

Managing for the multiple uses and values of Moreton Bay and its catchments

Abstract

Managing Moreton Bay involves a complex set of organisations and regulations which broadly reflect the historical build-up of Aboriginal customary uses and meeting of cultural obligations followed by a set of uses of this marine space for fishing; shipping and transport; maritime safety; conservation of marine ecosystems, birds and marine species; and water quality. Until now, management has been focused on regulating uses and managing their co-existence and potential conflicts, with some acknowledgement of 'rights'. While this is important, utilitarian and ecological values are only two of a potential set of values the public may hold towards waterways. This paper summarises the history of management of Moreton Bay, then considers how Moreton Bay and relevant aspects of the catchments are managed. It suggests new ways in which a wider set of values can be considered in management, and opportunities for communication with the interested public.

Keywords: governance, collaboration, partnership, history, communication, stewardship, shared responsibility

Introduction

Moreton Bay is managed as the sea country of the Quandamooka, Kabi Kabi/Gubbi Gubbi and Kombumerri (members of the Yugambeh peoples), under Aboriginal customary law, and since 2011 some of it has had formal recognition under the Quandamooka native title decision (1). Meanwhile it is managed as a marine park, and as a fishery, a Ramsar site, as well as for shipping, recreation, and multiple other uses. We argue that prior to policies for and regulation of these uses, Moreton Bay was a 'commons', to which the non-Indigenous public had open access and unrestricted use. Alongside formally recognised organisations with policies and management responsibilities, there are numerous citizen science groups, environmental education centres, and 'care' groups.

Its catchments, similarly, have overlays of management from the many original

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owners–custodians to governments with responsibilities for urban planning, environment, agriculture and water supply, to the 11 catchment management committees belonging to the Brisbane Catchments Network, to numerous Landcare and other groups, and to the individual landholders and industries adopting ‘best management practices’ on land they control (2).

This paper explores the many forms of management of this complex marine and freshwater system. In doing so it takes an expanded view of ‘management’ that goes beyond the formal perspective based on legislation, policies and plans formed by governments, to incorporate the actuality of Indigenous management and many voluntary activities by community organisations and NGOs. In doing so, we suggest that voluntary efforts ([Nasplezes et al.](#) (2), this volume), underpinned by people’s values towards waterways ([Ross et al.](#) (3) and [Pinner et al.](#) (4), this volume), should be recognised for the significant contribution they make towards the management of Moreton Bay and its catchments.

Management is not a straightforward matter of governing ‘functions’. It involves managing people as well as their activities and impacts. Yet we know very little about how people value waterways and marine spaces, what they mean in their lives, and their activities in marine spaces. This information is important for management, demonstrating voter support for formal management levers such as legislation and policy relating to the protection and restoration of waterways, the extent of voluntary stewardship, and the public’s priorities. A river, or marine park and its coastline offer many opportunities for people to enjoy these settings—from good places to experience nature, walking, reflecting, canoeing, surfing, fishing, hang-gliding, jetskiing, bird watching and meditation, to having wedding photos taken. Different cultural groups, ages and genders may relate to these places in different ways. People may value marine and waterway spaces in multiple ways including through capture and use of their resources, through feelings of affection and care, in aesthetic appreciation and inspiration, for learning and exploration, in spiritual reverence, or for physical and mental challenges (3–5). On the basis of the multiple values held towards the waterways, and the many government, Indigenous and community interests involved in their management, we argue for a more integrative approach to waterway management.

We thus interpret ‘management’ broadly to include policies, plans and programs intended to influence environmental outcomes over an area or resource or human behaviour (the conventional ‘government’ view of management), and tangible actions directly affecting that area or resource by any party, not necessarily a government. It can include managing public information and understanding (e.g. awareness raising), as well as stewardship by landholders and voluntary groups (2). Campaigning by lobby

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groups aims to influence management, and should also be considered part of the management system.

Managing Moreton Bay and its catchments

We can view the management of Moreton Bay in terms of changes over time (Table 1). As new forms and purposes of management have been added to preceding ones, a series of 'overlays' has arisen in which different management regimes exist over the same set of waters. In this view, Moreton Bay began and continues as an Aboriginal-managed domain. It is also a former commons that has been transformed through legislation limiting public access and use, a set of fisheries for a range of species ranging from whales to mud crabs, a marine park that includes an internationally recognised Ramsar site, as well as a marine space requiring management of shipping and boating. Moreton Bay is an important element of the regional economy with continual growth and expansion of infrastructure to accommodate increasing international trade. Privatisation of government-owned assets, such as the port and airports, as well as substantial recreation-based commerce and tourism, has resulted in the private sector being an instrumental player in the management of the Bay. Additionally, the proximity of the Bay to Australia's third-largest city has resulted in challenges to water quality and increased the interaction of a range of business and industries with the catchment and Bay. Across all of these are mixes of Aboriginal, local government, state and federal government jurisdiction, community-based stewardship and citizen science groups, and advocacy groups, sometimes acting in combination. The catchments similarly are domains of Aboriginal management, and under multifunctional and overlapping management regimes embracing planning, urban and regional management, mainly under local and state governments. The waterways are managed for water supply (urban and irrigation), water quality, and as transport corridors. Because water is regarded as a public good, seldom subject to property rights, management often has to rely on collaboration (6). From the late 1990s, a unique collaboration of government, non-government and science organisations, Healthy Waterways^[1], developed to improve water quality in Moreton Bay and its catchments. In 2016 this joined with another collaborative body, SEQ Catchments (one of Australia's 56 regional bodies for natural resource management) to form Healthy Land and Water. This collaboration combines strategic initiatives with on-ground opportunities for working across land to sea. The SEQ Regional Plan 2017 provides a blue-print for the sustainable development of the SEQ region for the next 50 years and includes substantial recognition of Moreton Bay and its stakeholders, and a range of strategies to

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support sustainable outcomes.

Evolution of management

Throughout its history, Moreton Bay, its islands and its catchments have been managed by a set of Aboriginal Traditional Custodians according to customary arrangements based in a holistic belief system in which humans and the natural world are closely related. Environmental management is a customary responsibility and informed by deep traditional ecological knowledge. For example, the peoples of Moreton Bay were active stewards of oyster beds (7). Table 1 provides a timeline of significant events in the management of Moreton Bay.

Table 1: A timeline of significant events in the management of Moreton Bay

Date	Law/Regulation
1862	Regulation of oyster cultivation (<i>Oyster Fisheries Act 1863</i>)
1888	Regulation of dugong fishing (<i>Queensland Fisheries Act 1887</i>)
1952	Coomabah Lake closed to taking of fish
1959	Swan Bay closed to taking of fish
1962	Commercial whaling ceased at Tangalooma
1968	Commercial turtle fishing ceased. Turtles designated as protected under Queensland Fisheries Act by order of Council.
1969	Commercial dugong fishing ceased. Hunting continued for recreational, subsistence and ceremonial purposes.
1969-1971	11 'fisheries habitat reserve' declarations in Moreton Bay
1982	<i>Marine Parks Act 1982</i> provided for the declaration and management of marine parks.
1983	All fisheries habitat reserves re-declared as either fish habitat reserve or wetlands reserves; Coomera, Coomabah and Bribie Island wetlands reserