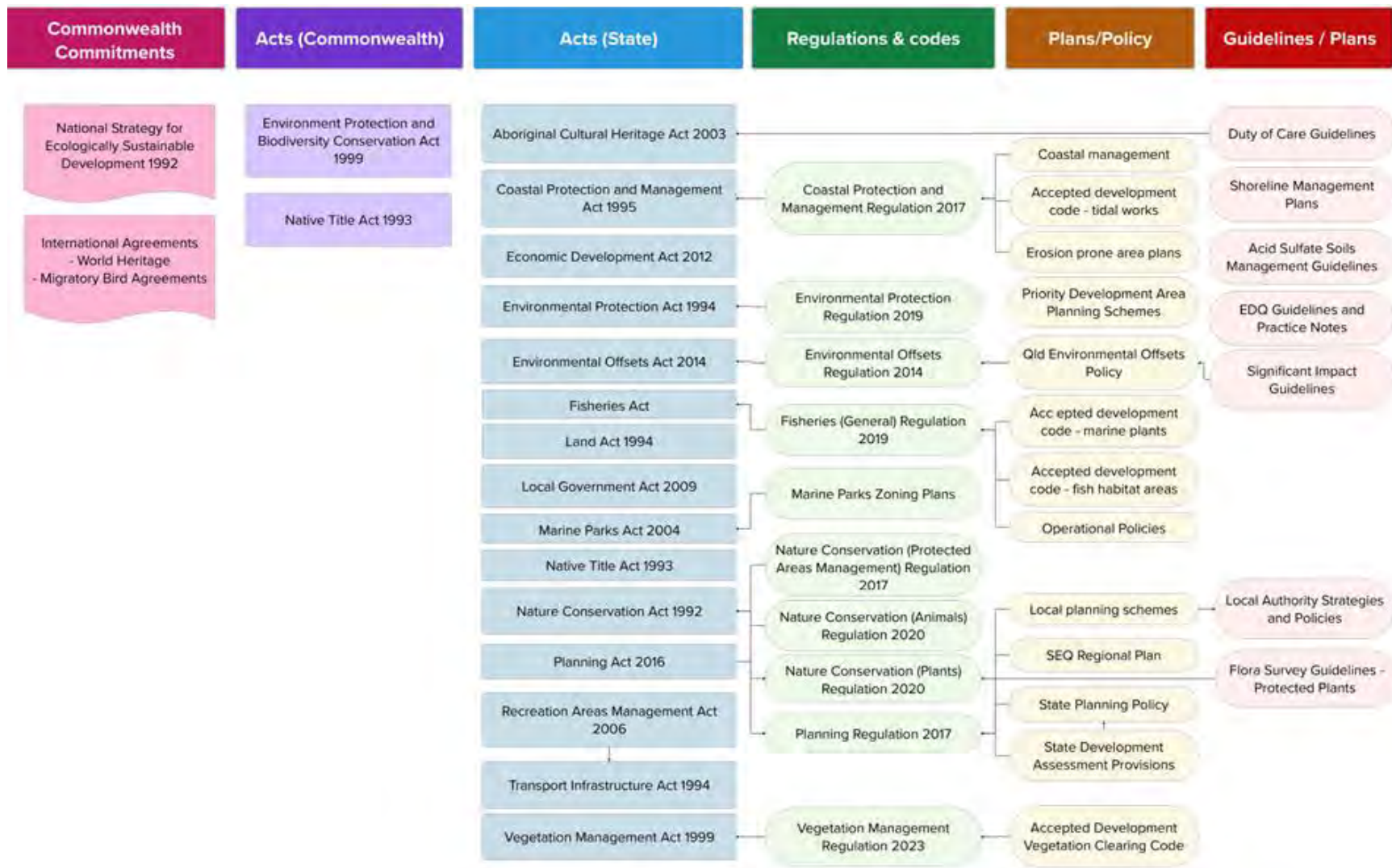


Figure 3. Summary of the legislation relevant to Moreton Bay that were reviewed and the links to regulations, plans and policies and guidelines or plans that sit below them.

2.5 Identifying social barriers to action

In our efforts to improve the health of the Bay in SEQ, it is crucial to acknowledge the complex interplay of social factors that influences marine stewardship. Stewardship can mean a wide range of direct and indirect actions that lead to positive environmental health and social outcomes. In the context of the Bay, these stewardship actions could include:

- Lifestyle actions: e.g. reducing the use of household and garden chemicals
- On-ground actions: revegetating riparian areas, removing litter from beaches, or avoiding anchoring in seagrass beds
- Civic actions: attending a public meeting or advocacy such as signing a petition asking for stronger restrictions on coastal development
- Social actions: encouraging others to care for marine life or follow rules.

Drawing on a large existing body of social scientific research on human behaviours and several recent studies the Moreton Bay, community-level social barriers to environmental actions for the Bay were reviewed. The two types of social barriers to environmental actions were considered in this review:

1. **Personal barriers**, which are related to the individual, including:
 - a. Intrapersonal barriers, which are a person's values, beliefs, attitudes, perceptions, emotions, habits, etc.
 - b. Interpersonal barriers, which are related to a person's social networks, such as the availability of people to do the action with, the opportunity of being invited to participate, etc.
2. **External barriers**, which are factors outside of the control of the individual, including:
 - a. External direct barriers, which are related to the action, e.g., complexity of the action, costs of undertaking the action, availability of technology or supplies to undertake the action, etc.
 - b. Indirect external factors, which are the broader structural barriers such as institutional or regulatory requirements, societal-wide technological, political, infrastructural, or economic barriers, or events such as natural disasters, bad weather, etc.

More detailed information about the typology of barriers is available in Appendix B.



Community awareness of and connection with the Bay increases likelihood of stewardship behaviours (Photo: E. Saeck)

2.6 Engagement and consultation

Stakeholder engagement was carried out to validate results and further refine our understanding of the values and threats to the Bay. The following three methods were used to engage stakeholders:

- One-on-one online interviews with key stakeholders
- One half-day stakeholder workshop (13th February)
- Stakeholder survey (launched 2nd February)

The purpose of the engagement was to seek stakeholder input on the future direction of The Moreton Bay Foundation's activities, and also help build a common understanding of the challenges and strategic direction for the protection and management of the Bay.

Specifically, the engagement aimed to establish key stakeholder views on:

- The values of and threats to the health of the Bay being managed by their organisation
- Gaps in management of the Bay
- Barriers to action to improve the health of the Bay
- Opportunities for action
- The role for The Moreton Bay Foundation

A summary of all the organisations who were consulted through this process are summarised in Table 6. Overall, 24 stakeholder organisations and 37 individuals were consulted to inform the assessment of the values and threats to the Bay.

Table 6. Stakeholder organisation represented in the consultation activities

One-on-one interviews (13 individuals)	Stakeholder workshop (16 individuals)	Online survey (13 individuals)
• Brisbane City Council • Gold Coast Council • Moreton Bay Regional Council • OzFish • Queensland Department of Environment, Science and Innovation • Queensland Parks and Wildlife Service • Redland City Council • Resilient Rivers Initiative (Council of Mayors SEQ)	• The Moreton Bay Foundation • Fisheries Queensland, Department of Agriculture and Fisheries • Gold Coast Waterways Authority • Healthy Land and Water • Logan City Council • Moreton Bay Education Centre • OzFish • Port of Brisbane • Qld Urban Utilities • Reef Check • Resilient Rivers Initiative (Council of Mayors SEQ) • Tangalooma EcoMarines • Queensland Wader Study Group	• Fisheries Queensland • Fisheries Queensland, Department of Agriculture and Fisheries • Healthy Land and Water • Logan City Council • Port of Brisbane Pty Ltd • Queensland Department of Environment, Science and Innovation • Queensland Department of Transport and Main Roads • Queensland Wader Study Group • Tourism and Events Queensland • Unitywater • Urban Utilities

2.7 Development of priority programs and actions

The programs and actions recommended in the Blueprint were developed using the information collected in the steps of the gap analysis described above. Key gaps principally focused on: 1) values with no available data on condition or trend; 2) key threats not considered in existing plans and strategies; and 3) stakeholder identified priorities. Gaps were articulated as actions, and then programs were developed by combining the actions that had similar or complementing objectives or outcomes. Programs were then prioritised using multi-criteria analysis (MCA) that compared the relative benefits and costs of each program and rank them in order. The MCA framework included 12 criteria (Table 7).

Table 7. The multi-criteria framework used to score and prioritise each of the programs

Category	Criteria	Description
Cost of initiative to Moreton Bay Foundation and partners	Upfront cost	Cost required to implement the action.
	Ongoing cost	Annual cost required to maintain the action outcomes in the long term.
Impacts (direct and indirect) against themes (think of these as achieving an output or outcome)	Resilient natural & unique ecosystem (direct)	Degree to which an action directly contributes to achieving the goal of a resilient natural & unique ecosystem.
	Resilient natural & unique ecosystem (indirect)	Degree to which an action indirectly contributes to achieving the goal of a resilient natural & unique ecosystem.
	Sustainable use, access, coastal living & livelihoods (direct)	Degree to which an action directly contributes to achieving the goal of sustainable use, access, coastal living & livelihoods.
	Sustainable use, access, coastal living & livelihoods (indirect)	Degree to which an action indirectly contributes to achieving the goal of sustainable use, access, coastal living & livelihoods.
	Community connection and stewardship (direct)	Degree to which an action directly contributes to achieving the goal of community connection and stewardship.
	Community connection and stewardship (indirect)	Degree to which an action indirectly contributes to achieving the goal of community connection and stewardship.
	Scientific excellence in decision-making (direct)	Degree to which an action directly contributes to achieving the goal of scientific excellence in decision-making.
	Scientific excellence in decision-making (indirect)	Degree to which an action indirectly contributes to achieving the goal of scientific excellence in decision-making.
Secondary considerations	Complexity of implementation	The complexity of implementation of the action with consideration of the level of coordination required across project partners.
	Investment attractiveness	Assessment of attractiveness to external investors with consideration of scale, tangibility/measurability of outcomes, etc.



The Bay is one of three key sites in Queensland that support significant dugong populations (Photo: Regatta Marine)

3 Values – condition and threats

3.1 Values considered in existing plans and strategies

The plans and strategies reviewed considered a broad range of environmental, social and economic values, as summarised in Table 8. The most common value theme was *natural and unique ecosystems*, with the majority of plans highlighting this as a key value, particularly noting the need to protect and maintain biodiversity more generally. This is unsurprising as there is policy and regulation at a national and state level that requires the protection of species, vegetation communities and wetlands of conservation significance. The Bay is home to many natural assets triggered by regulation therefore these values must be considered in planning at a local and regional scale.

Other very common values were *natural beauty*, *traditional owner cultural values* and *recreational access* especially for boating and fishing. Like biodiversity, Traditional Owner cultural value (and scenic amenity to a lesser extent) are the focus of policy and regulation at a national and state level, therefore must be considered in planning. However, natural beauty and recreational access were cited as values raised via community consultation³².

The values under the theme of *sustainable use of ecosystems* were the least mentioned, but still considered by a third of the plans and strategies reviewed, likely reflecting the type of strategies and plans reviewed. It may be that sustainable use is considered in regulation and planning developed at a state and national level that were not reviewed in this assessment. However, it does reflect a gap or lower level of management focus at a local and Moreton Bay specific scale.



Sustainable use of the Bay ecosystems, such as sustainable fisheries, is a value at a regional and national scale (Photo: E. Saeck)

³² For example see: Moreton Bay Regional Council. (2023). *Moreton Bay's Living Coast Plan 2023*. Available at: https://hdp-au-prod-app-mbay-yoursay-files.s3.ap-southeast-2.amazonaws.com/4316/8541/0078/Moreton_Bay_s_Living_Coast_Plan_Final.pdf

Table 8. Plans and strategies reviewed to generate an integrated list of values for the Bay (1 = plan/strategy identified value as important to stakeholders/community)

Value theme	Values	International		Regional				City of Moreton Bay			Redland City Council		City of Gold Coast		Brisbane City Council	QYAC		% of documents with value mentioned
		UN Sustainability Goals	Ramsar Convention (Ramsar Information Sheet)	Shaping SEQ 2023	SEQ NRM Plan	Resilient Rivers Initiative Strategy	TMBF Strategic Plan	Living Coast Plan 2023	Total Water Cycle Management Plan	Environment & Sustainability Plan 2042	Redlands Coast Bay and Creeks Plan 2021–2031	Coastal Hazard Adaptation Strategy	Gold Coast Plan 2022-2027; Out City Vision Gold Coast 2032	Coastal adaptation plan	Brisbane Vision 2031	QYAC Strategic Plan 2022-2026	QYAC Research Priorities (version 2).	
Resilience natural & unique ecosystem	Marine turtles		●				●	●			●							
	Shorebirds		●	●			●	●			●	●						
	Marine mammals		●				●	●			●	●						
	IUCN listed species		●								●					●	●	
	Fish communities		●	●			●											
	Open coastline (headlands, beaches, dunes)				●							●	●	●				
	Mangroves		●		●		●				●	●		●				
	Saltmarsh		●		●		●				●	●		●				
	Seagrass		●		●		●	●			●	●						
	Mudflats		●									●						
	Coral reefs		●				●											
	Shellfish reefs		●				●											
	Groundwater dependent ecosystems												●				●	
	Biodiversity (as a general mention)	●	●	●		●				●			●				●	
	Other/general mention (e.g. natural ecosystem value)											●	●	●		●		
	SUMMARY	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	88%
Coastal living	Natural beauty (including scenic amenity, water quality)			●		●				●	●	●	●	●	●			
	Coastal community protection (flooding, storm tide, erosion, sea level rise)	●						●					●	●	●			
	Other/general mention																	
	SUMMARY	●		●		●		●		●	●	●	●	●	●			63%
Traditional Owner cultural values	Quandamooka Cultural knowledge															●		
	Historic cultural heritage															●		
	Traditional hunting resources															●		
	Access to undertake cultural & spiritual activities															●		
	Other/general mention					●	●	●		●	●					●	●	
	SUMMARY					●	●	●		●	●					●	●	44%

Community connection & stewardship	Community connection	●		●		●		●		●	
	Community stewardship	●		●		●		●	●	●	
	Wellbeing & identity		●	●		●	●			●	
	Exploration, discovery for young people			●							
	Other/general mention										
	SUMMARY	●	●	●	●	●	●	●	●	●	56%
Sustainable use of ecosystems	Fisheries	●		●							
	Eco-tourism					●				●	●
	Water treatment cycle							●		●	
	Other/general mention									●	
	SUMMARY	●		●		●	●	●	●	●	38%
Access & recreation	Recreational fishing, boating, snorkelling		●	●	●	●		●			
	Swimming		●	●	●						
	Nature-based experiences			●				●			
	Other/general mention (e.g. recreational access; access & use infrastructure)				●		●	●	●	●	
	SUMMARY		●	●	●	●	●	●	●	●	56%

3.2 Condition and trend of Moreton Bay's values

A summary of the assessment of the condition of each of the 25 values, and their associated threats, is summarised in Table 9 (see Appendix A for additional detail and references).

Nine of the 25 values assessed were defined as being in good condition, including *fish communities*, *mangroves*, *mudflats*, *coastal community protection*, *fisheries*, and *recreational access*. The review indicated that condition of these values may be disturbed and slightly modified, however they are still considered to resemble remnant ecosystems in structure and deliver many of the same ecological/social functions. Concerningly, for approximately half (4) of the good condition values, the assessment found their condition to be declining or unknown. Specifically, these currently good condition values were *shorebirds* (declining), *coastal community protection* (declining), *fisheries* (unknown) and *recreational fishing, boating* (declining).

In contrast, nine of the values were considered to be in poor or fair condition. The values in poor condition, included *saltmarsh*, *shellfish reefs* and *exploration/discovery for young people*. The values in fair condition, included *seagrass*, *coral reefs*, *natural beauty*, *community connection*, *water treatment cycle* and *swimming*. The review indicated that the condition of these values has been significantly disturbed and modified, resulting in an ecosystem service that minimally resembles, or does not resemble, pre-disturbance structure and function. Of highest concern, was the poor condition values, were either declining (*saltmarsh*) or stable (*shellfish reef*) with no indication of recent improvement.

Approximately six of the values had no available data and information to assess either condition or trend. Many of which were *natural and unique ecosystem* values (herein referred to as biodiversity values), including *marine turtles*, *marine mammal*, *IUCN threatened species* and *open coastlines*, but also some social values that are challenging to measure including *natural beauty*, *well-being/identity* and *community stewardship*.



Mangrove habitats of the Bay are in good condition and extent, however, are threatened by population growth and climate change (Photo: P. Maxwell)

3.3 Threats to Moreton Bay's values

Our threat analysis indicates that there are many pressures which collectively represent significant current and future risk to all the Bay values. A summary of current and future threats to each of the values is presented in Table 9, next to their respective condition assessments.

The current threats to the biodiversity values were identified as predominantly ecosystem modification type threats, with the majority of values threaten by *declining habitat extent*, *habitat fragmentation* and *weeds, pests and diseases*. Noting that these same values are also under pressure from *population growth* related threats, which are further exacerbated by the *lack of community awareness* of their presence and lack of stewardship behaviours to promote their protection. Looking to the future, climate threats are predicted to place more pressure on the condition and function of biodiversity values as the Bay experiences *sea level rise*, *temperature increases* and *increases in extreme events*. For the light dependent and nutrient sensitive ecosystem values—*seagrass* and *coral reefs*—catchment sediment and nutrient pollutants were also flagged as a significant threat. For many of the fauna species, *microplastics* was identified as an additional threat to condition.

The analysis identified that social type values (e.g. values in themes *community connection & stewardship*, wellbeing, *access & recreation values*) are largely under threat from pollutants that impact aesthetics (*litter*) and swimability (*nutrients, sediments, water quality*), but also lack of *community awareness* or knowledge of the Bay values. These values also face significant pressure from future population growth related threats, including *coastal development* and *overuse*.

Coastal community protection value (i.e. the capacity for the Bay ecosystems to buffer communities from flooding, storm tide, erosion, sea level rise), is currently in good condition, however it is under the looming threat of climate change, notably sea level rise and increased extreme events. Additional threat comes from the community's lack of awareness about the ecosystem services provided by the Bay and therefore low levels of community stewardship or support for government implement natural solutions to minimise the predicted climate threat.

Traditional Owner cultural values are threatened by similar processes that reduce the condition and availability of the natural values and resources of the Bay (including extraction, overfishing, coastal erosion, pests and weeds, habitat loss, coastal development). These threats increase as the SEQ population rapidly grows. The level of awareness in the broader SEQ community of the significant cultural value of the Bay may have an impact on the levels of protection given to protecting these values.



Population growth and increasing use is a threatening process for many of the values of the Bay (Photo: Regatta Marine)

Table 9. Quantitative assessment of the Bay values and identification of threats to values (refer to Table 4 for description of condition and trend categories) CONDITION & TREND KEY: U = unknown, G = good, F = fair, P = poor; D = declining, S = stable; THREATS KEY: I = increasing; ● = current threat, ○ = future threat, ⊙ = both current & future threat; E=ecology/behaviour unknown, M=monitoring absent/minimal, T= future trends uncertain; MANAGEMENT KEY: | = <20%, || = 20-40%, ||| = >40%; N=none; M=mention, P= protection explicitly in legislation

VALUES ASSESSMENT				THREATS																		MANAGEMENT		
				POLLUTANTS				ECOSYSTEM MODIFICATION				CLIMATE			POP. GROWTH			STEWARDSHIP			R&D			
Value theme	Value	Condition	Trend	Catchment runoff – nutrient, toxicants	Catchment runoff - sediments	Current Water quality	Litter / microplastics	Coastal erosion	Weeds / pests / disease / algal blooms	Habitat area width / extent decline	Fragmentation/habitat connectivity	Sea level rise	Temperature increases	Rainfall/extreme events / flooding	Coastal development / artificial coastlines	Human & dom. animal disturb / overuse	Harvesting / overfishing / extraction	Low community connection	Low community awareness	Low community stewardship	Lack of data/knowledge	Prioritised in other strategies/plans	Confirmed by stakeholders as priority	Protected explicitly in legislation
Resilience natural & unique ecosystem	Marine turtles	U	U			●		●	●	●		○	○	⊙	⊙	⊙					T			P
	Shorebirds	F to G	D			●		○		⊙	●	○		○	⊙	⊙	●	●	●					P
	Marine mammals	U	U			●			●	⊙					⊙	⊙			●	EMT			P	
	IUCN listed species	U	U			●		⊙		⊙	⊙	○	○	⊙	⊙	⊙		●	●	EMT			P	
	Fish communities	G	S			●	●		●	○	●	○	○	⊙	●		⊙				ET			P
	Open coastline (headlands, beaches, dunes)	U	D					●	●	●	●	○			●	●			●	●	EMT			M
	Mangroves	G	I					●	●		●	○		○	⊙	⊙	●	●	●	T			P	
	Saltmarsh	P	D					●	●	●	●	○	○	○	⊙	●	●	●	●	T			P	
	Seagrass	F	variable	●	●	●		●	●	●	●	○	○	○							T			P
	Mudflats	G	S			○		●																N
	Coral reefs	F	S to I	●	●	●			●	●	●	○	○	○			●		●		MT			M
	Shellfish reefs	P	S			●				⊙	●	●	○	○	○	●	●	●	●	●	●	MT		
Coastal living	Natural beauty (including scenic	F	U	●	●	●	●	●	●	●	●	○		○	●			●		EMT			P	

	amenity, water quality)									
	Coastal community protection (flooding, storm tide, erosion, sea level rise)	G	D		• •	○ ◎ ◎	◎	◎ ◎		N
Traditional Owner cultural values	Cultural heritage, Quandamooka cultural knowledge, traditional hunting resources, access to undertake cultural & spiritual activities ³³	Not rated	Not rated		◎ • •	○ ◎ ◎	◎ ◎	• • •	T	P
Community connection & stewardship	Community connection	F	S	• • • •	◎ ◎ ○		○ ○ ○	• • •		N
	Community stewardship	U	S	• • • •			○ ○ ○	• • •		N
	Wellbeing & identity	U	U	• • • •			○ ○ ○	• •		N
	Exploration, discovery for young people	P	S	• • • •		○	○ ○	• • •		N
Sustainable use of ecosystems	Fisheries	G	U		◎ ◎ • •		•	• • •	T	P
	Eco-tourism	F	I	• • • •	• ○	○ ◎	•	• •		N
	Water treatment cycle	F	S	◎ •	•	○ ○ ○	○	• • •	T	P
Access & recreation	Recreational fishing, boating, snorkelling	G	D			○ ○	○ ○	◎ ◎	EMT	N
	Swimming	variable	S	• • • •	○ •	○ ◎	○ ○	• • •	MT	N
	Nature-based experiences	G	U	• • • •		○ ○	○ ○	• •	EMT	N

³³ As reported in: Quandamooka Yoolooburrabee Aboriginal Corporation. (2022). *QYAC Strategic Plan 2022-2026*. Available at: http://www.qyac.net.au/docs/QYAC_Strategic_Plan_2022-2026.pdf

4 Gaps and barriers to a sustainable Bay

4.1 Knowledge gaps about values and threats

There are several values for which our understanding is backed by significant body of research and monitoring, including *shorebirds, mangroves, seagrass, water treatment cycle* and *fisheries*. Despite this there are many key values for which there is either no, or very limited, data and information available to characterise current condition or trend. In terms of predicting future trajectories, the available data and information is even sparser. Notably for 17 of the 25 values, there is no, or insufficient, information currently available to understand the future trajectory of condition. The uncertainty in future trends is concerning and limits effective management, especially for biodiversity values that are in poor, declining, or unknown condition, such as *marine mammals, IUCN species, marine turtles, saltmarsh, shellfish reefs, open coastlines*, and *natural beauty*.

There were a few values assessed for which their current condition and trend also represents a threat to the other values. Specifically *access and recreation*, where overuse was identified as a threat, and also *community connection* for which low levels of connection was identified as a threat. Limited data and information available for these values limits capacity to understand and manage the future threats they may pose.

4.2 Gaps in the management of values

The majority of biodiversity values (8 of 12) were found to be explicitly protected under national and state legislation, with the exception of mudflats, coral reefs, shellfish reefs and open coastline. *Traditional Owner cultural values, fisheries* and *water treatment services* were also found to be explicitly protected. The majority of remaining values (11 of the 25), which are predominantly social and economic values, were not mentioned and only managed via non-statutory strategies and plan. Many of these were only prioritized in a few (less than 10 %) plans. The values with the lowest levels of protection/prioritisation in legislation, plans and strategies were: *mudflats, shellfish reefs, exploration/discovery by young people, swimming* and *nature-based experiences*.

4.3 Regulatory barriers

The purpose of the section is to outline the gaps identified in the suite of legislation that provides an important tool in protecting and enhancing the values of the Bay. The assessment is detailed in Appendix C. The technical assessment also outlines five case studies that show how the legislation interacts in different project scenarios.

The results of the review are presented under four broad themes, with each theme representing a difference in the intent of legislation and the differences in outcomes for the Bay from that legislation (e.g. direct or indirect risk mitigation). Misalignment of legislation was identified as a key barrier to successful the management of Moreton Bay's values and threats. The sections below discuss the barriers and gaps for each theme.

Theme 1 – Legislation controlling land use

This refers to legislation and planning that controls land use that results in drivers and pressures on the Bay. This type of legislation manages an indirect impact to the Bay as they are largely enacted in the catchment.

Under existing legislative and planning arrangements, there are several controls in place under local government planning schemes, and key legislation such as the *Environmental Protection Act 1994*, the *Environmental Protection Regulation 2019*, the *Economic Development Act 2012*, and the *Planning Act 2016*. In combination, these controls determine and constrain where future development and redevelopment occurs in the landscape and the conditions under which that development can legally occur. In rural landscapes, controls on intensification of land use largely fall outside legislative controls unless material change of use triggers are met. This represents a significant risk to the Bay's values.

The most significant barrier identified is that there are still residual risks to the Bay even if all activities are compliant with legislative and planning controls. Changes in land use still result in pollution runoff of total nitrogen, total phosphorus and total suspended sediment from urban development which still increases even if all regulatory performance requirements are met. In effect, the current legislative framework inadvertently locks in a system where development creates additional pressures on the Bay via higher loads of diffuse catchment pollutants that may be beyond the tolerance of Bay values. This in turn increases the scale of effort required to meet desired objectives for the Bay (including Ramsar obligations).

While it is not practical or efficient to stop all development of land, to the extent that residual risks to the Bay are not offset or more effectively controlled, the condition of the Bay's values will continue to be at risk of degradation and the scale of effort required to enhance the condition of the Bay will be greater. This is possibly the biggest risk to the Bay that could be managed through more effective and efficient legislation.

Legislative instruments are already partially in place to manage for residual risks to the Bay (the Environmental Offsets Act 2014 and the Environmental Offsets Regulation 2014). However, the limited scope of land use activities to which they are applied means that residual risks continue.

Theme 2 – Legislation that reduces pressure on direct use of resources

This theme refers to regulation and policies that relate to the pressures on the direct use of resources from the Bay. This type of legislation manages a direct impact to the condition of the Bay's values.

Pressures on direct use of the resources of the Bay are managed by a number of legislative instruments (e.g. *Fisheries Act 1994*, *Marine Parks Act 2004*, *Marine Parks Regulation 2017*, and *Marine Parks (Moreton Bay) Zoning Plan 2019*). These legislative instruments attempt to reduce the overall pressure on use of resources, while also excluding some activities from particularly sensitive zones or habitats (e.g. excluding fishing from marine protected areas). These legislative instruments are relatively blunt management instruments; however they are clear in their intent and informed by science. A significant gap is noted is that future impacts such as the effects of climate change could result in significant changes in assimilative capacities and tolerances of Bay values which is likely to reduce the effectiveness of the provisions in these pieces of legislation.

Theme 3 – Legislation that directly protects specific Bay values

This theme refers to legislation and policies that relate to directly protecting specific Bay values. This type of legislation manages a direct impact on the condition of the Bay's values.

Direct damage to the values of the Bay can occur when developments and use of the Bay's values are destroyed or heavily modified for commercial purposes. A number of legislative instruments are particularly relevant to managing these risks to the Bay including the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the QLD *Economic Development Act 2012* the *Environmental Protection Act 1994*, *Marine Parks Act 2004*, *Marine Parks Regulation 2017*, and *Marine Parks (Moreton Bay) Zoning Plan 2019*. These legislative instruments either preclude development altogether in sensitive areas of the Bay and/or require performance requirement for commercial and public projects that would directly damage the values of the Bay (usually achieved through development approval performance requirements). The recent decision on the Toondah Harbour development is an example of the application of these legislative instruments.

Where development is allowable under these instruments, there will be residual damage to the Bay. While it is not practical or efficient to stop all development, to the extent that residual direct damage to the Bay is not offset, the condition of the Bay's values will continue to be at risk. This is possibly the biggest direct risk to the Bay that should be managed through more effective and efficient legislation.

Legislative instruments are already partially in place to manage these risks (the *Environmental Offsets Act 2014* and the *Environmental Offsets Regulation 2014*). However, the limited use of offsets means that residual risks continue.

Theme 4 – Legislation controlling “On-ground” research, conservation & restoration activities

These are type of legislation and policies relating to on-ground works for habitat restoration. This type of legislation manages a direct impact on the Bay’s values. Refer to Appendix C.2 for several case studies detailing existing pathways to on-ground projects and existing barriers.

A number of measures could be considered to reduce the legislative hurdles that prevent restorative work from being implemented within the Bay.

- Better collaboration with local authorities or State government agencies (particularly the Department of Environment and Science and Queensland Parks and Wildlife) to enable works to occur without the full weight of the regulatory requirements imposed on development activities.
- Update of accepted development codes to increase the scope of restoration and rehabilitation works to occur without the requirement for assessable development. Updates to the legislation could also include an approval system for not-for-profit organisations or other suitable entities responsible for the development and implementation of restoration programs, however this approach may require additional measures to be implemented across the sector to ensure the provisions only apply to eligible or pre-approved organisations.
- Development of a strategic plan across the entire Moreton Bay that makes space for rehabilitation work to occur. This may sit under an existing regulatory mechanism (such as the SEQ Regional Plan, or perhaps the Moreton Bay Marine Park Zoning Plan). Existing legislation may require amendment to enable works consistent with the nominated plan to be subject to accepted development codes.

This approach has not sought to modify the landowner consent provisions but has focussed on limiting the requirement for rehabilitation works to be assessable under all of the relevant legislative provisions.

Summary

The current legislative arrangements that directly and indirectly impact on the Bay range from federal legislation through to the compliance with guidelines on practices to achieve performance targets under development approvals. Collectively these legislative arrangements allow for direct and indirect residual damages and risks to the Bay, overtime locking in an accumulation of pressures and risks on the Bay. Perhaps the most notable risks relate to legislation that allows changes in land use within the catchments that ultimately lead to increased runoff to the Bay. In the absence of widespread use of instruments such as offsets, risks to the Bay will continue to increase, as will the efforts/costs required to meet Bay objectives and obligations.

4.4 Social barriers

Community-level social barriers to environmental actions for the Bay can be generalised drawing on the large existing body of social scientific research on human behaviours. Appendix B documents some of the key community-level barriers to actions for the Bay, which may include:

- Knowledge and lack of knowledge sharing
- Perceptions/beliefs about the value and likely outcomes of the action
- Lack of time, opportunity, or capacity to undertake the action
- Lack of experience with the unique features Bay (e.g., wildlife, or visitation in general)
- Social norms associated with the action
- Costs to perform the action
- Other external, structural barriers (e.g., legislative, infrastructural, economic etc.)
- And/or others, which will be confirmed during the formative assessment of social barriers in the change strategy development.

For every action recommended by this report, there are a variety of social barriers to those actions. Some barriers will be beyond the direct influence of participants in the action (e.g., regulatory barriers), while others can be addressed through strategic communication and engagement activities.

An understanding of social barriers to ‘appreciating the Bay’, and therefore to some extent ‘willingness to undertake environmental action to protect the Bay’, can be seen in local study by Dean and Schultz (2023). The study analysed a representative survey of 3,208 SEQ resident and identified five distinct segments of the population based on their understanding and appreciation of the Bay. The groups included:

- **Champions** represent one quarter of the sample (24%) and exhibit high scores for all items: knowledge, familiarity with wildlife, appreciation – wildlife, appreciation general and willing to share information.
- **Appreciative but not aware:** this group reflects more than one quarter of the sample (28%). This group scores highly on appreciation of wildlife and willingness to share information are also strong. Knowledge scores were the lowest of all groups, and familiarity with wildlife scores were below average.
- **Receptive but unfamiliar:** this group (11% of sample) was characterised by strong knowledge and positive appreciation but exhibited the lowest familiarity with wildlife species in the Bay. Willingness to share information was positive, but lower than the other engaged groups.
- **Aware but not receptive:** participants in this group (14% of sample) exhibited high objective knowledge and average familiarity with wildlife. However, both wildlife and general appreciation, and willingness to share information was low.
- **Disengaged:** participants in this group were below average for all dimensions, including knowledge, familiarity with wildlife appreciation (wildlife and general) and willingness to share information.

Understanding differences between these groups helps to shape different strategies, especially relevant communication campaigns, to encourage each group to take specific actions for the Bay. Notable findings from the assessment included:

- In the previous 12 months, 32% never visited the Bay, and 27% only once or twice
- Beauty, environment & nature, wildlife, relaxation, peaceful are salient features of people’s thoughts of the Bay
- 30% identified a part of the Bay that is special to them
- In terms of values and benefits of the Bay, 26% said the Bay does not provide any benefits to them. This is interesting given more than that (one third) reported having never visited the Bay, and that another quarter of the sample only visited once or twice in the previous year. This suggests that people value the Bay even if they have little experience with it.
- Most of the respondents agreed that the Bay is important for:
 - providing jobs and income for South East Queenslanders
 - being a popular recreation and tourism destination
 - the unspoiled natural places that exist in the Bay
- Most agreed that the Bay should be kept healthy for future generations.

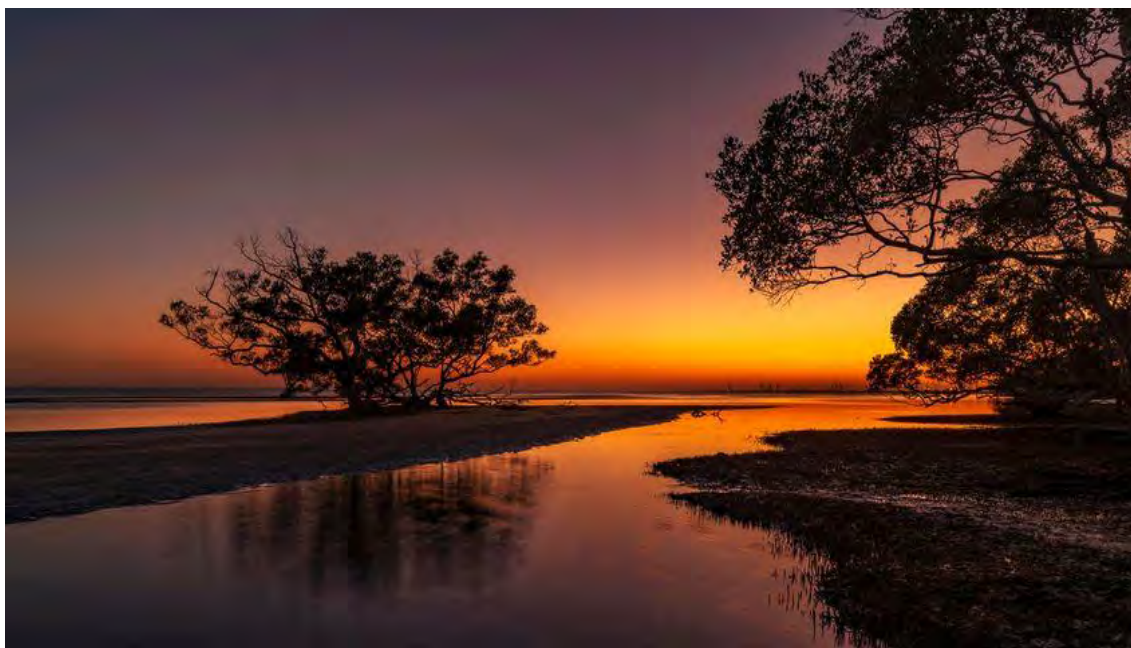
5 Programs for action

Recommended programs and actions are described in this section, with a summary list presented in Table 10. Programs are presented in order of priority. Further information regarding the development and prioritisation of programs and actions is provided in Appendix D.

Table 10. Summary list of program and actions

Program	Actions
Program 1. Protecting coastal habitats	Action 1.1 Develop a regional prioritisation for coastal habitat locations that require enhancement, protection or coastal hazard mitigation
	Action 1.2 Identify and confirm specific legislative enhancements required to allow for the protection and enhancements of coastal habitats
	Action 1.3 Advocate for enhanced state legislation to improve regional protection and management of prioritised coastal habitat locations in the Bay
	Action 1.4 Advocate for improved management of roosting and feeding sites for migratory shorebirds
	Action 1.5 Develop an education campaign with a focus on the threats and responses to coastal zones and habitats from sea level rise, storm surge, flooding and extreme events
Program 2. Identifying priorities and requirements for degraded habitats	Action 2.1 Advocacy for new guidelines for habitat restoration to accompany key legislation like the Marine Parks Act 2004
	Action 2.2 Develop a Bay-wide habitat restoration strategy and prioritisation for priority habitat: shellfish reefs, corals reefs and seagrass
	Action 2.3 Conduct research and trials into restoration of priority habitat: seagrass
	Action 2.4 Conduct research and trials into restoration of priority habitat: coral reefs
Program 3. Knowledge exchange and stakeholder coordination	Action 3.1 Create and resource ongoing partnership position/s within First Nations organisations to interface with SEQ-wide non-governmental agencies
	Action 3.2 Develop and maintain a centralised knowledge hub or portal for Moreton Bay
	Action 3.3 Establish a regular Bay-wide stakeholders forum
Program 4. Increasing catchment sediment reduction at a Bay-wide scale	Action 4.1 Develop business case for catchment sediment reduction at a regional scale
	Action 4.2 Develop regional prioritisation of sediment reduction projects
	Action 4.3 Develop an education campaign about the threats of sediments on Moreton Bay
	Action 4.4 Advocate for enhanced sediment reduction legislation to underpin regional program of sediment reduction program
Program 5. Managing recreation use to maintain Bay values	Action 5.1 Targeted research to understand impacts and benefits of high use spots around the Bay
	Action 5.2 Education campaign for sustainable recreational use
	Action 5.3 Coordinate research and support the protection and improvement of scenic amenity and nature-based experiences in the Bay
	Action 5.4 Establish partnerships to coordinate the management of locations of high value to the tourism industry

Program	Actions
Program 6. Strengthening community connection with Moreton Bay	Action 6.1 Develop an education and engagement campaign that showcases the Bay's values and unique ecosystems
	Action 6.2 Develop an education program that integrates with the primary and secondary school curriculum
	Action 6.3 Research to identify opportunities to strengthen community connection to the Bay
Program 7. Refining legislation to better align with outcomes for Bay values	Action 7.1 Research to identify best practice regulatory, policy and strategic frameworks.
	Action 7.2 Advocate for refinements and updates to key legislation.
	Action 7.3 Targeted research to understand impacts of water quality objectives, stormwater quality objectives on the biodiversity values of the Bay.
	Action 7.4 Develop a whole of catchment prioritisation to identify suitable locations for point source management projects through the offset policy.
Program 8. Ecological monitoring and evaluation	Action 8.1 Develop a monitoring and evaluation framework to support the management of key values and threats
	Action 8.2 Implement a coordinated monitoring and evaluation framework to support the management of key values and threats
Program 9. Climate risk and vulnerability assessment	Action 9.1 Climate change vulnerability/risk assessment for whole-of-Bay



Sunrise through the mangroves at Nudgee, looking across Bramble Bay towards the Port of Brisbane (Photo: D. Mankoo)

Program 1. Protecting coastal habitats

Description

Coastal habitats are at the interface of the land and sea. They support unique biodiversity, coastal protection and provide community connections with the boundaries of Moreton Bay (the Bay).³⁴ Coastal habitats referred to include mangroves, saltmarshes, coastal freshwater swamps and wetlands, beaches and dune systems. Program 1 seeks to identify high-priority coastal habitats areas in the Bay, protect them from current and futures threats and identify areas requiring restoration.

Justification for the program

- Coastal habitats are highly valuable, providing significant ecosystem services including habitat for biodiversity and commercially important fisheries species, coastal protection from storm surge and erosion, nutrient sequestration and storage and opportunities for recreation and tourism¹.
- Coastal habitats are recognised in multiple plans and legislation – internationally under the Ramsar Convention, nationally under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and locally under the *Fisheries Act 1994* (Qld) and the *Vegetation Management Act 1999* (Qld). Coastal habitats are protected under these pieces of legislation from disturbance activities (e.g. development); however, they are not protected from other current or future threats. Conversely, coastal habitats can also potentially be impacted by legislation, for example development by Priority Development Area provisions allowed under *Economic Development Act 2012* (Qld). Addressing these risks represents a significant gap in safeguarding the Bay.
- Coastal habitats are acknowledged as important as well as highly threatened by most stakeholders including local councils, state governments, community groups and Traditional Owner groups.³⁵
- Coastal habitats are highly threatened by recreation (e.g. 4WDs and other disturbances, encroachment by other habitats (e.g. mangroves into saltmarshes), coastal erosion and sea-level rise^{1,36,37}
- Many current threats to coastal habitats are increasing in extent and intensity, e.g. recreation impacts on beaches and dunes, mangrove encroachment of saltmarshes, urban encroachment on the fringe of coastal habitats and disturbance of a range of flora and fauna species^{1,38}; and climate change is exacerbating the impact and risk of non-climatic threats.
- Future threats under climate change have been identified and the councils along the Moreton Bay coastline have developed Coastal Hazard Adaptation Strategies under the state government's QCoast 2100 program.²
- There is no Bay-wide prioritisation for areas of coastal habitats requiring protection or enhancement from future threats. Additionally, the CHAS process does not explicitly consider areas of coastal habitat that support high-priority species (e.g. shorebirds) or areas where habitats are at risk of inundation yet restricted in their ability to move away from low-lying land due to encroachment from urban development.

Long-term outcomes

- High-priority coastal habitats around Moreton Bay have been either protected or restored to enhance biodiversity and coastal protection from major threats.
- Community connection with Moreton Bay has increased so that coastal habitats are valued and the community acts (directly and indirectly) to protect the coastal habitats of Moreton Bay.

³⁴ Lovelock C, Accad A, Dowling R, Duke N, Lee SY, Ronan M. (2019). Mangroves and saltmarshes of Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

³⁵ See Section 3.1 for plans reviewed and Section 2.6 for stakeholder engagement list

³⁶ Jaensch, R. (2005). *Wetland management profile—saltmarsh wetlands*. Ecosystem Conservation Branch, QEPA.

³⁷ Saunders M, Runting R, Charles-Edwards E, Syktus J, Leon J. (2019). Projected changes to population, climate, sea-level and ecosystems. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

³⁸ DERM. (2012). *Moreton Bay Marine Park Monitoring Program*. Water Quality and Aquatic Ecosystem Health, Environment and Resource Sciences.

Program objectives

- Coordinate the management of coastal habitats at a Bay-wide scale and show a clear return on investment to increase investor confidence.
- Provide the policy and regulatory environment to enable management, protection and restoration of coastal habitats.
- Raise community understanding of the value and importance of coastal habitats for biodiversity and coastal protection.

Action 1.1 Develop a regional prioritisation for coastal habitat locations that require enhancement, protection or coastal hazard mitigation

Justification for the action

Conserving and restoring coastal habitats depends on sound science and a clear investment plan that outlines the specific locations that require protection and restoration. This approach would enable various levels of government operating within Moreton Bay to better manage these habitats at a scale that would lead to a demonstrable improvement in the current condition of coastal habitats and protect against future threats. A Bay-wide prioritisation would be a powerful decision-making tool to lay out the suite of on-ground actions required across the bay for the protection and enhancement of coastal habitats. Moreton Bay's management organisations have identified sites within their own jurisdictions requiring protection or restoration; however, these sites have not been synthesised into a Bay-wide prioritisation, nor have they been prioritised with a focus on protecting the biodiversity values that coastal habitats provide.

Threats targeted

- *Ecosystem modification*: Coastal erosion, incursions of weeds/pests/disease, reduction of habitat area, fragmentation/reduction connectivity
- *Climate*: Sea level rise, increase in extreme events and flooding
- *Population growth*: Coastal development/artificial coastlines, human & domestic animal disturbances, harvesting/overfishing
- *Research & development*: Lack of data and knowledge

Action description

The following elements should be integrated into the prioritisation.

- Identify high-risk coastal zone locations across the Bay for protection. Most of the Bay's councils have developed coastal hazard adaptation strategies as part of the Queensland Government's QCoast2100 program. Coastal hazard adaptation strategies enable local councils to understand vulnerabilities of communities, infrastructure and the environment from current and future risks. The locations identified as 'high risk' should be collated from these plans and placed together at a Bay-wide scale. This part of the prioritisation should also identify where natural ecosystem-based adaptation options could be integrated with hard infrastructure and included into councils' infrastructure planning portfolios.
- Identify high-value coastal habitats that provide ecosystem services beyond coastal protection. The locations identified in coastal hazard adaptation strategies are not prioritised based on other ecosystem services that coastal habitats provide, such as support for biodiversity or opportunities for sustainable recreation and tourism. As a result, these sites should be combined with a prioritisation of coastal areas based on additional services provided. This prioritisation should include adopting priority shorebird roost and feeding sites and opportunities for restoration and enhancement as outlined in *Managing Threats to Migratory Shorebirds in Moreton Bay*.²
- Identify locations for 'blue carbon' opportunities across the Bay including seagrass, mangroves, saltmarsh and tidal re-inundation restoration options. The Nature Conservancy (TNC), Alluvium and Natural Capital Economics (NCE) have recently completed a Blue Carbon and Coastal Resilience Feasibility Assessment for SEQ. This project evaluated the potential for reclaiming or repurposing private and public coastal land, from the Noosa River to the Tweed River, as blue carbon ecosystems to support greater protection and resilience of coastal communities. However, similar to

the coastal hazard adaptation strategies process, the evaluation only considered locations at risk of coastal erosion or inundation, so a further evaluation considering other ecosystem services is required.

- Identify key locations that would re-establish the connection between estuaries and coastal habitats in the Bay. Estuarine habitats significantly contribute to the biodiversity and productivity of Moreton Bay by providing migratory pathways between freshwater and upper estuarine breeding grounds for many commercial, recreational and culturally important species including fish and invertebrates. However, the estuaries of Moreton Bay also provide significant services to humans, many of which have led to the degradation, removal or fragmentation of key estuarine habitats like mangroves, saltmarshes, shellfish reefs, rocky reefs and seagrass meadows of the western and southern part of the Bay. For example, more than half of natural shoreline along east Coast of the bay (i.e. Deception Bay, Redcliffe, Bramble Bay, Rose Bay, Redland Bay, Broadwater) and several major estuaries (i.e. Brisbane, Coomera and Nerang) has been replaced with hard protection structures around developed areas to offer infrastructure protection, and visual and recreational access to the water (both public and private access)³⁹.
- The characteristics of the estuarine habitats in each of the Bay's estuaries have been mapped and the fish communities that use them have been surveyed extensively showing that the extent and connectedness between estuarine habitats is a key driver of diversity.⁴⁰ This information should be used to develop a spatial prioritisation of locations that would increase the connection between the estuarine and Bay habitats. This would include priority locations for enhancement/optimisation of the existing habitat for fish communities, and also priority locations for restoration of habitats using living shoreline design options that enhance fish community outcomes (e.g. creation of sheltered zones that promotes wetland vegetation (re)establishment through propagules and creates new fish habitat).
- Investigate opportunities for buybacks of coastal land to add to the local councils' and state government's reserve network to allow for coastal habitat migration and coastal protection.
- Include criteria and locations that have been identified by the Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC) and other Traditional Owner groups through their programs of restoration and protection.
- Estimate the costs required to restore or protect priority locations promoting estuarine connectivity around the Bay.

The prioritisation would outline the priority coastal locations that require management and would be used to advocate for changes to legislation and seek investment for site-based management.

Types of organisations that could be involved

Traditional Owner groups, local councils, state government departments, NRM groups, The Nature Conservancy, catchment groups and community groups (e.g. Watgum)

Action 1.2 Identify and confirm specific legislative enhancements required to allow for the protection and enhancements of coastal habitats

Justification for the action

Government policy and legislation to protect coastal habitats is already provided at federal and state levels (detailed in Appendix C). However, even though a suite of laws, policies and international agreements protect mangroves and saltmarshes, they continue to be lost. Current legislation does not provide protection against threats like sea-level rise, encroachment by other habitats (e.g. mangroves into saltmarshes) and urban squeeze that prevents coastal habitats from migrating as climatic conditions change. In Moreton Bay, planning and management on a large scale has not been initiated to reverse these losses. There is a need to identify what legislation amendments are required to protect and allow restoration of the priority coastal habitat sites identified in Action 1.1. This would inform legislation change advocacy required as described in the next actions. This would also serve to be a regional-level review of the planning and management regulations that would assist advocacy campaigners, especially those already working within

³⁹ Healthy Land and Water (2024). Report Card 2023 Interactive Map, accessed 21 May 2024. Available at: <https://hlw.org.au/seq/nrm-plan>

⁴⁰ Gilby, B, L. Goodridge Gaines, C. Henderson, J. Mosman, A. Olds. (2020). *Optimising estuarine restoration plans and long-term monitoring for fish and fisheries*. Annual report to Healthy Land and Water.

government agencies, to target specific areas for change. Key pieces of legislation relating to management of Moreton Bay management is outlined in Section 3.4 and Appendix C.

Threats targeted

- *Population growth*: coastal development/artificial coastlines
- *Research & development*: Lack of data and knowledge

Action description

Legislating for protection and allowing restoration of the priority coastal habitat sites identified in Action 1.1 would help to ensure that investment into large-scale restoration is supported. Key pieces of legislation relating to management of Moreton Bay management is outlined in Section 3.4 and Appendix C.

Legislation to be considered for amendment to improve the management and protection of high-value and high-risk coastal habitat sites includes, but is not limited to:

- *Fisheries Act 1994* to declare prioritised sites as fish habitat areas
- *Marine Parks Act 2004* to advocate for increased protection of prioritised sites in the Marine Park Zoning Plan
- *Nature Conservation Act 1992* to advocate for the development of management plans to protect roosting and feeding sites.

This action would confirm desired changes and would inform advocacy needs.

Types of organisations that could be involved

- Federal, State and Local government
- NGO's and practitioners

Action 1.3 Advocate for enhanced state legislation to improve regional protection and management of prioritised coastal habitat locations in the Bay

Justification for the action

Government policy and legislation to protect coastal habitats is already provided at federal and state levels (detailed in Appendix C). However, even though a suite of laws, policies and international agreements protect mangroves and saltmarshes, they continue to be lost. Current legislation does not provide protection against threats like sea-level rise, encroachment by other habitats (e.g. mangroves into saltmarshes) and urban squeeze that prevents coastal habitats from migrating as climatic conditions change. In Moreton Bay, restoration on a large scale has not been initiated to reverse these losses.

Threats targeted

- *Ecosystem modification*: reduction of habitat area, fragmentation/reduction connectivity
- *Climate*: Sea level rise
- *Population growth*: Coastal development/artificial coastlines

Action description

Legislating for protection and allowing restoration of the priority coastal habitat sites identified in Action 1.1 would help to ensure that investment into large-scale restoration is supported. Key pieces of legislation relating to management of Moreton Bay management is outlined in Section 3.4 and Appendix C.

Legislation that should be amended to improve the management and protection of high-value and high-risk coastal habitat sites includes, but is not limited to:

- *Fisheries Act 1994* to declare prioritised sites as fish habitat areas
- *Marine Parks Act 2004* to advocate for increased protection of prioritised sites in the Marine Park Zoning Plan

- *Nature Conservation Act 1992* to advocate for the development of management plans to protect roosting and feeding sites.

An advocacy campaign is needed, focused on changes to state legislation. This campaign should encourage advocacy from multiple groups, including landholders who live near or adjacent to priority coastal habitats, developers, local councils, not-for-profit interest groups, and the wider community to push for change in the legislation.

An advocacy strategy would first need to confirm desired changes (see Action 1.2), define the advocacy actions and identify strategic partners.⁴¹ Advocacy may include actions such as providing informational briefs for decision makers and local Members of Parliament, sharing information about the legislative changes needed with the general public, building strategic alliances, and rallying community support and pressure.

To build maximum support from a strong cross-section of the community, an education and engagement campaign could accompany advocacy actions. Some of the potential social barriers to **building strategic alliances and rallying public support** in advocacy actions may include existing knowledge and perceived value of advocacy; social norms (e.g. social pressure to advocate or not); time to undertake advocacy actions, as well as knowledge and perceived value of priority coastal habitat. A lack of knowledge of the relevant policies and regulations may also prevent advocacy for coastal habitat protection.

Communications to reduce these barriers should include messages that: (i) communicate the potential value of, and threat to priority coastal habitats before these natural values are eroded⁴², (ii) leverage social norms and encourage more people to advocate for legislative change, (iii) communicate the specific ways people can become involved in advocacy, including the time commitments, and (iv) are crafted to specific audiences to ensure information that is relevant to them. Audience-specific messages might benefit from the inclusion of stories about the advocacy actions of others (e.g. landholders, developers, community groups).

Types of organisations that could be involved

- Organisations without jurisdiction or legislated management obligations (e.g. landholders, developers, not-for-profit interest groups, and the wider community)
- Local councils

Action 1.4 Advocate for improved management of roosting and feeding sites for migratory shorebirds

Justification for the action

The importance of Moreton Bay's coastal habitats to migratory shorebirds is recognised under the Ramsar Convention on Wetlands. Many of the shorebird species that use Moreton Bay's coastal habitats are listed under the EPBC Act. Despite this listing and international recognition, many of the roost and feeding sites of the Bay's shorebird populations are under threat from mangrove encroachment, urban encroachment, human disturbance, coastal erosion and sea-level rise. Recently, a significant shorebird habitat was threatened by a Priority Development Area declared at Toondah Harbour under the *Economic Development Act 2012* highlighting the vulnerability of high-value coastal habitat areas and shorebirds sites to future development.

The shorebirds that use Moreton Bay are under threat from a range of international pressures like destruction of habitat in the East Asian-Australasian Flyway; however, a range of threat management and protection measures can be implemented in Moreton Bay to support the population of shorebirds that use the Bay. While shorebird roost and feeding sites are protected under existing legislation protecting the habitats that shorebirds use (detailed in Appendix B),

⁴¹ For more information about strategy development to address social barriers to action, see Appendix B.

⁴² In the context of South East Queensland waterways, communicating the potential threat to the ecosystem before that threat has eroded the natural values of the location is essential to motivating stewardship actions. See Dean, A. J., Uebel, K., Schultz, T., Fielding, K., Saeck, E., Ross, H., and Martin, V.Y. (2024). Community stewardship to protect coastal and freshwater ecosystems –Pathways between recreation and stewardship intentions. *People and Nature*.

there is no legislative mechanism that provides for the protection and management of specific shorebird sites around the Bay.

In addition, there appears to be a low level of knowledge about migratory shorebirds in the Bay. A study conducted in 2022⁴³ found that South East Queenslanders' awareness of 'endangered birds that migrate from the northern hemisphere' is low, with only 25% of respondents indicating they know about Moreton Bay's migratory birds. Low levels of knowledge may also be true for developers and other site-related stakeholders. Conversely, most respondents indicated they would be 'excited' to know '...that Moreton Bay is home to endangered birds that migrate from the Northern Hemisphere' (33% reported being 'very excited' to know this). This suggests there is potential to leverage the excitement and interest people have for learning more about migratory shorebirds to foster greater advocacy for habitat protection and management. In addition, the same study found that South East Queenslanders were most supportive of management strategies that protect wetlands and coastal areas from coastal development, compared to strategies that target other management issues such as pollution, marine park zoning and rule enforcement.

Threats targeted

- Climate: Sea level rise, increasing temperature, increase in extreme events and flooding
- Population growth: Coastal development/artificial coastlines, human & domestic animal disturbances
- Stewardship: low levels of community awareness, low levels of community stewardship

Action description

This action is to advocate for improved management of roost and feeding sites for migratory shorebirds. Sites, threats and management actions have been identified and prioritised in recommendations made in the report *Managing Threats to Migratory Shorebirds in Moreton Bay*.⁴⁴ These recommendations seek to reduce threats to roosting sites through actions such as establishing buffer zones around critical roosting and feeding sites to reduce the disturbance and encroachment of development, as well as allowing for migration over time as sea levels rise. Managing disturbance at shorebird sites to reduce the impact of human-based disturbance (e.g. dog walkers) is also critical, as is managing vegetation with a particular focus on reducing mangrove encroachment at key sites.

Desired outcomes would include changes to planning, management, and development instruments, to include considerations for the important areas of shorebird habitat. The changes need to be coordinated at the regional level across the relevant authorities (e.g. local councils and state government).

The campaign could be led by special interest groups (including schools), local and state government staff, and developers. Groups may have differing capacity or willingness to engage in advocacy; if necessary, an education and engagement strategy would need to be established to define specific actions, and barriers to those actions, for critical partners. Key to understanding partner willingness to engage would be their experience and knowledge of the migratory shorebirds and the severity of threat; their comfort and willingness to participate in advocacy; and their resources and ability to partner in advocacy.

An education and engagement campaign could accompany advocacy actions, and build broad support from the community to increase advocacy success. An engagement campaign might include: providing in-person experiences (e.g. field trips) to observe shorebirds and their habitat; school trips; community-based citizen science programs to monitor the shorebirds; and communication campaigns via social and mainstream media. To underpin efforts and increase the chance of successful outcomes, a regional-level review of the planning and management regulations would assist advocacy campaigners, especially those already working within government agencies, to target specific areas for change (i.e. Action 1.2).

⁴³ Dean, A. and Shultz, T., (2023). *Community understanding and appreciation of Moreton Bay – a framework to support engaging communities*. Report to the Moreton Bay Foundation.

⁴⁴ Fuller RA, Clemens RS, Woodworth BK, Moffitt D & Simmons BA (2021). *Managing Threats to Migratory Shorebirds in Moreton Bay*. Final report to Healthy Land and Water. University of Queensland, Brisbane.

Types of organisations that could be involved

Organisations without jurisdiction or legislated management obligations (e.g. non-government organisations) working in partnership with organisations that have jurisdiction or adjacent jurisdiction over roosting and feeding sites (e.g. local councils, state governments)

Action 1.5 Develop an education campaign with a focus on the threats and responses to coastal zones and habitats from sea level rise, storm surge, flooding and extreme events

Justification for the analysis

Through the gap analysis and the stakeholder consultation with local councils, many coastal communities and developers lack an understanding of the threat that sea level rise, storm surge, flooding and other extreme events pose on the safety of coastal communities and coastal habitats across the Bay. Most of the Bay's local councils have developed coastal hazard adaptation strategies as part of the Queensland Government's QCoast2100 program; however, coastal development and encroachment into coastal zones that might be used as a buffer against climate-related threats continues and would continue into the future. This is based on the projections outlined in the *SEQ Regional Plan* that shows increasing urban development and density in the near coastal zones of SEQ.⁴⁵

Threats targeted

- **Habitat modification:** decline in extent, habitat fragmentation
- **Climate:** Sea level rise, increasing temperature, increase in extreme events and flooding
- **Population growth:** Coastal development/artificial coastlines, human & domestic animal disturbances
- **Stewardship:** low levels of community awareness, low levels of community stewardship

Action description

This action is to develop an education strategy and campaign for coastal hazard issues to enhance community connection, understanding, and support for coastal zone protection. While this action should be undertaken by local councils, a collaborative effort on the campaign would maximise the reach and impact of these messages. The audiences to target are developers, councils, coastal residents, and the wider community, with the aim to improve people's knowledge of the threats and actions they can take to reduce the threats. The potential social barriers to the development of the education strategy include the ability of councils to work collaboratively, in-house capabilities in developing educational campaigns that aim to change knowledge and (ultimately) behaviours, as well as the time and resources needed for the campaign. Solutions to these barriers include establishing a working group to develop the campaign, which includes staff from all councils, ensuring those involved have the relevant training and skills to develop and deliver targeted educational campaigns, securing funding, and allocating appropriate staff time and securing other resources as required.

During the development of the education campaign, campaign managers would need to gain an understanding of the target audiences' current levels of understanding of the threats. There may be, for example, a lack of experience with specific coastal hazards, so using stories of experiences from other coastal areas in Australia may assist. Other education strategies to consider include co-creating educational information with key trusted groups or individuals within the community who can also assist in disseminating the information through their networks. Signage explaining the coastal hazards and threats could also be improved. Collaboration with stakeholders such as emergency services could be leveraged and coordinated. For developers, content could be crafted with industry associations and conveyed via professional webinars, newsletters, etc. The content for developers should include information about legislative requirements and insurances. For council staff, in-house training could assist further education about the threats; however, it would be important to first identify knowledge gaps to ensure the content is relevant.

⁴⁵ Department of State Development, Infrastructure Local Government and Planning, Queensland (2023). *Shaping SEQ –South East Queensland Regional Plan*.

Types of organisations that could be involved

- Collaboration between local councils to develop the education campaign.
- Target audiences would include coastal residents, developers, council staff, and the wider community.

Program 2. Identifying priorities and requirements for degraded habitats

Description

The habitats of Moreton Bay represent outstanding coastal wetland values with many habitat types in the Bay retaining a relatively natural character. The diversity of habitat types across the Bay provides significant support for the Bay's unique biodiversity, as well as providing ecosystem services for the communities that rely on the Bay, including coastal protection, sediment stabilisation and water filtration. Through the gap analysis, key habitats were identified as being at risk of degradation or are already heavily degraded. For many of the habitats identified, active restoration throughout a seascape like Moreton Bay has been identified globally⁴⁶ as a key option for reducing degradation and biodiversity loss.⁴⁷

In general, most habitats of Moreton Bay would benefit from restoration, with priority habitats being shellfish reefs, coral reefs and seagrasses, as identified in the gap analysis (Section 4.1). Mangroves are not considered degraded in general. However, they were also identified as a potential target for active restoration, particularly in areas at risk of coastal erosion under future climate change scenarios.

Coral and shellfish reef habitats were once common in Moreton Bay; however, they have declined since the early 1900s.⁴⁸ This decline has been attributed to overexploitation, extraction, disease and poor water quality, particularly sedimentation. The decline has resulted in shellfish reefs becoming functionally extinct in Australia⁴⁹ and coral reefs in the Bay reduced to species that are tolerant of poor water quality and catchment runoff.⁵⁰ Unlike marine plants (mangroves, seagrass, saltmarsh) and coral reefs, shellfish reefs have not been individually recognised for protection and management within Queensland's marine parks.

The trend in the extent of seagrasses in the Bay is more complicated. In the ten years before 2022, seagrass meadows had increased in extent, with meadows establishing in the relatively highly impacted western embayments like Bramble Bay and southern Deception Bay.⁵¹ Despite this success, after the 2022 flood, seagrass extent in Moreton Bay declined, particularly in the Bay's deeper meadows.⁵² As a result, seagrass was identified as a habitat that might benefit from a restoration approach because, once lost seagrass in the Bay has a long lag time to recover.¹⁶ Seagrass restoration is rapidly becoming a key tool in coastal conservation plans Australia-wide as the success of these programs grows.⁵³

Justification for the program

- Shellfish reefs, coral reefs, seagrasses and mangroves are all identified as key habitats providing significant ecosystem services.⁵⁴

⁴⁶ Convention of Biological Diversity Secretariate. *Kunming-Montreal Global Biodiversity Framework*, accessed 18 Jun 2024. Available at: <https://www.cbd.int/gbf/targets>

⁴⁷ Vozzo, M.L. et al. (2023). To restore coastal marine areas, we need to work across multiple habitats simultaneously. *PNAS* 120:26.

⁴⁸ Johnson P, Neil DT. (1998). Susceptibility to flooding of two dominant coral taxa in Moreton Bay. In: Tibbetts IR, Hall NJ, Dennison WC. (Eds) *Moreton Bay and Catchment*. School of Marine Science, The University of Queensland. Brisbane, Australia. p. 597-604

⁴⁹ Beck, M. W. , Brumbaugh, R. D. , Airoidi, L. , Carranza, A. , Coen, L. D. , Crawford, C. , Defeo, O. , Edgar, G. J. , Hancock, B. , Kay, M. C. , Lenihan, H. S. , Luckenbach, M. W. , Toropova, C. L. , Zhang, G. , & Guo, X. (2011). Oyster reefs at risk and recommendations for conservation, restoration, and management. *Bioscience*, 61(2), 107–116.

⁵⁰ AD Olds, KA Pitt, PS Maxwell, RC Babcock, D Rissik, RM Connolly, (2014). Marine reserves help coastal ecosystems cope with extreme weather. *Global Change Biology* 20(10): 3050-3058.

⁵¹ Maxwell P, Connolly R, Roelfsema C, Burfeind D, Udy J, O'Brien K, Saunders M, Barnes R, Olds A, Hendersen C, Gilby B. (2019). Seagrasses of Moreton Bay Quandamooka: Diversity, ecology and resilience. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org>

⁵² Udy, J., B, Venables, E. Ovsyanikova, C. Sheidler. (2021). Spatial modelling of seagrass distribution in Moreton Bay. *Science Under Sail Australia for Healthy Land and Water*.

⁵³ See Seagrass Restoration Network <https://seagrassrestorationnetwork.com/>

⁵⁴ See Ramsar Information Sheet – Moreton Bay. www.dccew.gov.au/sites/default/files/documents/41-ris.pdf

- All of these habitats were identified as either in poor current condition or in decline, with the exception of mangroves, which are expanding across the Bay.⁵⁵ All habitats were identified as being at high risk from the impacts of climate change (e.g. coastal erosion and sea level rise).
- Active restoration has been identified as an important tool for enhancing degraded coastal habitats.¹²
- The permitting process for active restoration projects was identified during consultation as a key barrier by community groups and non-government organisations such as Ozfish, The Nature Conservancy and Healthy Land and Water, as well as local councils.
- Including restoration as a tool for shellfish reefs in the Bay would provide significant improvements in ecological health and social and cultural values. This program requires regional coordination and refinements to legislation to enable Bay-scale restoration to be achieved.

Long-term outcomes

- Degraded habitats around Moreton Bay have been restored to enhance biodiversity and to contribute to coastal protection from major climate change related threats.
- Policy and regulation relevant to Moreton Bay facilitates restoration of Bay habitats and enables regionwide restoration efforts.
- Active restoration is used as a mechanism to enhance the connection between estuaries and Bay habitats as well as protection from coastal hazards.

Program objectives

- Coordinate the management of habitat restoration at a Bay-wide scale and show a clear return on investment to increase investor confidence.
- Provide the policy and regulatory environment to enable restoration of habitats in Moreton Bay acknowledging the importance of a robust regulatory process to protecting the values of Moreton Bay.

Action 2.1 Advocacy for new guidelines for habitat restoration to accompany key legislation like the *Marine Parks Act 2004*

Justification for the action

The *Marine Parks Act 2004* provides for activities to be undertaken in marine parks under an authority (e.g. permit) (detailed in Appendix C). There is currently limited provision for proactive or beneficial activities that are designed to improve the condition of habitats or protect them against threats (e.g. restoration, coastal erosion protection). These are treated in the same way as development activities, which were identified by multiple stakeholders as a significant barrier.

Threats targeted

- Ecosystem modification: Coastal erosion, incursions of weeds/pests/disease, reduction of habitat area, fragmentation/reduction connectivity
- Population growth: Harvesting/overfishing/extraction

Action description

The Moreton Bay Shellfish Reef Restoration Working Group and others have identified a need to streamline authorisations for undertaking marine habitat restoration works. A part of that streamlining would be developing guidance for restoration activities. The advice from the working group was that any guidance should recognise and appropriately treat risk, responsibility, liability, funding and ongoing monitoring in partnership with external parties. A

⁵⁵ Lovelock C, Accad A, Dowling R, Duke N, Lee SY, Ronan M. (2019). Mangroves and saltmarshes of Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

review of the *Marine Parks Act 2004* and subordinate legislation should also be undertaken with a view to establishing and defining restoration in the context of a comprehensive strategy for conservation of the marine environment.

The prioritisation of sites in Action 2.1 could provide the basis for streamlining authorisation, acting as pre-approved sites for restoration. This would require endorsing sites outlined by the relevant authorities. Streamlining could also consider accreditation or licensing regional organisations to engage in habitat restoration that is aligned with the regional strategy.

Types of organisations that could be involved

Advocacy action should be conducted in consultation with Marine Parks, Traditional Owner groups, non-government organisations who are actively engaged in restoration projects (The Nature Conservancy, OzFish, Healthy Land and Water, Reefcheck and research organisations), community groups and local councils

Action 2.2 Develop a Bay-wide habitat restoration strategy and prioritisation for priority habitat: shellfish reefs, corals reefs and seagrass

Justification for the action

Shellfish reef restoration has occurred globally (United States, New Zealand, Europe, United Kingdom, Asia) over the past 20 years and in Australia since 2014, guided by robust international standards and procedures. Shellfish reef restoration has been undertaken in Moreton Bay since 2017, with trials in Pumicestone Passage and more recently in Waterloo Bay and adjacent to the Port of Brisbane. In 2019, the Moreton Bay Shellfish Reef Restoration Working Group was convened by Moreton Bay Marine Parks to provide advice and recommendations on an appropriate response to restoration initiatives.

The overall benefits of restoring shellfish reef habitat in Moreton Bay outweigh the associated risks, if adequately mitigated. Maximising benefits and mitigating impacts of region-wide restoration would best be realised through strategic planning. Replacing one habitat with another is not without risk; however, recovering an important pre-existing and now functionally extinct ecosystem, and the opportunity for connectivity and mutual benefit between habitats as a result of restoration, would be highly beneficial to ecosystem health and resilience.

Shellfish reef restoration is more advanced in Moreton Bay than for coral reefs and seagrass. There is a need for research into coral reef and seagrass restoration trials before they can be added into a Bay-wide site prioritisation.

Threats targeted

- *Ecosystem modification*: Coastal erosion, incursions of weeds/pests/disease, reduction of habitat area, fragmentation/reduction connectivity
- *Climate*: Sea level rise, increasing temperature, increase in extreme events and flooding
- *Population growth*: Harvesting/overfishing/extraction

Action description

The Moreton Bay Shellfish Reef Restoration Working Group recommended a suite of actions for developing a strategic framework for shellfish reef restoration specifically and restoration more broadly in Moreton Bay⁵⁶. The working group recommended developing an overarching habitat restoration plan for Moreton Bay to guide the consideration, planning, authorisation funding and management of reef restoration efforts in the Bay. This should be done through a risk-based management framework that identifies objectives, appropriate sites, scale stages and management controls.

Protection and restoration of habitats at a region-wide scale requires a substantial investment if it is to have a demonstrable impact. Several excellent restoration projects have occurred across the Bay; however, there needs to be large-scale, coordinated, long-term investment over multiple years for any Bay-wide improvements to reef health to be seen over the next 10 years. The establishment of a regional strategy with estimated costs for managing those locations

⁵⁶ Document not publicly available but available upon request from Moreton Bay Marine Parks

across the Bay should be used as the investment plan for a regionally coordinated fundraising and grant program to deliver funds to manage those locations. The fundraising campaign should target all potential sources of funding including disaster recovery funding, private investment, carbon and biodiversity offsetting opportunities and incorporate existing investment initiatives at all levels of government.

Types of organisations that could be involved

A Bay-wide reef restoration plan should be developed in partnership with Traditional Owner groups, Queensland Parks and Wildlife Service (Moreton Bay), researchers and the regional organisations already involved in reef restoration such as OzFish, The Nature Conservancy and Healthy Land and Water.

Action 2.3 Conduct research and trials into restoration of priority habitat: seagrass

Justification for the action

Seagrasses are a key intertidal and subtidal habitat in Moreton Bay. They are highly productive and return a disproportionate amount of services per area than most other estuarine habitats. Historically, large areas of seagrass have been lost from the Bay due to sediment accretion and smothering. Since 2009, however, promising natural recovery of seagrass meadows in the most highly degraded nearshore areas of southern Deception Bay and Bramble Bay,⁵⁷ has prompted an interest in active restoration of seagrasses to speed up recovery of meadows in the western and southern parts of the Bay following flooding. After the 2022 flood, seagrass extent in Moreton Bay declined, particularly in the Bay's deeper meadows.⁵⁸ As a result, seagrass was identified as a habitat that might benefit from a restoration approach because, once lost, seagrass in the Bay has a long lag time to recover.²³ Seagrass restoration is rapidly becoming a key tool in coastal conservation plans Australia-wide as the success of these programs grows.⁵⁹

Threats targeted

- *Ecosystem modification*: Coastal erosion, incursions of weeds/pests/disease, reduction of habitat area, fragmentation/reduction connectivity
- *Population growth*: Harvesting/overfishing/extraction
- *Research & development*: Lack of data and knowledge

Action description

This action is to conduct research to determine the feasibility for active seagrass restoration in Moreton Bay. The aim of the research is to understand how to enhance the natural recovery of seagrasses in key parts of the Bay, as well as in areas closer to estuaries to enhance the connectivity between habitats.

Active seagrass restoration has been successful in other parts of Australia,⁶⁰ and across the world, which provides a useful basis for trials in Moreton Bay. The Seagrass Restoration Network has published a range of tools and guidance for seagrass restoration techniques.

Seagrasses exert influence on the conditions of the environment they inhabit, effectively engineering their habitats to improve their viability and persistence to external impacts. However, once if meadows are degraded or lost (e.g. following flooding) that influence is also lost meaning previously seagrass dominated parts of the bay remain bare for long periods even if conditions recovery to favourable levels²³.

⁵⁷ Maxwell P, Connolly R, Roelfsema C, Burfeind D, Udy J, O'Brien K, Saunders M, Barnes R, Olds A, Hendersen C, Gilby B. (2019). Seagrasses of Moreton Bay Quandamooka: Diversity, ecology and resilience. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

⁵⁸ Udy, J., B, Venables, E. Ovsyanikova, C. Sheidler. (2021). Spatial modelling of seagrass distribution in Moreton Bay. Science Under Sail Australia for Healthy Land and Water.

⁵⁹ See Seagrass Restoration Network <https://seagrassrestorationnetwork.com/>

⁶⁰ See Seagrass Restoration Network <https://seagrassrestorationnetwork.com/>

Large sections of the intertidal and shallow subtidal areas of the western Bay, including southern Deception Bay, northern Bramble Bay and the southern Bay, have been predicted to be bistable in this way. Some of these areas have experienced seagrass loss since 1987 most notably in southern Deception Bay and the southern Bay channels. These are therefore areas in the Bay where any natural recovery after the loss of seagrass is likely to be delayed due to the breakdown of the feedbacks controlling the presence of seagrass. It is these areas that are likely to benefit from active or facilitated restoration.

Types of organisations that could be involved

Trials should be developed and conducted in partnership with the Seagrass Restoration Network, which is a collective of researchers and practitioners across Australia who exchange experience and knowledge to improve the success of seagrass restoration nationally. Trials should include research organisations and non-government organisations that have expertise in active restoration. Partner with Traditional Owner organisations (e.g. QYAC ranger program) for on-ground delivery of restoration and on-going monitoring. Consider opportunities for citizen science engagement in monitoring.

Action 2.4 Conduct research and trials into restoration of priority habitat: coral reefs

Justification for the action

Coral reefs have declined significantly in Moreton Bay since European arrival.⁶¹ Many of the coral reefs in the western and southern parts of the Bay have declined in condition or been lost altogether after being inundated by increased sedimentation and outcompeted by macroalgae. For the reefs that are left in the western part of the Bay, stress-tolerant, generalist, and opportunistic corals dominate.⁶² The corals of Moreton Bay do not favour reef building, like tropical reefs, but still provide important habitat for juvenile fish and other micro-benthic organisms that support local fisheries.

Moreton Bay corals sit at the interface between the tropical coral communities and the populations further south. They are likely to be important stepping stones to support the diversity of coral assemblages to the south.⁶³ Despite their importance, the coral assemblages in the Bay are at high risk of decline if catchment impacts are not reversed and if sea temperatures continue to lead to coral bleaching as happened in the summer of 2023–24. To provide resilience for the Bay's coral assemblages, active restoration in suitable locations across the Bay would protect the diversity of corals in the Bay, as well as providing critical habitat for other organisms like macroalgae, fish and macroinvertebrates.

The first active coral reef restoration only recently began in Moreton Bay.⁶⁴ There is limited understanding of the viability of active restoration or if there are other suitable sites within the Bay that could be targeted.

Threats targeted

- *Ecosystem modification*: incursions of weeds/pests/disease, reduction of habitat area
- *Climate*: Sea level rise, increasing temperature, increase in extreme events and flooding
- *Research & development*: Lack of data and knowledge pertaining to the Bay's values

Action description

Research into the viability of coral reef restoration at a Bay-wide scale is needed to assess how it might support the resilience of coral communities to current and future threats. The findings of the restoration trials should be incorporated into the Bay-wide habitat restoration strategy.

⁶¹ Pandolfi J, Lybolt M, Sommer B, Narayan R, Rachello-Dolmen P. (2019). Coral and micro-benthic assemblages from reef habitats in Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

⁶² Salmond J. & Schubert J. (2024). Reef Check Australia South East Queensland Season Summary Report 2022-2023. Reef Check Foundation Ltd, accessed 10 May 2024. Available at: https://www.reefcheckaustralia.org/season_summary_report_seq_2022_2023

⁶³ Wallace CC, Fellegara I, Muir PR, Harrison PL. (2009). The scleractinian corals of Moreton Bay, eastern Australia: High latitude, marginal assemblages with increasing species richness *Memoirs of the Queensland Museum*. 54(2):1-118

⁶⁴ Salmond J. & Schubert J. (2024). Reef Check Australia South East Queensland Season Summary Report 2022-2023. Reef Check Foundation Ltd, accessed 10 May 2024.

Types of organisations that could be involved

Trials should be developed and conducted in partnership with the researchers and practitioners across Australia who have developed experience and knowledge through similar coral restoration trials in other parts of the country. Trials should include research organisations and non-government organisations that have expertise in active restoration. Partner with Traditional Owner organisations (e.g. QYAC ranger program) for on-ground delivery of restoration and on-going monitoring. Consider opportunities for citizen science engagement in monitoring.

Program 3. Knowledge exchange and stakeholder coordination

Description

Moreton Bay is one of the more heavily studied and managed embayments on the east coast of Australia. Along with multiple research organisations, there are many management organisations, Traditional Owner groups, community groups, and non-government and industry organisations that collect and use data to make decisions to protect and enhance the Bay's values. Currently, there is very little coordination of Bay-wide scale information that could be used for coordinated decision making. Program 3 is designed to enhance the coordination and exchange of information and knowledge sharing among organisations that work within the Bay.

Justification for the program

- There has been a history of research, strategy development, management and monitoring programs that have focused on Moreton Bay. There is a large amount of published information describing the Bay's unique values as well as the threats to those values.⁶⁵
- The majority of the stakeholders consulted in this project, including local councils, state governments and community groups, identified a lack of knowledge regarding published information and the difficulties and time involved in finding information quickly to support decision making. Councils identified a lack of knowledge about available information that has in turn resulted in either poor management decisions made or lengthy studies that repeat previous work. They cited this as a significant barrier to the management of the Bay. The state government also specifically identified this as a key barrier in managing the Ramsar site.
- While a lot of the research and management reports written about the Bay have been published, there are many datasets, monitoring programs, research studies, community group assessments and management initiatives that are either unpublished and not publicly available or are stored on websites that are difficult to find. Much of this information would be valuable to support Bay-wide management. Additionally, there are methods, techniques and guidelines for different management actions that have been developed or trialled that would be useful for other organisations seeking to undertake similar activities.
- Many of the regulatory instruments that allow activities within the Bay require scientific assessments; however, this data is rarely published.⁶⁶
- Ongoing stewardship by First Nations people, and First Nations management of Sea Country is known to increase ecological outcomes but has substantial effects on health and wellbeing outcomes for First Nations communities.

Long-term outcomes

- All information is available and knowledge exchange is efficient and widespread between all Bay organisations.
- Knowledge gathering (e.g. research and monitoring activities) is coordinated and targeted to support the management of Moreton Bay.
- Traditional knowledge and cultural heritage values are central to decision making.

Program objectives

- Coordinate knowledge availability and exchange between Traditional Owners, managers, researchers and the community.
- Develop a stakeholder forum to integrate Bay science and knowledge into management and industry activities.

⁶⁵ See literature review in Appendix A

⁶⁶ See Appendix C for the legislation relevant to Moreton Bay

Action 3.1 Create and resource ongoing partnership position/s within First Nations organisations to interface with SEQ-wide non-governmental agencies

Justification for the action

First Nations organisations are actively collaborating with diverse agencies across Southeast Queensland to protect marine and other cultural resources. Yet often, partner agencies are unaware of each other's activities, strategies and programs.

In addition, First Nations organisations are uniquely positioned as knowledge-holders at the centre of all on-ground activity for Sea Country.

However, demands on these organisations are high. This action would resource a permanent paid role within a First Nations organisation with a key responsibility to holistically manage the First Nations' interface with other SEQ agencies and their collective objectives (including research, restoration, and other recommended actions in this Blueprint).

Threats targeted

- All identified threats

Action description

A fully resourced position within a First Nations organisation would act as an interface between Traditional Owner organisations and other agencies in the development of mutual objectives and advancement of Traditional Owner priorities. This position could be a 'paired' or 'partnered' position working in close collaboration with TMBF or other agencies in the facilitation of all other recommended actions in this plan, and could contribute to mutual capacity building through the exchange of professional and cultural skills.

Types of organisations that could be involved

Traditional Owner groups (e.g. MMEIC, QYAC, Kabi Kabi Peoples Aboriginal Corporation), and non-governmental SEQ-wide agencies such as The Moreton Bay Foundation and Healthy Land and Water.

Action 3.2 Develop and maintain a centralised knowledge hub or portal for Moreton Bay

Justification for the action

Multiple organisations have an interest in Moreton Bay and either collect information to assist in their activities or use other organisations' information to help in decision making. As priorities and the focus of management and research organisations, combined with staff turnover over, many reports, datasets and initiatives are lost or forgotten. They could be used to develop a coordinated foundation of understanding that can be built on over time to assist in protecting and restoring the Bay's values.

Threats targeted

- Research & development: Lack of data and knowledge

Action description

To assist in ensuring that all Bay-related information is captured in perpetuity, this action recommends that a knowledge-sharing portal is developed. The aim of the portal would be to bring together information to inform and guide management decisions in Moreton Bay. The portal should not be a data repository; there are many databases that hold data relating to the Bay's values and threats. Rehousing or replicating this information would be complicated and inefficient. Instead, the portal should be a collaborative discovery platform for Bay-related projects and information sharing. The portal should include a meta database that describes the types of data and projects available and where the information is housed. Because the intention of the site is for knowledge exchange, it is not necessary that project information is complete or publishable. Rather, the portal should allow Bay organisations to access information about a project, its purpose, where it is occurring and the contact details for more information or collaboration activities.

Knowledge systems have been developed in other regions for similar purposes that could be used as a basis for the design of the portal (for example the Reef Knowledge System⁶⁷).

The features of the platform could include:

- a spatial display of current and past projects that have happened across the Bay as an interactive tool to find project information for a location of interest and discover what other agencies are working on
- a meta database and data repository that describes datasets and where they are stored as well as providing a location to stored datasets that are not housed elsewhere
- a resource library for publications, reports, data sets, factsheets, field equipment, methods, techniques. The library would provide resources to help managers and practitioners access best practice methods and technical guidelines for monitoring, restoration, communication and community engagement. The portal would provide different organisations with project and decision support to ensure that all organisations have access to the methods developed and lessons learned by other organisations in the region
- a list of projects occurring across the Bay that includes the spatial location, aims, description of the project and contact details
- a discussion page for interaction between Bay managers and practitioners to share information
- decision support tools.

Types of organisations that could be involved

The knowledge sharing portal should be a collaborative platform building off the expertise of regional bodies like Traditional Owner groups (e.g. QYAC, Minjerribah Moorgumpin Aboriginal Elders in Council, Kabi Kabi Peoples' Aboriginal Corporation), Healthy Land and Water, SEQ Council of Mayors, and the Moreton Bay Foundation. Partnerships should be sought with the tourism sector and Bayside Chamber of Commerce to assist and help shape their activities. Partnerships should also be sought with institutions like the Queensland Museum and the State Library of Queensland who specialise in ensuring public access to information.

Action 3.3 Establish a regular Bay-wide stakeholders forum

Justification for the action

Many organisations operate in Moreton Bay. Traditional Owner groups; community groups; non-government organisations; local, state and federal government departments; research organisations and industry all collect information about the Bay's values and threats. Management of the Bay's values is not coordinated at a Bay-wide scale. While a formal, overarching Bay-wide coordination of management was not identified as critical by many stakeholders through consultation, it was widely agreed that awareness and understanding of the activities of other organisations is critical to avoid replication, to build on existing knowledge, experience and understanding and to improving efficiency for managing the Bay.⁶⁸ This action is for a coordinated and regular Bay-wide stakeholders forum to help to coordinate, plan and support the management of the Bay's values.

Threats targeted

- Research & development: Lack of data and knowledge

Action description

The action is to establish and convene a Bay-wide stakeholders Forum. Forum engagement and communication activities should include:

⁶⁷ GBRMPA (2024). Reef Knowledge System. Website. <https://reefknowledgesystem.gbrmpa.gov.au/about/about-reef-knowledge-system>

⁶⁸ See the description of stakeholder engagement in Section 0

- Convene regular Bay-wide Stakeholder Forum meetings to plan, co-ordinate and support holistic management of resources, and
- Host inter-annual Moreton Bay Conferences to showcase and share new knowledge.

The Forum would enable Bay managers to influence the regionwide management of the Bay, to seek guidance from other organisations with similar issues, to foster partnerships between organisations to coordinate fundraising efforts, and to leverage funds and expertise for larger-scale actions over longer periods. The forum should also be used to inform the advocacy, awareness raising, and research priorities as outlined in the other programs in this Blueprint. Bay.

A biennial conference provides an opportunity for an in-depth exchange of knowledge, where researchers, Bay managers and community groups can showcase their activities and programs. Information shared at the conference should be captured in the centralised knowledge portal outlined in Action 3.2.

Types of organisations that could be involved

The Bay-wide stakeholders forum activities should be open to all organisations that conduct activities in and around Moreton Bay. The conference should be coordinated in partnership with the other regional bodies like QYAC, Minjerribah Moorgumpin Aboriginal Elders in Council, Healthy Land and Water, the SEQ Council of Mayors and the Moreton Bay Foundation.

Program 4. Increasing catchment sediment reduction at a Bay-wide scale

Description

Catchment-derived sediment is one of the most significant threats to the values of Moreton Bay, smothering near coastal habitats like seagrasses, shellfish and coral reefs and sandy intertidal zones and creating poor water quality that impacts the types of plants and animals that can inhabit the Bay, as well as impacting the amenity and tourism values of the Bay.⁶⁹

Extensive clearing since European settlement in the catchments that drain to Moreton Bay has led to significant sediment erosion. Sediments especially enter Moreton Bay via terrestrial run-off and river discharge after rainfall events and flooding.⁷⁰ Regionally focused organisations like Healthy Land and Water, Seqwater and the Council of Mayors along with local councils, utilities and the Port of Brisbane have been implementing sediment projects across SEQ. Despite more than twenty years of dedication by these organisations to reducing sediment pollutants, there is no evidence that annual sediment loads to the Bay have declined, instead there are indications that this threat may be increasing. This is because, the region has not yet secured the funding required to embark on a long-term, large-scale program of works that would reduce erosion to improve the amount of sediment entering the Bay. This program outlines a suite of actions to help.

Justification for the program

- Sediment running off the catchment is regularly identified as a significant current threat to values within Moreton Bay^{30,71} by smothering benthic habitats like seagrass meadows, coral reefs, sandbanks, and by impacting the diversity of fish communities and other fauna species.
- Sediment runoff to the Bay has increased after the 2022 flood⁷² and is projected to progressively get worse with the increasing likelihood of flooding associated with climate change.⁷³
- Sedimentation in waterways was identified as a key focus of management activities through a review of management plans and strategies, as well as through the stakeholder consultation process.
- Reducing sediment is one focus of the urban stormwater provisions in the *SEQ Regional Plan* and is a benchmark within the water quality guidelines in the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*; however, there is no explicit legislation regulating the causes of erosion in the catchment, which is the primary source of sediment entering the Bay.⁷⁴

Long-term outcomes

- The sediment erosion threat is mitigated at a whole-of-catchment scale leading to a reduction of sediments into Moreton Bay.
- Sediment reduction measures in the catchment are encompassed in legislation to assist in driving action at a catchment scale.

⁶⁹ Saeck E, Udy J, Maxwell P, Grinham A, Moffatt D, Senthikumar S, Udy D, Weber T. (2019). Water quality in Moreton Bay and its major estuaries: Change over two decades (2000-2018). In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

⁷⁰ Lyons M, Phinn S, Roelfsema C. (2019). Moreton Bay and catchment urban expansion and vegetation change. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

⁷¹ Beecroft, R., Cossu, R., Deering, N., Hutley, N., Albert, S., Maxwell, P., Grinham, A., (2024). Rapid morphosedimentary development of a shallow subtropical embayment in response to extreme episodic flooding, *Continental Shelf Research*, <https://doi.org/10.1016/j.csr.2024.105252>

⁷² Grinham, A., T. Costantini, N. Deering, C. Jackson, C. Klein, C. Lovelock, J. Pandolfi, G. Eyal, M. Linde, M. Dunbabin, B. Duncan, N. Hutley, I. Byrne, C. Wilson, S. Albert. (2024). Nitrogen loading resulting from major floods and sediment resuspension to a large coastal embayment. *Science of the Total Environment*. Vol 918 176646.

⁷³ Department of Environment and Science, Queensland (2019). Climate Change in the South East Queensland Region. Available at: https://www.qld.gov.au/_data/assets/pdf_file/0023/67631/seq-climate-change-impact-summary.pdf

⁷⁴ See legislation breakdown in Appendix C

Program objectives

- Coordinate and prioritise restoration of erosion sites to show a clear return on investment to increase investor confidence for investing at a region-wide scale.
- Sufficient resources are acquired over an appropriate timeline to systematically address the sediment erosion impacts in Moreton Bay's catchments at a region-wide scale.

Action 4.1 Develop business case for catchment sediment reduction at a regional scale

Justification for the action

Sediment runoff has been recognised as one of the most significant threats to Moreton Bay values for many years. Poor catchment management practices, combined with large rainfall events and floods continues to deliver very large quantities of sediment into the Bay.⁷⁵ Many organisations are involved in erosion reduction projects in the catchments that drain into Moreton Bay. While these projects have been very successful, they are not at a scale that significantly reduces the amount of sediment entering Moreton Bay. With the approach of the 2032 Olympic games and commitment to Brisbane 2032 Legacy Strategy and Elevate 2042, to ensure lasting benefits of the games beyond 2032,⁷⁶ there is an opportunity to make a case for a region-wide campaign to leverage the funds required to reduce sediment.

Threats targeted

- *Pollutants:* Catchment runoff – sediments, nutrients, toxicants,

Action description

This action is to develop a business case for catchment sediment reduction at a regional scale. Reduction of sediment at a region-wide scale is a substantial investment if it is to have a significant reduction in the amount of sediment reaching Moreton Bay. The business case should be developed and used as a basis for a coordinated fundraising campaign by any organisation wanting to invest in sediment reduction projects. Many excellent restoration projects are occurring across the catchments in the region; however, there needs to be large-scale, coordinated and long-term investment for any Bay-wide reductions in sediment to be seen over the next 10 years. Establishing a business case and prioritising locations (see Action 4.2) and estimating costs for managing those locations across the region should be used as the investment plan for a regionally coordinated fundraising and grant program to manage those locations. The business case should include a cost-benefit analysis that systematically evaluates financial cost against the broader economic and social benefit for the Bay's rights holders, stakeholders and community.

Types of organisations that could be involved

SEQ Council of Mayors, Healthy Land and Water, Seqwater, Queensland Urban Utilities, Port of Brisbane, and research organisations.

Action 4.2 Develop regional prioritisation of sediment reduction projects

Justification for the action

Sediment erosion is widespread across many of the major catchments that drain into Moreton Bay.⁷⁷ Many sites are on private property, which requires careful relationship building with the landholder to build trust and gain access to

⁷⁵ Grinham, A, T. Costantini, N. Deering, C. Jackson, C. Klein, C. Lovelock, J. Pandolfi, G. Eyal, M. Linde, M. Dunbabin, B. Duncan, N. Hutley, I. Byrne, C. Wilson, S. Albert. (2024). Nitrogen loading resulting from major floods and sediment resuspension to a large coastal embayment, Science of The Total Environment, Volume 918.

⁷⁶ Department of Tourism, Innovation and Sport, Queensland (2023). Elevate 2042: Brisbane 2032 Olympic and Paralympic Games Legacy Strategy. Available at: <https://q2032.au/plans/games-legacy>

⁷⁷ Alluvium, Healthy Land and Water, Seqwater (2018). Integrated Sediment Assessment Project – Final Report. Report P416053_ISA_R01 by Alluvium Consulting Australia, Healthy Land and Water and Seqwater

mitigate high-sediment yielding sites. Decreasing the sediment loads to Moreton Bay by 50% is estimated to involve rehabilitating approximately 6,350 km of stream and river banks below the region's water storage dams.⁷⁸

Reducing erosion in Moreton Bay's catchment at this scale depends on the combination of sound science and a clear prioritisation that outlines the specific locations for restoration. Through the stakeholder consultation process, councils and the state government said they lacked a clear understanding of the priority locations for sediment erosion mitigation that made it difficult to prioritise funding or to quickly progress projects when funding opportunities were available. Further, they said that although there is funding available through a range of avenues (e.g. the Australian Government's Disaster Recovery Funding Arrangements⁷⁹ and Queensland Environmental Offsets⁸⁰), they lacked a robust prioritisation of sites within their jurisdictions to be able to respond rapidly to opportunities or to attract external funding.

Prioritisation at a regional scale would enable the various levels of government operating within Moreton Bay to better manage this threat at a scale that would lead to a demonstrable improvement in the level of sediment entering Moreton Bay and protect against future threats. A catchment-wide prioritisation would be a powerful decision-support tool that lays out the suite of on-ground actions required to reduce the threat. The region's management organisations (e.g. Healthy Land and Water, Seqwater and local councils) have identified locations that require protection or restoration within their own jurisdictions or for their own objectives; however, these locations have not been synthesised into a Moreton Bay catchment-wide prioritisation that could be used to support a region-wide investment strategy.

Threats targeted

- *Pollutants:* Catchment runoff – sediments, nutrients, toxicants,

Action description

The following elements should be integrated into the prioritisation.

- Update the region-wide integrated sediment assessment work commissioned by Seqwater and Healthy Land and Water in 2017.
- Identify where natural ecosystem-based adaptation options could be mixed with hard infrastructure and included into local councils' infrastructure planning portfolios to assist in site-based management.
- Incorporate locations for environmental offsetting (e.g. nutrients, carbon or environmental offsets) considering the criteria required for offset projects, including co-benefits and risks.
- Estimate costs required to restore or protect priority locations around SEQ.

The prioritisation would outline the priority catchment locations requiring restoration and would be used to advocate for changes to legislation and seek investment for site-based management. Outcomes from other projects working to prioritise catchment restoration in the region would be integrated into the prioritisation, for example model development projects by Queensland Water Quality Modelling Network, Griffith University and Healthy Land and Water.

Types of organisations that could be involved

Council of Mayors, Healthy Land and Water, Seqwater, Queensland Urban Utilities, Port of Brisbane, and research organisations.

⁷⁸ Olley J, Burton J, Hermoso V, Smolders K, McMahon J, Thomson B, et al. (2015). Remnant riparian vegetation, sediment and nutrient loads, and river rehabilitation in subtropical Australia. *Hydrological Processes*. 29(10):2290–2300.

⁷⁹ Department of Home Affairs, Australian (2018) Disaster Recovery Funding Arrangements, accessed 10 June 24. Available at: <https://www.qra.qld.gov.au/funding/drfa>

⁸⁰ Department of Environment and Science, Queensland (2023). Queensland Environmental Offsets Policy.

Action 4.3 Develop an education campaign about the threats of sediments on Moreton Bay

Justification for the action

The sediment threat to Moreton Bay is dispersed across most of the catchments that drain into Moreton Bay, with many locations requiring erosion mitigation on private property.⁸¹ The literature review and gap analysis showed that many parts of the community lack an understanding of the threat that erosion and sediment runoff pose to the condition and resilience of the Bay's unique ecosystems. In the absence of sediment legislation (see Action 4.4), other methods are needed to encourage landholders to control the sediment and other pollutants from washing into the local waterways. In response to this, the City of Moreton Bay⁸² and Healthy Land and Water⁸³ have developed programs to raise awareness and education about sediment control on private land for homeowners, builders, developers and consultants. However, as the issue continues to cause problems for the health of the Bay, more needs to be done to ensure widespread knowledge about the sources of sediment in the Bay, and what can be done to address the causes. In addition, research at the national level has found that Australians generally have a low level of knowledge about stormwater pollution, and the actions they can take to prevent it.⁸⁴ Although *Community understanding and appreciation of Moreton Bay – a framework to support engaging communities*⁸⁵ did not investigate public perceptions of sediment specifically, this report found there was strong support for management strategies to reduce stormwater pollution from urban and rural sources.

Threats targeted

- **Pollutants:** Catchment runoff – sediments, nutrients, toxicants, **Stewardship:** low levels of community awareness, low levels of community stewardship

Action description

This action is to develop an education strategy and campaign for erosion and sediment impacts to enhance community support and action to reduce stormwater pollution. The campaign would be best developed in collaboration with organisations that are already working on sediment reduction with landholders (e.g. relevant councils, Healthy Land and Water, etc.) so that consistent information and messaging is conveyed to the target audiences. To do this, the organisations would need to have capabilities, capacity, and resources, to create the campaign.

The audiences to target in such a campaign are the general community, rural landholders, riparian landholders, urban homeowners, developers and builders, with an aim of encouraging sediment mitigation, particularly for prioritised, high-risk erosion locations, and to protect Bay values as a result. Potential barriers for these target audiences may include their knowledge and experience of sediment issues in the Bay, and a lack of understanding of their obligations under the *Environmental Protection Act 1994* (EP Act).

To overcome these potential barriers, solutions include:

- Define key market audiences and any barriers to action
- Develop communication content and materials to be disseminated by trusted sources or champions for each target audience group.
- Ensure content and materials are relevant to the needs and interests of each target audience.
- Co-design communication and engagement with landholders or other audiences, where relevant.

⁸¹ Alluvium, Healthy Land and Water, Seqwater (2018). Integrated Sediment Assessment Project – Final Report. Report P416053_ISA_R01 by Alluvium Consulting Australia, Healthy Land and Water and Seqwater

⁸² City of Moreton Bay (2023). Erosion and sediment control for residential building sites, accessed December 2023. Available at <https://www.moretonbay.qld.gov.au/Services/Building-Development/Erosion-And-Sediment-Control>

⁸³ Healthy Land and Water (2020). Erosion and Sediment Control House, accessed 10 Jan 2024. Available at: <https://waterbydesign.com.au/esc-house>

⁸⁴ Dean, A.J., Newton, F.J., Gulliver, R.E., Fielding, K.S., & Ross, H. (2022) Accelerating the adoption of water sensitive innovations: community perceptions of practices and technologies to mitigate urban stormwater pollution. *Journal of Environmental Planning and Management*, 66(4), 1–20.

⁸⁵ Dean, A. and Shultz, T., (2023). *Community understanding and appreciation of Moreton Bay – a framework to support engaging communities*. Report to the Moreton Bay Foundation.

- Develop training courses, webinars, and other educational material to address knowledge gaps in specific audiences. Topics to consider are legislative requirements and insurance issues.

Types of organisations that could be involved

- Co-design of the strategy could include councils, natural resource management groups, building industry representatives, developers, not-for-profits and community groups.
- Target audiences who may become partners in delivering sediment reduction messages may include landholders associations, developers and builders.

Action 4.4 Advocate for enhanced sediment reduction legislation to underpin regional program of sediment reduction program

Justification for the action

Many of the priority sediment reduction locations in SEQ are on private property.⁸⁶ The legislation review process showed there is no explicit legislation that regulates erosion in the rural parts of the catchment, which is the primary source of sediment entering the Bay.⁸⁷

Sediment in waterways was identified as a key focus of management activities through the review of management plans and strategies, as well as through stakeholder consultation; however, without any legislative or policy support for sediment reduction on private property, there is very little incentive for landholders to engage in sediment reduction. Even where legislation does apply, there is no incentive to go beyond minimum legislative requirements.

Threats targeted

- *Pollutants*: Catchment runoff – sediments, nutrients, toxicants
- *Stewardship*: low levels of community awareness, low levels of community stewardship

Action description

This action is to advocate for enhanced sediment legislation to provide a head of power to incentivise landholders to reduce erosion on their properties. This legislation reform could also include a broader application of the existing (legislated) offsets framework to ensure that residual impacts to the Bay that occur even after meeting all legislative requirements are eliminated. An option would be to include legislation that is directly targeted at water quality in the Bay and amendments to actions in and the scope of existing legislative and quasi-legislative mechanisms.

Legislating for restoration of the priority sediment erosion sites identified in Action 4.2 would help to support investment into large-scale restoration. The campaign should encourage advocacy from multiple groups, including landholders who live near or adjacent to priority sediment erosion sites, developers, local councils, not-for-profit interest groups and the wider community, to push for change in legislation. An advocacy strategy would need to be developed first to confirm the relevant potential partners, define the specific advocacy actions needed, and identify the relevant barriers to overcome.⁸⁸ Advocacy may include actions such as providing informational briefs for decision makers and local Members of Parliament, sharing information about the legislative changes needed with the general public, building strategic alliances, and rallying special interest groups to support and pressure.

Some of the important potential social barriers to advocacy actions by these groups may include their knowledge and perceived value of advocacy, social norms (e.g. social pressure to advocate, or not), time to undertake advocacy actions, as well as their knowledge and perceptions of the value of the priority coastal habitat. Knowledge of the relevant policies and regulations may also prevent advocacy for coastal habitat protection.

⁸⁶ Alluvium, Healthy Land and Water, Seqwater (2018). Integrated Sediment Assessment Project – Final Report. Report P416053_ISA_R01 by Alluvium Consulting Australia, Healthy Land and Water and Seqwater

⁸⁷ See legislation breakdown in Appendix C

⁸⁸ For more information about strategy development to address social barriers to action, see Section 1.1, 4.4 and Appendix B.

Reducing the potential barriers to groups taking action may require an informative engagement campaign including messages that: (i) clearly communicate the potential value of, and threat to riparian zones from erosion before these natural values are reduced⁸⁹, (ii) leverage social norms and encourage more groups and people to advocate for legislative change, (iii) clearly communicate the specific ways groups, or people can become involved in advocacy, including the time commitments, and (iv) are crafted to specific groups to ensure the information is relevant to them. Audience-specific messages might benefit from the inclusion of stories about advocacy actions from others (e.g. landholders, developers, community groups).

Types of organisations that could be involved

Council of Mayors, Healthy Land and Water, Seqwater, Queensland Urban Utilities, Port of Brisbane, and research organisations.

⁸⁹ In the context of South East Queensland waterways, communicating the potential threat to the ecosystem before that threat has eroded the natural values of the location is essential to motivating stewardship actions. See Dean, A. J., Uebel, K., Schultz, T., Fielding, K., Saeck, E., Ross, H., and Martin, V.Y. (2024). Community stewardship to protect coastal and freshwater ecosystems –Pathways between recreation and stewardship intentions. *People and Nature*.

Program 5. Managing recreation use to maintain Bay values

Description

SEQ is one of Australia's most rapidly growing regions.⁹⁰ Along with population growth, tourism and recreation is of growing importance to the local economy.⁴² Moreton Bay is popular for recreationists in the region. There are a large number of recreational pursuits undertaken in and adjacent to the Bay, including boating, fishing, beach driving, swimming, scuba diving and snorkelling, enjoying nature, cycling and walking.⁹¹

Program 5 is designed to provide an understanding of the impact of recreation in the Bay to inform effective management of any associated threats.

Justification for the program

- The management of Moreton Bay has tended to focus on the biophysical values of the Bay with relatively little attention being given to the Bay's recreational value for the local community and interstate and overseas visitors.
- Recreation interest in the Bay has increased with population growth with some recreation pursuits increasing significantly over the past 20 years. For example, the number of recreational boat registrations in Queensland, for example, increased from 175,659 in 2003 to 275,983 in 2024⁹² with a large proportion of these registrations in the south-east corner.
- Recreation in and around the region's waterways, including Moreton Bay, is estimated to be valued at billions of dollars per year.⁹³ Recreational fishing in Moreton Bay alone was valued at \$20 million in 2009, a value that is estimated to grow by \$1.3 m–\$2.5 m per year.⁹⁴
- Tourism in Moreton Bay is a rapidly growing sector with a range of experiences available for visitors.⁹⁵
- The increasing use of Moreton Bay for recreation has put pressure on the ecological values of the Bay, with popular locations often degraded by human influences.⁹⁶
- Direct overuse was identified by state governments, non-government organisations and local councils through the stakeholder engagement process as an unknown, yet largely increasing, threat to the Bay's unique biodiversity. This pressure has been explicitly identified in the Ramsar Information Sheets (RIS) as a factor that is likely to adversely affect the Ramsar ecological character of the Bay; however, the extent or nature of the threat is unknown.⁹⁷
- Natural beauty or amenity is often cited as an important value the community has towards Moreton Bay. Approximately 83% of community respondents to a social survey identified nature-based experiences as a key reason to visit the Bay, with 71% citing aesthetic physical appeal and beauty as key values.⁹⁸

⁹⁰ Department of State Development, Infrastructure Local Government and Planning, Queensland (2023). Shaping SEQ –South East Queensland Regional Plan.

⁹¹ Healthy Land and Water (2023) Ecosystem Health Monitoring Program Annual Social Survey (2015–2023). Data available at: <https://reportcard.hlw.org.au/deeper-dive-interactive-data-dashboards>

⁹² Department of Transport and Main Roads, Queensland (2023). Registration statistics, accessed 10 May 2024. Available at: <https://www.tmr.qld.gov.au/safety/transport-and-road-statistics/registration-statistics>

⁹³ Healthy Land and Water (2023) Ecosystem Health Monitoring Program Annual Social Survey (2015–2023). Data available at: <https://reportcard.hlw.org.au/deeper-dive-interactive-data-dashboards>

⁹⁴ Pascoe, S., A. Doshi, Q. Dell, M. Tonks, R. Kenyon, (2014). Economic value of recreational fishing in Moreton Bay and the potential impact of the marine park rezoning. *Tourism Management*. 41:53–63.

⁹⁵ Ruhanen L, Orams M, Whitford M. (2019). Tourism in the Moreton Bay Region. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

⁹⁶ Ruhanen L, Orams M, Whitford M. (2019). Tourism in the Moreton Bay Region. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

⁹⁷ Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis Ramsar.org/> <https://rsis Ramsar.org/ris/631> or www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf

⁹⁸ Ross H, Jones N, Witt K, Pinner B, Shaw S, Rissik D, Udy J. (2019). Values towards Moreton Bay and catchments. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

- Many of the strategies and plans reviewed cited recreation and access to Moreton Bay and its waterways as an objective for future planning and management to re-engage the community with rivers, creeks and the Bay.
- The proximity of the rapidly growing Brisbane population to the Bay presents a significant challenge and threat to the Bay's values. Visitor pressure at key locations was identified through stakeholder consultation as an important concern for most local councils and is of concern for Moreton Bay Marine Park managers.
- There has been no coordinated understanding of the impact of recreation in the Bay and there is no management plan for the priority recreational locations within the Bay.

Long-term outcomes

- Sufficient resourcing and regional attention are given to effectively manage the increasing recreational use of Moreton Bay.
- The community maintains a deep connection with Moreton Bay with sustainable use of the Bay's values.

Program objectives

- To understand and manage the impacts and benefits of recreation use in Moreton Bay so that the threat to the Bay's values can be effectively managed.

Action 5.1 Targeted research to understand impacts and benefits of high use spots around the Bay

Justification for the action

The impact of recreationists on high-use locations around the Bay is not well understood. Many of the Bay's management organisations like Queensland Parks and Wildlife Service (Moreton Bay Marine Park), Traditional Owner groups, and local councils understand the pressure on key high-use sites within their areas of interest; however, the impact on the ecological, social and economic values of those locations is relatively unknown.

The literature review and stakeholder consultation identified recreational use as a likely current threat to many of the values on the list. These threats included:

- 4WDs on Bay island beaches and saltmarshes resulting in disruption and displacement of shorebirds⁹⁹ and other fauna,^{100,101} turtle nests, impacts on dune vegetation and potentially spreading invasive weeds
- boating having a direct impact on habitats like seagrasses and corals through anchoring and motoring through shallow areas and illegally discharging sewage from vessels in overnighting in anchorage spots
- fishing with lost fishing equipment such as crab pots and floats entangling wildlife and overfishing (taking fish beyond bag or size limits)
- trampling and human disturbances by people walking through sensitive habitat like saltmarshes or intertidal seagrasses
- parking and viewing having a direct impact on the coastal edges of the Bay at viewing locations that do not have dedicated parking infrastructure.

Very few of the high-use sites within the Bay are being actively managed through, for example, a site-based management plan, except for sites used for commercial benefit or the parklands and foreshores that are managed by local councils.

⁹⁹ Schlacher TA, Nielsen T, Weston MA (2013) Human recreation alters behaviour profiles of non-breeding birds on open-coast sandy shores. *Estuar Coast Shelf Sci* 118:31–42

¹⁰⁰ Moss, D. D. McPhee, (2006). The impacts of recreational four-wheel driving on the abundance of the ghost crab (*Ocypode cordimanus*) on a subtropical sandy beach in SE Queensland. *Coastal Management*. 34 (1): 133–140.

¹⁰¹ Schlacher T, Richardson D, McLean I (2008) Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environ Manag* 41:878–892

Threats targeted

- *Pollutants*: litter & microplastics
- *Population growth*: human & domestic animal disturbances, harvesting/overfishing/extraction
- *Stewardship*: low levels of community awareness, low levels of community stewardship
- *Research & development*: Lack of data and knowledge

Action description

Targeted research into different recreational pursuits would assist in understanding the impact and benefit of recreation at key locations in the Bay and provide necessary evidence for management intervention. Research should seek to identify locations in the Bay that need specific management to reduce the impact that recreation has on Bay values. Focus areas should include:

- 4WDs on beaches at Bribie Island, Minjerribah (Stradbroke Island) and Moorgumpin (Moreton Island)
- popular anchorages at locations in the southern Bay and Broadwater, central bay locations like Horseshoe Bay, and locations within Pumicestone Passage
- popular vessel-based fishing locations
- popular shore-based fishing locations
- trampling and human impacts.

Research should also quantify the impact of recreation on a range of values identified in the literature review and stakeholder consultation including:

- high-value coastal habitat sites – coral reefs, rocky reefs, saltmarshes, seagrasses, intertidal mudflats and mangroves
- ecological communities and biodiversity values – marine mammals, marine turtles, fish communities, shorebird roosts, meiofauna and benthic communities.

Research should also consider how current threats are likely to interact with predicted future threats on the Bay values, which could result in cumulative impacts that should be considered together.

The results of the targeted research program should be used to:

- identify sites that require specific management planning
- underpin any advocacy efforts that may be necessary to ensure management strategies are adopted and implemented successfully
- indicate priority audiences for strategic education campaigns (Action 5.2)

Types of organisations that could be involved

Research organisations, Moreton Bay Marine Parks, local councils and community groups.

Action 5.2 Education campaign for sustainable recreational use

Justification for the action

Sustainable use is key to improving the health of the Bay and, in turn, ensuring that recreational users continue to have the opportunity to enjoy and appreciate the benefits of the Bay. Some recreational uses and behaviours can result in serious environmental impacts such as anchor damage, boat strikes on marine megafauna, overfishing, pollution (e.g.

litter), and impacts on food availability, nesting sites and collisions with shorebirds.^{102,103} Unpublished data from Maritime Safety Queensland shows that recreational boating is increasing in South East Queensland and Moreton Bay Marine Park staff are concerned about managing the increasing recreational pressures on the Bay.¹⁰⁴ In 2012, it was reported that recreationists and industry are supportive of sustainable use⁵⁴; however, due to the rapid population changes in the region since 2012, potential changes in recreational types (such as increased proportion of jet skis, or new activities such as wing foiling and foiling catamarans), and the growing concerns of Queensland Parks and Wildlife Service about recreational impacts, it is timely to develop a more widespread educational campaign to ensure all recreationists understand how their activities may lead to unintended damage, and how they can avoid it.

Threats targeted

- *Pollutants*: litter & microplastics
- *Population growth*: human & domestic animal disturbances, harvesting/overfishing/extraction
- *Stewardship*: low levels of community awareness, low levels of community stewardship

Description of the action

Develop an education campaign targeted at recreational users to provide guidance on the sustainable recreational use of the Bay. The campaign should be co-designed with the relevant management organisations in the Bay and Traditional Owner groups to ensure the information is relevant to the impacts that require mitigation. An education campaign could use the results of the targeted research program (see Action 5.1) and seek to address what recreational users know and do not know about the potential impacts of their activities, as well as addressing existing unsustainable cultural and social norms, with the aim of changing target behaviours. A monitoring and evaluation plan would be an important part of the campaign to determine its success. Monitoring and evaluation would also assist campaign managers revise the strategy, messaging or channels used to communicate messages.

The target audiences for the education campaign would include recreational boaters, fishers, or people who undertake other forms of recreation that may lead to serious impacts. The majority of recreationists are responsible users of the Bay. This education campaign would seek to target inappropriate behaviours of a minority of users, as well as to reinforce the 'right thing to do' among all recreationists. Potential barriers to changing behaviours include a lack of understanding of how recreation in the Bay could lead to environmental damage, social or cultural norms that are unsustainable practices, and a lack of adequate infrastructure or other external barriers (e.g. no bins in fishing spots to dispose of fishing line waste or a lack of mooring facilities).

Types of organisations that could be involved

- The campaign could be co-designed with Queensland Parks and Wildlife Service, Traditional Owner groups, Maritime Safety Queensland, and non-government organisations.
- Research institutions could partner to track the campaign and provide monitoring and assessment of success
- Target audiences include recreational boaters, fishers, and other recreational users whose activities may have high impact.

¹⁰² Department of Environment, Science and Innovation, Queensland (2021). Moreton Bay Marine Park: Pressures on the marine park, accessed 10 May 2024. Available at: https://parks.desi.qld.gov.au/parks/moreton-bay/zoning/information-sheets/pressures_on_the_marine_park

¹⁰³ Department of Environment and Resource Management (2012). Moreton Bay Marine Park Monitoring. Report for the Queensland Government prepared by Water Quality and Aquatic Ecosystem Health, Environment and Resource Sciences. https://parks.des.qld.gov.au/_data/assets/pdf_file/0030/167916/moreton-marine-park-monitoring-report.pdf

¹⁰⁴ Martin, V. (2023). *Recreational Boaters' Use and Values of Moreton Bay 2022*. Research report for The Moreton Bay Foundation.

Action 5.3 Coordinate research and support the protection and improvement of scenic amenity and nature-based experiences in the Bay

Justification for the action

Scenic amenity and nature-based experiences are cited as some of the key reasons that the community value and recreate in Moreton Bay.^{105, 106} For example, 21 of the 30 non-Indigenous participants in study *Values towards Moreton Bay and catchments* mentioned aesthetic values.⁷⁰ In the study *Recreational Boaters' Use and Values of Moreton Bay 2022*, 'appreciating the natural beauty of this place (overall beauty of the area, or of specific things e.g., lovely sunrises, beautiful fish)' was selected by 98% of respondents, making it the most selected value type by the 304 recreational boaters in the study.⁶⁹ The same study also found 'experiencing nature (e.g. seeing wildlife, exploring the natural world)' was the second most frequently selected value for 91% of respondents. *Values towards Moreton Bay and catchments*¹⁰⁷ also noted that Indigenous and non-Indigenous peoples express scenic amenity differently; while both Indigenous and non-Indigenous people appreciate the beauty of the Bay in the present, non-Indigenous people also consider the beauty of the past, and lament its decline. The characteristics that drive aesthetic and nature experiences values have not yet been prioritised for guiding the management of these experiences. More needs to be done to understand what aspects of scenic amenity and nature-based experiences are important to improve or preserve for people in Moreton Bay.

Threats targeted

- *Population growth*: Coastal development/artificial coastlines
- *Stewardship*: Low levels of community connection, low levels of community awareness, low levels of community stewardship
- *Research & development*: Lack of data and knowledge pertaining to the Bay's values

Action description

Two phases are necessary for this action. Firstly, a research program should be developed to understand the characteristics that drive scenic amenity and nature-based experience for the community of Moreton Bay. There are several methods to consider, ranging from deeply qualitative social research to assessments of 'key vistas' that are important for maintaining the character of the Bay for locals and visitors. The most appropriate method would need to be determined with collaborators in the research program. To manage these values, locations and management actions would need to be prioritised.

Secondly, when the scenic and nature-based values are better understood and locations and management actions are prioritised, this action would prioritise management of the priority locations and build community awareness, pride, and support for the protection of these values through strategic marketing and engagement. The intention of this action is for councils and other regional management organisations to partner to raise the profile of these place-based values as requiring protection and enhancement, given their predominance as key reasons for the community's and tourist's enjoyment of the Bay.

Barriers to this action may include funding, capacity and capabilities of the research and advocacy teams and willingness to collaborate between organisations.

Types of organisations that could be involved

- Research organisations, Moreton Bay Marine Parks, local councils, other relevant regional management organisations, community groups and tourism organisations.

¹⁰⁵ Jones NA, Ross H, Shaw S, Witt K, Pinner B, Rissik D. (2016) Values towards waterways in south east Queensland: Why people care. *Marine Policy*. 71:121–31

¹⁰⁶ Martin, V. (2023). *Recreational Boaters' Use and Values of Moreton Bay 2022*. Research report for The Moreton Bay Foundation.

¹⁰⁷ Ross H, Jones N, Witt K, Pinner B, Shaw S, Rissik D, Udy J. (2019). Values towards Moreton Bay and catchments. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org>.

Action 5.4 Establish partnerships to coordinate the management of locations of high value to the tourism industry

Justification for the action

Scenic amenity and nature-based experiences are a key driver of tourism in SEQ.¹⁰⁸ The region's tourism development plans have relied on the natural features of the Moreton Bay region, which includes the Marine Park and Bay islands (Minjerribah (Stradbroke), Moorgumpin (Moreton) and Yarun (Bribie)) as a key differentiator from other capital cities. The greater Brisbane region currently receives 24 million visitors staying 51 million visitor nights, with 16 % exploring the region's rivers and 12% visiting the Bay.¹⁰⁹ Visitor numbers are growing faster than the national average, which represents an increasing threat, as well as an opportunity, to improve the management of the Bay's values. Through the stakeholder consultation process, local councils and Tourism and Events Queensland identified a lack of relationship and knowledge exchange between the organisations managing the Bay's ecological values and the tourism industry that relies on these values.

Brisbane Marketing's 2031 Vision for the visitor economy outlines key goals for the region's tourism industry¹¹⁰. One goal is to 'drive a positive contribution to our environment through restoration projects and environmental education'. The *Brisbane Tourism Investment Study*, completed in 2017, indicated that \$800 million of the \$6.5 billion growth potential for the region can be delivered through new nature-based experiences, including in Moreton Bay. This growth represents an opportunity to leverage tourism funding with the current understanding of Moreton Bay's values to maintain an effective sustainable tourism experience.

Threats targeted

- *Population growth*: Coastal development/artificial coastlines, human & domestic animal disturbances, harvesting/overfishing/extraction
- *Stewardship*: Low levels of community connection, low levels of community awareness, low levels of community stewardship

Action description

This action is to establish partnerships between the tourism industry, chambers of commerce and other Bay management organisations to coordinate and advocate for the protection and enhancement of scenic amenity and nature-based experience in the Bay. Brisbane Marketing's 2031 Vision calls for effective collaboration between the tourism industry and local councils; however, this collaboration should be expanded to include Bay managers for more effective management of high-use locations. One goal of the 2031 Vision is to 'drive a positive contribution to our environment through restoration projects and environmental education'. Establishing partnerships between the tourism industry and organisations that manage the Bay would enable more effective coordination of the types of restoration projects and education programs that might emerge from Brisbane Marketing's strategy.

This action should be considered in conjunction with establishing the Bay stakeholders forum outlined in Action 3.3.

Types of organisations that could be involved

- Brisbane Marketing, Tourism and Events Queensland, SEQ Council of Mayors, local councils, Traditional Owner groups, Queensland Tourism Industry Council

¹⁰⁸ Ruhanen L, Orams M, Whitford M. (2019). Tourism in the Moreton Bay Region. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

¹⁰⁹ Brisbane Marketing (2019). Visitor Economy 2031: Vision for the Brisbane Region.

¹¹⁰ Brisbane Marketing (2019). Visitor Economy 2031: Vision for the Brisbane Region.

Program 6. Strengthening community connection with Moreton Bay

Description

A key driver of environmental protection and restoration strategies is building community support and acceptance of changes in policy, practice, and acceptable behaviour. Knowledge and understanding of Bay-related issues in the community is considered an essential factor in obtaining the financial and political support required to solve the biggest threats to the Bay's values. Program 6 is designed to increase people's understanding of the Bay's unique ecosystems and to encourage more people to adopt appropriate behaviours that care for or improve the natural values of the Bay.

Justification for the program

- Familiarity with and understanding of the values and unique ecosystems in SEQ waterways have been identified as core components that drive engagement and behaviour change at a community level.¹¹¹
- Approximately 75% of the adult population in SEQ do not have a high level of knowledge and familiarity with the Bay.¹¹² However, this statistic is complicated by the fact that many of people express an intrinsic value for the Bay. That is, they do appreciate the Bay's natural values even if they are less knowledgeable about it. There is an opportunity to leverage the community's appreciation of the Bay, while improving their understanding.
- All local councils and state government departments identified awareness-raising and promoting the Bay's unique biodiversity and experiences as a key gap in improving the wider community's understanding of their impacts on the Bay.
- Direct overuse was identified through the stakeholder engagement process by state governments, non-government organisations and local councils as an unknown, yet largely increasing, threat to the Bay's unique biodiversity. Overuse has been explicitly identified in the Ramsar Information Sheets as a factor that is likely to adversely affect the Ramsar ecological character of the Bay; however, the extent or nature of the threat is unknown.¹¹³ Overuse is the result of a combination of increased population and the keenness of the population to enjoy the Bay, but many people do not understand its fragility.
- The apparent barrier to action of a 'lack of understanding' is an assumption by many stakeholders. Decades of social scientific research has demonstrated that education on its own is not enough to change behaviours.¹¹⁴ More important is the need to improve procedural awareness (i.e. actions to take) and to encourage more diverse communities to have meaningful connections and experiences in the Bay. Research shows that motivation to engage in stewardship is related to connection to place and feeling empowered to help protect a place, rather than awareness of specific threats. This emphasises the importance of targeting connection to the Bay rather than knowledge alone.¹¹⁵

Long-term outcomes

- The wider community is aware of the unique values of Moreton Bay and maintains a deep connection and sense of pride in the Bay for the long-term and across generations.
- The wider community feels empowered to act (directly and indirectly) to protect Moreton Bay's values and reduce threats.

¹¹¹ Dean AJ, Fielding KS, Newton F, Ross H. (2019). Community knowledge about water and engagement in waterway protection in south east Queensland. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

¹¹² Dean, A. and Shultz, T., (2023). *Community understanding and appreciation of Moreton Bay – a framework to support engaging communities*. Report to the Moreton Bay Foundation.

¹¹³ Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis Ramsar.org/> <https://rsis Ramsar.org/ris/631> or www.dcccew.gov.au/sites/default/files/documents/41-ris.pdf

¹¹⁴ Martin, V.Y., Weiler, B., Reis, A., Dimmock, K., and Scherrer, P. (2017). 'Doing the right thing': how social science can help foster pro-environmental behaviour change in marine protected areas. *Marine Policy*, 81, 236-246.

¹¹⁵ Dean, A. J., Uebel, K., Schultz, T., Fielding, K., Saeck, E., Ross, H., and Martin, V.Y. (2024). Community stewardship to protect coastal and freshwater ecosystems –Pathways between recreation and stewardship intentions. *People and Nature*.

Program objectives

- Strengthen the wider community's appreciation and connections with Moreton Bay.
- Raise awareness of opportunities for stewardship actions in the Bay with the wider community.
- Showcase the Bay's unique ecosystems and focus narratives on the positive characteristics. When communicating about threats, emphasise protecting value from potential threats and avoid describing places as already degraded.

Action 6.1 Develop an education and engagement campaign that showcases the Bay's values and unique ecosystems

Justification for the action

The scientific narrative from the past 25 years has been that the Bay's ecosystems are degraded or at risk of degradation. Using this narrative, the *SEQ Regional Water Quality Management Strategy* of the early 2000s galvanised the region's managers to recognise the threats to the Bay and resulted in approximately \$1 billion of upgrades to the region's wastewater treatment plants and other point-source discharges.¹¹⁶ In many ways, addressing point-source pollution in the Bay was the least complicated focus, with diffuse sources of pollution requiring extensive consultation and engagement with many thousands of landholders. Strengthening relationships and building shared understanding between decision makers, stakeholder groups, and community members is pivotal for strengthening future management of the Bay.¹¹⁷ However, negative stories about the Bay's environmental condition may reduce the people's connection and result in disengagement of the wider community.⁶⁴

Many stakeholders consulted perceived community apathy or lack of knowledge of the Bay's unique values as a major barrier to legislative change or increased funding for restoration or protection activities in the Bay. For individuals, instilling a willingness to change behaviour, advocate for change, or act in ways to protect an ecological asset like Moreton Bay requires a high degree of connection and pride in the value of the asset. Creating an education and engagement campaign to build people's appreciation of the unique ecosystem in Moreton Bay is one way to strengthen connection for people, particularly if the narrative changes to being more positive about the opportunities for people to enjoy and actively engage in the Bay.

Threats targeted

- *Stewardship*: Low levels of community connection, low levels of community awareness, low levels of community stewardship

Action description

This action is to develop an education and engagement campaign that showcases the Bay's values and unique ecosystems to reach as many of the wider community as possible, for the purpose of building support for wise use, management and protection.

The campaign could be considered from a marketing perspective by engaging communication and social marketing experts to structure the campaign. The campaign should be designed to achieve two outcomes:

- increase awareness and appreciation of the Bay's unique values
- increase opportunities to strengthen engagement with the Bay.

The campaign would be best served through a collaborative design effort between relevant stakeholders (e.g. Queensland Parks and Wildlife Service, the Department of Environment, Science and Innovation, local councils, non-government organisations, and universities). For raising awareness and appreciation, the following steps would be required before the campaign is implemented: (a) conduct audience research to decide which groups should be targeted

¹¹⁶ Lloyd, T, P. McMahon, B. Gibbes, C. Collier. (2000). South East Queensland regional water quality management strategy. *Water* 27 (6) 42–47.

¹¹⁷ Ross H, Rissik D, Jones N, Witt K, Pinner B, Shaw S. (2019). Managing for the multiple uses and values of Moreton Bay and its catchments. In: Tibbetts IR, Rothlisberg PC, Neil DT, Homburg TA, Brewer DT, & Arthington AH (Eds). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia.

by the campaign, (b) identify which knowledge gaps should be addressed, (c) decide what ecological, environmental, and social information would be conveyed and how, and (d) establish which communication channels would be best suited to reaching target audiences.

A similar process would be necessary to determine the opportunities to strengthen engagement in the Bay, including building an understanding of the existing opportunities and what is working well, and the demand for new types of active engagement. Such a strategy would need to identify who to target, what opportunities would be most attractive to the different audiences, and how to fund, implement, and sustain these opportunities.

The campaign should consider a range of media outlets, content types, and audiences to maximise reach. There are many organisations and individuals with interesting and compelling knowledge of and experiences in the Bay (e.g. Bay users and visitors, Traditional Owner groups, researchers, and Bay managers). Partnerships should be considered to collate content and information that could be used in the campaign.

The campaign could consider:

- engaging a well-known personality and advocate to be the face of the campaign
- advertisements on mainstream media and social media outlets
- a documentary series of short videos showcasing the Bay's values and experiences, released through online platforms (e.g. YouTube, Instagram etc.).

The awareness campaign should include the development of an engagement campaign to support the awareness program. The engagement campaign could include a program of events that are designed to attract a wide level of community participation while raising funds for the Bay (e.g. a Bay swim, around the Bay cycle ride, across the Bay kayak/tiger boat race, family events that are educational and entertaining, etc). If structured well, the engagement campaign could additionally include opportunity to raise funds for other Actions in this plan.

Types of organisations that could be involved

Non-government organisations, tourism industry, local councils, Queensland Parks and Wildlife Service, and researchers, in partnership with a social marketing company.

Action 6.2 Develop an education program that integrates with the primary and secondary school curriculum

Justification for the action

This action is to develop a formal education program that is centred on protecting the unique values of Moreton Bay. The Bay is a significant resource and opportunity for education. There are already a range of excellent education opportunities that focus on Moreton Bay values.¹¹⁸ However, for a generational change in the community's awareness, appreciation, and engagement in Moreton Bay, more opportunities are needed for children to build their connection to the Bay. This program should focus on increasing the extent of access to Moreton Bay for school children across SEQ, emphasising the connection between urban areas and the unique ecosystems of Moreton Bay.¹⁰

Threats targeted

- *Stewardship*: Low levels of community connection, low levels of community awareness, low levels of community stewardship

Action description

The development of a suitable and long-term Moreton Bay education program should be coordinated in partnership with the Department of Education and other education-focused organisations that operate in and around the Bay. The

¹¹⁸ Casey E, Roe T, Tibbetts IR, Aylward D. (2019). Education in Quandamooka – A long and evolving tradition. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

program should enhance, support, and integrate the existing environmental and cultural education programs being run by Traditional Owner groups. It should support and expand the existing education work of non-government organisations like the Ecomarines Foundation. The program would require teaching materials specific to Moreton Bay, which in turn would require a close partnership with education specialists such as the Moreton Bay and Jacobs Well Environmental Education Centres, Traditional Owners, researchers, and Moreton Bay managers to help develop materials to support the program.

The education program should integrate Moreton Bay into the existing environmental education of all school children in South East Queensland with the intent to increase each student's awareness of Moreton Bay and its values. Potential social barriers to this action include the costs, curriculum requirements, and the capabilities and availability of experts to develop appropriate content.

Developing an education program for the 110,000 students¹¹⁹ in the SEQ region would require a substantial investment if it is to have a generational improvement in awareness and engagement with Moreton Bay. There are excellent education programs and activities at work in Moreton Bay (e.g. Ecomarines Foundation and the Environmental Education Centres) that should be celebrated and could play a critical role in designing content and informing fundraising for a large-scale, coordinated, long-term investment over multiple years. A campaign should target all potential sources of funding including government and private investment and incorporate existing initiatives at all levels of government.

Types of organisations that could be involved

Education Queensland, Traditional Owner groups, education specialists, existing education programs in the Bay, research organisations, non-government organisations, and local councils

Action 6.3 Research to identify opportunities to strengthen community connection to the Bay

Justification for the action

This action was identified by a local council's stakeholders based on a need to find avenues to connect their communities to the Bay. Specifically, many of the local councils consulted identified the value of nature-based experiences, including community swimming locations as a major motivator for protecting waterways.

Several international and Australian urban jurisdictions have focused on increasing the ability to swim in a waterway as the impetus to engage the community in improving the health of a waterway or catchment. There are many swimming sites in the Bay, most notably on the Gold Coast, Moreton Bay and Redland Bay local government areas; however, there little attention given to expanding the swimming locations at a Bay-wide scale or to understand the benefits of using swimming as a way of engaging local communities to better connect with their local Bay values.

Threats targeted

- *Stewardship*: Low levels of community connection, low levels of community awareness, low levels of community stewardship
- *Research & development*: Lack of data and knowledge

Action description

Targeted research should:

- Undertake research into how the community feels about using the Bay for nature-based experiences, such as swimming, including their appetite for swimming in the Bay, barriers to swimming in the Bay and preferences for swimming site activities and infrastructure.

¹¹⁹ Department of Education, Queensland (2024). Teach Queensland: South East Region, accessed 20 May 2024. Available at: <https://teach.qld.gov.au/teach-in-queensland-state-schools/our-schools/south-east-region>

- Collate existing information and targeted water quality research to identify high-risk sites for primary recreation (i.e. activities where body and face immersion is involved such as swimming, diving, surfing), as well as high-potential sites for swimming, to be encouraged and developed.
- Model water quality at key potential primary recreation locations to better understand what is possible from a human health risk perspective and to use as a basis to advocate for increasing primary recreation opportunities in and around the Bay.
- Prioritise potential sites to be managed or enhanced for primary recreation and other nature-based experiences identified as likely to strengthen community connection with the Bay.
- Make recommendations for improving potential primary recreation and nature-based experience sites in the Bay.

After the research program to understand the opportunities for increasing nature-based experiences and swimming in the Bay, there should be a campaign to advocate for managing the priority sites identified. The intention of this action is to partner with councils and other regional management organisations to raise the profile of nature-based experiences and swimming as an option for recreation in areas of the western Bay that are accessible to the SEQ community.

Types of organisations that could be involved

Research organisations, local councils and non-government organisations.

Program 7. Refining legislation to better align with outcomes for Bay values

Description

The biodiversity and associated social, cultural and economic values of Moreton Bay are recognised and conceptually protected in State Government legislation, regulations and guidelines, and local government and NGO plans and strategies. Appendix C outlines the legislation, the values that are regulated and the gaps and barriers that have been identified for each. This program is to provide targeted science-based evidence to refine the provisions in the key legislation intended to protect the specific values of Moreton Bay and facilitates constructive engagement with ongoing reforms in national and state environmental laws, for example the initiatives outlined in the Nature Positive Plan.

Justification for the program

- A number of key habitats in Moreton Bay are declining, degraded or are at risk of future threats including, seagrasses, saltmarshes, coral reefs, shellfish reefs, mangroves and ocean beaches (see the justification in the previous programs).
- Sediment runoff, along with its associated nutrient content, is identified as one of the most significant threats to the majority of the Bay's universal values, yet with vegetation clearing, urbanisation and the increasing likelihood of floods with climate change, pollutant loads to the Bay are predicted to continue to increase. Current regulations and other policy interventions are not sufficient to mitigate the impacts to values, and the current arrangements lead to a deliberative and slow decline of the Bay.
- Local councils, non-government organisations and community groups outlined through the stakeholder consultation process that some state legislation does not provide them with the regulatory framework to effectively restrict or reduce catchment sediment and nutrient loads while considering projects that would lead to changes in catchment hydrology and potential increases to loads.
- The review of legislative barriers showed that the legislative environment, and in some cases specific legislation, may inadvertently result in the continuation of residual damages and risks to the Bay, even when legislative requirements are fully met. The majority of legislation is designed to minimise the impacts of a proposed activity to maintain the existing condition of the value that it protects. Every time a project or permit is allowed, it marginally reduces the condition of the value. This is particularly relevant to the broader initiatives outlined in this document as the legislative environment effectively locks in increasing degradation, provides no top-down incentive for positive improvements to Bay values and increases the effort and costs of those initiatives to meet the objectives for the Bay.
- Through the review of legislation and the consideration of the threats to the Bay's values, the greatest risk to the Bay identified from the existing portfolio of legislative instruments is derived from the current approaches to land-use change and management that results in continuing increases in sediment and nutrient loads entering the Bay. Key examples include:
 - The *Vegetation Management Act 1999* seeks to reduce vegetation clearing (which is a main source of sediment erosion from the catchment). Despite that, the State Government's Statewide Landcover and Trees Study (SLATS) reported 19,964 ha of land full clearing occurred in the SEQ in 2020-21¹²⁰, a value typical of annual clearing rates in SEQ.
 - The *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* and the *State Planning Policy* includes objectives for water quality that are intended to ensure a range of aquatic values identified as important in each of SEQ's main waterways are sustained. However, the water quality objectives and stormwater performance outcomes enacted do not explicitly consider the water quality needs of key receiving habitats like seagrasses, corals, rocky reefs, sand banks or the biodiversity that use them. Projects are still allowed even in catchments that do not meet those objectives. Furthermore, many smaller

¹²⁰ Department of Environment and Science, Queensland (2023). 2020-21 SLATS Report, accessed 10 Dec 2023. Available at: <https://www.qld.gov.au/environment/land/management/mapping/statewide-monitoring/slats/slats-reports/2020-21-slats-report/bioregion-breakdown>

developments and/or changes that do not constitute a material change of use are not captured by regulatory arrangements yet contribute to a cumulative decline of condition.

- In many cases under current legislation, projects that lead to increases in pollutant loads or degradation to habitat and biodiversity can still be approved even where they would cause environmental harm so long as measures are implemented to prevent or mitigate harm. However, in many cases, the appropriate measures required to prevent impact explicitly for the Bay are not clearly understood. There are no benchmarks or targets that can be used to assess cumulative impact for sediment and nutrient loads, no vegetation targets and no riparian targets. As such, regulators who assess projects against the legislative requirements have very little guidance to assess the impacts of proposed projects against the cumulative impacts on the catchment and the Bay's values as a whole.
- Finally, the *Economic Development Act 2012* has recently shown to pose a significant risk to the values of Moreton Bay. Under the Act, Priority Development Areas can be declared by the Minister for Economic Development Queensland and may exempt applicants from various other elements of the approvals framework (e.g. impacts to marine plants, works in tidal waters or in a coastal management district). In 2013, the Toondah Harbour Priority Development Area was declared which proposed a development over 49.5 hectares within the Moreton Bay Marine Park. It was ultimately Commonwealth Legislation that halted the development, partially based on the determination that the project was inconsistent with international environmental obligations (which fall under Commonwealth legislative responsibilities). Scope exists within the PDA planning schemes for environmental provisions as they relate to values within Moreton Bay to be included in the assessment process.

Long term outcomes

- Policy and regulation would enable management to protect and restore the Bay's unique values and prioritises sustainable use.
- All major current and emerging threats to the Bay values are regulated, and management would have clear adaptive management plans to address them.

Program objectives

- Provide the policy and regulatory environment to enable management, protection and restoration of coastal habitats.
- Refine current legislation to ensure no net loss or impact to the Bay's values so when legislation is applied across the region, it has a positive net impact on the Bay's values.
- Conduct targeted research to refine and update legislation.

Action 7.1 Research to identify best practice regulatory, policy and strategic frameworks.

Justification for the action

Before advocating for refinement to existing regulation, policy or strategic framework a greater base of evidence is required so that any changes made consider the explicit needs of the values in the Bay.

Threats targeted

- *Pollutants*: Catchment runoff – sediments, nutrients, toxicants, current water quality
- *Ecosystem modification*: Reduction of habitat area, fragmentation/reduction connectivity
- *Population growth*: Coastal development/artificial coastlines
- *Research & development*: Lack of data and knowledge

Action description

This action is intended to provide targeted research that would underpin refinements to the existing state legislation. The refinements would ensure that the guidance and regulations provided within the legislation would assist with protecting the Bay's universal values.

The purpose of the action is to identify elements of specific legislation that may inadvertently continue residual damage and risks to the Bay, even when legislative requirements are fully met. This is particularly relevant to the previously

outlined programs because the legislative environment effectively ‘locks in’ damage and risks that increase the required effort and costs of other non-regulatory initiatives that would meet the objectives for the Bay.

Filling the information and evidence gaps in the current legislation would improve the regulatory environment and improve the protection of the Bay’s biodiversity values.

This action links to legislation actions in other programs, specifically:

- Action 1.3 Advocate for enhanced state legislation to improve regional protection and management of prioritised coastal habitat locations in the Bay
- Action 1.4 Advocate for improved management of roosting and feeding sites for migratory shorebirds
- Action 2.1 Advocacy for new guidelines for habitat restoration to accompany key legislation like the *Marine Parks Act 2004*
- Action 4.4 Advocate for enhanced sediment reduction legislation to underpin regional program of sediment reduction program

Action 7.2 Advocate for refinements and updates to key legislation.

Justification for the action

Protecting the Bay’s values depends on sound science underpinning legislation that is targeted toward both mitigating the impacts of development and improving those values. Reversing the decline of key habitats because of current and future threats would require refining the legislation that is intended to do so. This is because current legislation pertaining to the Bay allows projects if measures are implemented to prevent or minimise harm, even if an approved project would lead to an environmentally damaging increase in loads.

Managing coastal assets in Queensland is covered by federal and state legislation, and local authority planning schemes. This results in a complex structure of rights and responsibilities, particularly about implementing coastal works. The legislation results in a complex structure of rights and responsibilities, particularly surrounding the implementation of coastal works. The majority of legislation is designed to mitigate the impacts of a proposed activity to maintain the existing condition or minimise the degradation of the value that it protects. Every time a project or permit is allowed, it marginally reduces the condition of the value. This is particularly relevant to the broader initiatives outlined in this document as the legislative environment effectively locks in increasing degradation, provides no top-down incentive for positive improvements to Bay values and increases the effort and costs of initiatives designed to improve the Bay’s values.

The legislative framework requires provisions for protecting or restoring, based on science-based legislation and policy that directly links to the biodiversity values requiring protection. This action would enable the various levels of government operating within Moreton Bay to manage the impact of the increasing population on Moreton Bay’s unique values.

Threats targeted

- *Pollutants*: Catchment runoff – sediments, nutrients, toxicants, current water quality
- *Ecosystem modification*: Reduction of habitat area, fragmentation/reduction connectivity
- *Population growth*: Coastal development/artificial coastlines

Action description

This action concerns advocating for refining and updating key legislation using the research from action 7.1. Advocacy efforts should be informed by research, and in consultation with Bay managers and the regulatory department to ensure that information from all stakeholders is incorporated into the updates. Strategic partnerships should be formed to advocate for specific changes to legislative instruments including:

- *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* – update to the water quality objectives to align with water quality requirements of the Bay’s values identified in Action 7.1.

- Updating the stormwater provisions and performance measures in the *State Planning Policy* to account for the identified in Action 7.1. Updated provisions should consider the cumulative impact and current state of the catchment as well as setting loads targets for urban areas in each catchment. This would help identify the level of mitigation required to achieve the water quality objectives outlined under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*.
- Enforcing the erosion and sediment control provisions under the *State Planning Policy* and *Planning Act 2016*. Currently not all activities undertaken that have the risk of causing environmental harm, require development approval and not all development approvals have adequate or specific provisions regulating the management of erosion and sediment controls. Councils and state government representatives identified a lack of enforcement of construction sites as a key gap in achieving reduction in sediments from construction sites.
- Refinements to the *Economic Development Act 2012* to increase the thresholds and evidence requirements for provisions allowing the declaration of a Priority Development Area over the Moreton Bay Marine Park and Ramsar Site. This is particularly the case where the proposed development primarily delivers private goods and services (e.g. high-end housing).

The campaign should encourage advocacy from multiple groups, Councils, not-for-profit interest groups, and the wider community, to push for change in legislation. An advocacy strategy will need to be developed first to identify the relevant partners, define the specific outcomes needed, identify the barriers and opportunities, and develop the most appropriate communication approaches¹²¹. Advocacy may include actions such as providing informational briefs for decision makers and local Members of Parliament, sharing information about the legislative changes needed with the general public, building strategic alliances, and rallying community support and pressure.

Some potential barriers to a potential partner's commitment to advocacy include a lack of knowledge or perceived value of advocacy, social norms (e.g., social pressure to advocate, or not), time to undertake advocacy actions, and the level of knowledge of the value of the impact of poor water quality on the Bay's values.

Reducing these barriers may be necessary to build effective advocacy campaigns, if so, outreach may require messages that: (i) clearly communicate the potential universal value of, and threat to values from sediment and nutrient runoff (importantly, before these natural values are reduced)¹²², (ii) leverage social norms and encourage more people to advocate for legislative change, (iii) clearly communicate the specific ways in which people can become involved in advocacy, including the time commitments, (iv) and are crafted to specific audiences to ensure the information is relevant to them. Audience-specific messages and dialogue might benefit from the inclusion of stories about advocacy actions others (e.g., landholders, developers, community groups) have been doing.

Types of organisations that could be included

Non-government organisations, local councils, community groups, relevant stakeholder groups.

Action 7.3 Targeted research to understand impacts of water quality objectives, stormwater quality objectives on the biodiversity values of the Bay.

Justification for the action

Before any refinements are made to existing legislation, regulations or guidelines, a greater base of evidence is required so that any changes made consider the explicit needs of the key biodiversity values in the Bay.

- *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*. The water quality objectives developed under the EP Act provide target concentrations for a range of water-quality parameters. The Act regulates the impact of water quality on a range of environmental values in waterways throughout SEQ, including Moreton Bay. However, there is no explicit causal link listed between the objectives and the condition of the aquatic values.

¹²¹ For more information about strategy development to address social barriers to action, please refer to Appendix B.

¹²² In the context of SEQ waterways, communicating the potential threat to the ecosystem before that threat has eroded the natural values of the location is essential to motivating stewardship actions. See Dean, A. J., Uebel, K., Schultz, T., Fielding, K., Saeck, E., Ross, H., and Martin, V.Y. (2024). Community stewardship to protect coastal and freshwater ecosystems –Pathways between recreation and stewardship intentions. *People and Nature*.

Conceptually, the water quality objectives could be achieved, yet still lead to degraded aquatic conditions that they intended to protect. Targeted research is needed to establish the water quality needs of the biodiversity values in Moreton Bay, so that these needs can be included in legislation.

- *State Planning Policy (SPP)*. The State Planning Policy includes a SPP Code: Water Quality (Appendix 2) that outlines performance and acceptable outcomes to ensure urban development is planned, designed, constructed and operated to manage stormwater and wastewater in ways that support the protection of environmental values identified in the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*. Similarly, the stormwater guidelines within the code were also not developed with any explicit causal link between the pollutant load targets for stormwater and the outcomes and impacts on the aquatic values of the Bay. Because the stormwater provisions in the SPP are one of the only legislated mechanisms councils can use to reduce the impacts of low-quality water from urban development on aquatic values, the lack of causal relationship is a gap in the legislation.
- *Point Source Water Quality Offsets Policy (2019)*. This policy supports the *Environmental Offsets Act 2014*, counterbalancing the significant residual impacts of point-source discharges on prescribed environmental matters by using environmental offsets. Environmental offsets must achieve a conservation outcome for the impacted prescribed environmental matter. However, there is no region-wide, coordinated guidance that provides proponents or governments with locations that could be targeted for offsets if they are required.

Threats targeted

- *Pollutants*: Catchment runoff – sediments, nutrients, toxicants, current water quality
- *Research & development*: Lack of data and knowledge

Action description

Undertake research focused on establishing links between the provisions in the following acts and the causal links of legal activities to impacts on key habitats and the biodiversity values of Moreton Bay.

- Refining the water quality objectives in the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* to provide habitat and biodiversity specific guidelines for Moreton Bay. Quantification of the relationships between the Bay's values and the water quality objectives in the policy is needed to ensure the sustainability and protection of the Bay's values. Healthy Land and Water has recently completed a project to review those objectives with a range of stakeholders¹²³. This work should be built on to ensure the full range of the Bay's values are considered in the legislation.
- Refining the stormwater performance and acceptable outcomes within the *State Planning Policy* ¹²⁴. The design objectives for the management of stormwater quality (80% reduction of total suspended sediments, 60% reduction of total phosphorus, 45% reduction of Total Nitrogen) that are required for any new developments do not consider the cumulative impacts of development runoff in a given catchment on the Bay's assimilative capacity and universal values. Quantification of the relationships between the stormwater guidelines within the code and the Bay's values is required so that councils can better consider the impact of urban development.

Types of organisations who could be involved

Research organisations in partnership with state governments and local councils, not-for-profits

Action 7.4 Develop a whole of catchment prioritisation to identify suitable locations for point source management projects through the offset policy.

Justification for the action

The *Point Source Water Quality Offsets Policy (2019)* is intended to enable new or existing environmental authority holders to consider how water quality offsets can be adopted as a voluntary option for managing environmentally

¹²³ Healthy Land and Water (2023). Ecologically Relevant Water Quality Guidelines for Moreton Bay and Estuaries, accessed 10 May 2024. Available at: <https://hlw.org.au/portfolio/water-quality-guidelines-moreton-bay#gsc.tab=0>

¹²⁴ Department of Environment and Science, Queensland (2021). State Planning Policy State Interest Water Quality 2017 Supplementary Implementation Guidance, February 2021. Available at: https://environment.des.qld.gov.au/_data/assets/pdf_file/0026/234755/spp-2017-state-interest-wq-supplementary-implementation-guideline.pdf

relevant activities. It provides an alternative option to meeting wastewater discharge requirements to deliver an improvement in water quality in the receiving environment. Nutrient offsets are intended to maintain the concentration or load of nutrients that end up in waterways. Nutrient offset projects are currently designed by individual organisations such as local councils and water utilities. Co-ordinated offset programs across a catchment are rare, let alone across the entire region.

Through the stakeholder consultation process, local councils and utilities identified a lack of regional guidance and appropriate evidence to allow for more confident investment planning for offsetting programs.

Threats targeted

- *Pollutants*: Catchment runoff – sediments, nutrients, toxicants, current water quality
- *Research & development*: Lack of data and knowledge

Action description

This action is to develop a region wide identification and prioritisation process for appropriate nutrient offset projects. A region wide prioritisation would be a powerful decision-making tool that lays out locations for on ground actions that would reduce nutrients and sediment loads and provide regionally consistent guidance about where to conduct projects to improve the Bay's values. Some of the Bay's management organisations have identified sites within their jurisdictions that require protection or restoration; however, these haven't been synthesised into a region-wide prioritisation. Identifying and prioritising sites to optimise nutrient and sediment reduction – and accounting for additional benefits such as protecting or improving infrastructure and agriculture for key flora and fauna species – would provide proponents with regionally consistent guidance that if enacted, would cumulatively contribute to the improvement of the Bay's values. Prioritisation would need consider the risks associated with regional population growth and as well as climate change impacts (e.g. risks to offsetting project function).

Type of organisations who could be involved

- Research organisations in partnership with local councils, utilities, and non-government organisations

Program 8. Ecological monitoring and evaluation

Description

Moreton Bay is home to a large number of flora and fauna species lying at the confluence of a major biogeographic overlap between subtropical and temperate zones. The Bay is where the biota of the two zones meet, forming a unique and diverse community of species. In recognition of the need to protect its unique diversity, much of Moreton Bay was designated as a Ramsar site and a marine park in 1993. While the condition and trend of some of the Bay's biodiversity values are actively monitored, the majority are not. This program is to fill the gaps in monitoring and evaluation of the condition and trend of the Bays' biodiversity values and the threats to those values.

Justification

- A range of biodiversity values are identified for protection or restoration in the strategies and plans that have been developed by the government and non-government organisations that operate in Moreton Bay. The broad biodiversity categories of values were identified from the Ramsar Information Sheet, The Marine Park Zoning plan, the SEQ Natural Resource Management plans and through the stakeholder consultation process.
- There are numerous monitoring programs that monitor some of the biodiversity values and threats to those values or monitor a range of values but in a sub-area of the Bay, however these are mainly focussed on water quality and a subset of the key habitats and coastal wetlands¹²⁵
- Many of the biodiversity values identified in the strategies and plans are not actively monitored so the condition and trend of the values are unknown. One example is the monitoring of the biodiversity values identified in Moreton Bay Ramsar site description. The Ramsar site supports a high diversity of threatened flora and fauna species, and ecological communities listed nationally under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), and/ or internationally under the IUCN Redlist.¹²⁶ 32 species of plants, shorebirds, marine turtles, mammals, fish and frogs are listed along with four ecological communities. However, few of the species or communities listed in the Ecological Character Description and Ramsar Information Sheet are supported by ongoing monitoring programs. Without ongoing assessment of how these species use Moreton Bay currently, management efforts to retain these values with both current and future threats is made more difficult.
- The gap analysis identified a lack of information regarding the condition and trend for many of the Bay's biodiversity values and the impacts to them. These include the following:
- The trend in the population of several of the IUCN listed species found in Moreton Bay which are identified as in need of protection in legislation, strategies and plans
- The condition of the wetlands and habitats that support IUCN listed species and the key characteristics of those habitats is unknown
- The impacts of invasive plants and animals on bay habitats, flora and fauna
- The condition and trends of the ecosystem services/benefits identified in the Ramsar Information Sheet
- The impact of human use on key biodiversity values (addressed in Program 5)
- Most of the stakeholders consulted through the project, including local councils, state governments, non-government organisations and community groups, identified a lack of monitoring data for key biodiversity values was impacting their ability to make informed management decisions.

¹²⁵ See the monitoring program list on Wetland Info <https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/ramsar-wetland-moreton-bay/>

¹²⁶ Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis Ramsar.org/> <https://rsis Ramsar.org/ris/631> or www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf

- Successful management of biodiversity values is integrally linked to well-designed monitoring and evaluation programs¹²⁷, however many of the biodiversity values in the Bay are not monitored. This makes refining and improving legislation (as outlined in Program 7) difficult.

Long term outcomes

- Long term management of the Bay's unique biodiversity values are underpinned by a regionally coordinated monitoring and evaluation program
- All major threats, current and emerging to the Bay values are regulated with clear adaptive management plans to address them

Program objectives

- Develop and implement a co-ordinated monitoring program to assess the viability of the species and communities listed under the Bay wide strategies and plans and to evaluate the progress of management initiatives towards targets

Action 8.1 Develop a monitoring and evaluation framework to support the management of key values and threats

Justification for the action

Many of the species and ecological communities identified in Bay wide plans and strategies (e.g. the Ramsar designation, the Marine Park Zoning Plan and the SEQ Natural Resource Management Plan) are either not monitored or are monitored by multiple organisations without regional coordination. This makes evaluating the effectiveness of management initiatives intended to protect or restore the Bay's values and reduce threats very difficult. The literature review and stakeholder consultation identified gaps in data and information for many of the broader biodiversity groupings, as summarised below. In this list there are examples of excellent long-term monitoring program for seagrass, mangroves, shorebirds, fish communities and several other groupings, however these have not been developed as part of a co-ordinated monitoring and evaluation framework focused on the managing the broad suite of bay values.

- Seagrass and mangroves – The extent of seagrass and mangroves has been assessed by a range of programs. These include seagrass and mangrove assessments in the Ecosystem Health Monitoring Program¹²⁸, seagrass mapping by Science under Sail Australia¹²⁹ and mangrove extent mapping by the Queensland Herbarium¹³⁰. Most of these programs only assess extent and do not assess the condition of seagrass and mangroves or assess the fauna they support nor the services they provide. Additionally, the ongoing funding and co-ordination of these programs is not certain. The threat of climate change (e.g. from sea level rise) to mangroves and seagrasses is largely unknown aside from isolated research projects¹³¹.
- Coral and shellfish reefs – These habitats were once common in Moreton Bay; however, they have declined since the early 1900s.¹³² Coral reef monitoring in Moreton Bay is conducted by Reef Check in partnership with The University of Queensland and Healthy Land and Water. The program is an excellent example of the contribution that citizen science can make to understanding changes to critical habitats. Ongoing funding for the program is uncertain, however with support, the monitoring program could be expanded to assess the condition and resilience of the Bay's reefs and the fauna that they support.
- Saltmarshes – The extent and change of saltmarshes in Moreton Bay is monitored by the Queensland Herbarium. However, threats to saltmarshes like the introduction of non-native flora and fauna species is largely unknown but is important to understanding the condition of saltmarsh ecosystems. Understanding the requirements for saltmarsh

¹²⁷ Jacobson, R.W. Carter, D.C. Thomsen, T.F. Smith (2014). Monitoring and evaluation for adaptive coastal management. Ocean & Coastal Management, Volume 89, 51-57

migration with sea level rise is also a significant gap given the current pressure saltmarshes are under from urban and mangrove encroachment.

- Beaches and coastal dune systems – Headlands, beaches and dunes are unique habitats on the exposed shorelines of the Bay's barrier sand islands. They act as a barrier to protect coastlines against erosion. Future threats to beaches under climate change have been identified and the councils along the Moreton Bay coastline have developed Coastal Hazard Adaptation Strategies under the state government's QCoast 2100 program. However, there is no monitoring and assessment of the biodiversity and ecology of the coastal systems despite the recognition of increasing threats^{133,134,135}.
- Fish communities - The fish fauna of mangroves, seagrasses, inshore reefs and intertidal flats has been relatively well sampled in Moreton Bay. By contrast, fish surveys in saltmarshes, soft sediments, offshore reefs and surf zones are sparse and incomplete¹³⁶. The fish assemblages of Moreton Bay are diverse and of considerable value to the economy; but have also been heavily modified by the combined effects of water quality degradation, coastal urbanisation and fishing. There is very little understanding of the change over time of fish stocks in Moreton Bay and the effect that human impact and climate changes has on those changes⁹⁹. This represents a significant gap given the commercial and recreational interest in Moreton Bay fisheries and the recognition of the Bay as significant for fish biodiversity.
- Shorebirds – The Queensland Wader Study group¹³⁷, a volunteer-based organisation, was established in 1992 to monitor and conserve shorebird populations. Shorebird counts are monthly which is unique to shorebird monitoring efforts nationally. Regional support of the study group would assist in ensuring the viability of the monitoring efforts long term as well as allowing the group to continue and expand its engagement with researchers and to continue to advocate for shorebird protection.
- Marine mammals – The Bay supports one of the most diverse and abundant marine mammal faunas of the east coast¹³⁸. Resident populations of dugongs and dolphins are joined by migrant whale species that move along the east coast. Surveys of dugong populations have been conducted regularly over the past 20 years. Continued monitoring of their population and threats to their health and survival are needed to ensure their sustainability. The population of dolphin species that use the bay is less well known. More consistent population monitoring and assessment of the behaviour and use of the Bays' resources by dolphins is needed as is a better understanding of the impacts of habitat loss and variability in food sources. Specifically, regional support for research and management organisations to consistently monitor and assess the Australian Humpback Dolphin is needed. The Bay is the southern most population of the species which is listed as vulnerable in Queensland so requires more focus in order to better direct management efforts to protect the species.
- Marine turtles – Six species of marine turtles have been recorded in Moreton Bay. Two species (green and loggerhead) migrate into the Moreton Bay waters and nest annually at low density on the ocean beaches of the Bay islands¹³⁹. Marine turtles in the Bay have been well studied due to the efforts of government and non-government researchers, however ongoing assessment is needed to better understand the impacts of human influence on their population and health.

¹³³ Schlacher TA, Nielsen T, Weston MA (2013) Human recreation alters behaviour profiles of non-breeding birds on open-coast sandy shores. *Estuar Coast Shelf Sci* 118:31–42

¹³⁴ Moss, D. D. McPhee, (2006). The impacts of recreational four-wheel driving on the abundance of the ghost crab (*Ocypode cordimanus*) on a subtropical sandy beach in SE Queensland. *Coastal Management*. 34 (1): 133–140.

¹³⁵ Schlacher T, Richardson D, McLean I (2008) Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environ Manag* 41:878–892

¹³⁶ Olds AD, Gilby BL, Connolly RM, Tibbetts IR, Henderson CJ, Stevens T, Thackwray SK, Schlacher TA. (2019). Fishes of Moreton Bay: Ecology, human impacts, and conservation. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

¹³⁷ Queensland Wader Study Group. Website <https://waders.org.au/>

¹³⁸ Lanyon J, Noad M, Meager J. (2019). Ecology of the marine mammals of Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

¹³⁹ Limpus CJ, Coffee OI. (2019). Marine turtles in Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

- Threatened and vulnerable species - The trend in the population of several of the IUCN listed species found in Moreton Bay which are identified as in need of protection in legislation, strategies and plans - e.g. Dugong (*Dugong dugong*), all six marine turtles found in the Bay, water mouse (*Xeromys myoides*), Australian Humpback Dolphin (*Sousa sahalensis*), great white shark (*Carcharodon carcharias*), manta ray (*Mobula alfredi*) is largely unknown. Consistent and regionally co-ordinate monitoring and research is needed to better understand the viability of, and threats to the populations of these species.

Threats targeted

- *Stewardship*: low levels of community awareness, low levels of community stewardship
- *Research & development*: Lack of data and knowledge pertaining to the Bay's values

Action description

This action is to design a monitoring and evaluation framework that will help manage the Bay's biodiversity values and threats and evaluate management progress towards improvements in the Bay's biodiversity values. Monitoring the condition and trends of all species in the Bay is not viable, however a monitoring program focussed on the ecological communities, key habitats and key species that have been identified in this Blueprint and in the other Bay wide plans and strategies should be developed.

Action 8.2 Implement a coordinated monitoring and evaluation framework to support the management of key values and threats

Justification for the action

Effectively protecting and restoring biodiversity values in the region is a substantial investment. Without a coordinated monitoring and evaluation program, it is difficult to show progress toward targets, highlight the impacts of changing or emerging threats, or to demonstrate return on investment to investors. Many excellent monitoring programs are occurring across the Bay; however, only a large scale, coordinated, long-term investment would collect the information required to support management of the unique Biodiversity values of the Bay.

Threats addressed

- *Stewardship*: low levels of community awareness, low levels of community stewardship
- *Research & development*: Lack of data and knowledge pertaining to the Bay's values

Action description

A regionally coordinated monitoring program should seek to include the following components and opportunities:

- Form partnerships with Traditional Owner groups that have programs to improve key biodiversity values. A co-ordinated partnership approach would leverage resources and increase the geographic scope and impact of those projects across Moreton Bay.
- Form partnerships with regional bodies and management organisations that currently monitor Bay values and threats including Healthy Land & Water, Queensland Wader Study Group, Queensland Museum, Queensland Conservation Council, Australian Marine Conservation Society, Queensland Department of Environment, Science and Innovation, a range of community groups, non-government organisations and local councils. Partnerships should seek to leverage the resources, effort and knowledge of the organisations for a coordinated evaluation of the Bay's values.
- Partner with the four universities in South-East Queensland that have undergraduate marine science courses and incorporate student learning to assist in the monitoring effort. The courses seek to teach their students the field skills required to become professional marine scientists. These annual teaching field trips typically occur with a new cohort of students and could be used to collect monitoring data for Bay's values and threats while teaching students the correct scientific techniques.
- Conduct habitat mapping. There is no comprehensive map of the habitats in Moreton Bay. The extent and condition of habitats that support the Bay's biodiversity values need to be monitored so suitable management interventions can be implemented. The Queensland Department of Environment and Science and Innovation have a mapping framework that has been used in Central Queensland that should be replicated in Moreton Bay.

- Integrate and refine existing monitoring programs. There are many existing monitoring and long-term research programs and monitoring frameworks across the region with separate coordination. These programs have a range of differing objectives, but elements could be integrated into a cohesive program that could be used to explicitly support management decisions for Moreton Bay. Such existing programs such as the Ecosystem Health Monitoring Program, local councils' monitoring, Seagrass-Watch, Mangrove Watch and SEQUEST could contribute.

Program 9. Climate risk and vulnerability assessment

Description

Moreton Bay and the SEQ region is expected to see significant changes in its climate in decades to come with an increased frequency and severity of extreme events like floods, droughts, heatwaves and bushfires. Compounding those changes is an increase in the likelihood of significant changes in ambient temperature, sea temperature, rainfall and runoff, sea level rise and storm surges. The ecology of the Bay is dynamic, with the persistence of key habitats and the biodiversity they support highly dependent on the range of environmental conditions that are experienced. This program is to understand the vulnerability of the Bay's values to the effects of climate change and to assess potential adaptation pathways under different climate futures.

Justification

- The impacts of climate change (sea level rise, temperature increases and increases in extreme events) were identified through the literature review as a significant future threat to most of the Bay's values identified. Mean annual air temperatures are expected to rise between 1.2-1.7°C, sea-level will rise 0.21-0.27 and rainfall expected to be variable by 2050 which will likely impact the tolerance and range of many of the Bay's values and habitats.
- For many of the values identified, the trend in condition of the value was uncertain or lacked data which represents a significant gap in understanding.
- The threatening processes due to climate change were acknowledged as a key gap in their understanding and management planning by most stakeholders including local councils, state governments, community groups and Traditional Owner groups.¹⁴⁰
- Climate change is identified as a key threat and recognised in multiple plans and legislation – internationally under the Ramsar Convention and locally within the Ramsar Information Sheet for Moreton Bay and nationally under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and locally under the *Fisheries Act 1994* (Qld) and the *Vegetation Management Act 1999* (Qld). Many of the Bay's values are protected under legislation from disturbance activities (e.g. development). However, they are not protected from other current or future threats. Addressing these threats in legislation is a gap in safeguarding the Bay.
- Many current threats to the Bay's values are increasing in extent and intensity, e.g. recreation impacts on beaches and dunes, mangrove encroachment of saltmarshes, urban encroachment on the fringe of coastal habitats and disturbance of a range of flora and fauna species¹⁴¹ and climate change is expected to exacerbate the impact and risk of non-climatic threats.
- Future threats under climate change have been identified and the councils along the Moreton Bay coastline have developed Coastal Hazard Adaptation Strategies under the state government's QCoast 2100 program however, the CHAS process does not explicitly consider most of the Bay's values.
- There is no bay-wide vulnerability assessment for most of the Bay's values that might require protection or enhancement from future threats.

Long term outcomes

- The vulnerability of Moreton Bay's values to climate change threats are addressed in management plans and adaptation pathways identified.

Program objectives

- Coordinate a vulnerability assessment of the Bay's values at a bay-wide scale to enable management, protection and restoration under different climate futures.

¹⁴⁰ See Section 2.1 and 3.1 for plans reviewed and Section 2.6 for the stakeholder engagement list

¹⁴¹ Department of Environment and Resource Management, Queensland (2012). Moreton Bay Marine Park Monitoring. Report for the Queensland Government prepared by Water Quality and Aquatic Ecosystem Health, Environment and Resource Sciences, accessed 18 Jun 2024. Available at: https://parks.des.qld.gov.au/_data/assets/pdf_file/0030/167916/moreton-marine-park-monitoring-report.pdf

Action 9.1 Climate change vulnerability/risk assessment for whole-of-Bay

Justification for the action

Climate Change Vulnerability Assessments are a tool that can be used as an initial step in the adaptation planning process and assist managers address the threats of climate change in plans and strategies. A vulnerability assessment identifies factors that contribute to the vulnerability of ecological and built assets to the direct and indirect effects of climate change. This level of assessment has not been conducted for many of the Bay's values and is required for more co-ordinated long-term planning.

Threats targeted

- *Ecosystem modification*: Coastal erosion, incursions of weeds/pests/disease, reduction of habitat area, fragmentation/reduction connectivity
- *Climate*: Sea level rise, increase in extreme events and flooding
- *Population growth*: Coastal development/artificial coastlines, human & domestic animal disturbances, harvesting/overfishing
- *Research & development*: Lack of data and knowledge

Action description

This action is to conduct a climate change vulnerability assessment for the Bay's values. **Climate change vulnerability** is the susceptibility of a species, system or resource to the negative effects of climate change and other stressors. There are a range of methodological frameworks available to structure a climate change assessment¹⁴². Many assessment frameworks are based on **three broad components: exposure, sensitivity, and adaptive capacity**¹⁴³:

- *Exposure* is the amount and rate of change that a species or system experiences from the direct (e.g., temperature, precipitation changes) or indirect (e.g., habitat shifts due to changing vegetation composition) impacts of climate change;
- *Sensitivity* refers to characteristics of a species or system that are dependent on specific environmental conditions, and the degree to which it will likely be affected by climate change (e.g., temperature or hydrological requirements); and
- *Adaptive capacity* is the ability of a species to cope and persist under changing conditions through local or regional acclimation, dispersal or migration, adaptation (e.g., behavioural shifts), and/or evolution.

The vulnerability assessment should assess these three components for each of the Bay values and look to include the following components.

- Consideration of the key climate change threats facing the Bay—sea level rise, temperature increases, increase in extreme events like flooding and droughts—building on previous work completed for the Bay¹⁴⁴. The assessment would benefit from defining a series of climate change scenarios projected to impact the Bay that could be used to compare the exposure and sensitivity of the different values to climate change threats.
- Prioritise Bay values for which the future trend is uncertain or that lack data on condition. This is particularly important for the rare and threatened species listed within the bay.
- Identification and assessment of the ecological processes and ecosystem services most likely to be directly and indirectly impacted by climate change threats.

¹⁴² Gumel, D. (2022). Assessing Climate Change Vulnerability: A Conceptual and Theoretical Review. *Journal of Sustainability and Environmental Management*, Vol. 1, No. 1. 22 – 31.

¹⁴³ Downing, TE, A, Patwardhan, E. Mukhala, L, Stephen, M, Winograd, G, Ziervogel. (2002). Vulnerability assessment for climate adaptation. *Adaptation Planning Framework Technical Paper 3*. Intergovernmental Panel on Climate Change.

¹⁴⁴ Saunders M, Runting R, Charles-Edwards E, Syktus J, Leon J. (2019). Projected changes to population, climate, sea-level and ecosystems. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

- Explicit assessment of the cumulative effects of climate change threats along with current threats (e.g. urbanisation, catchment run-off, habitat removal).
- Assessment of the potential for an influx of tropical species into the Bay with changing water quality conditions. This has been considered for coral communities already¹⁴⁵. The potential for increase in exotic and invasive species should also be considered.
- Investigation into the adaptive capacity of Bay values and identifying the adaptation pathways required to ensure the persistence of those values with climate change. Identifying adaptive pathways help decision makers to plan for, prioritise and stagger investment for the adaptation actions required.

Types of organisations that could be included

Research organisations, not-for-profits

¹⁴⁵ Sommer B. (2015). Ecological dynamics of scleractinian corals at their high-latitude range margins. PhD Thesis. School of Biological Sciences. The University of Queensland. Brisbane, Australia. <https://doi.org/10.14264/uql.2015.1083>

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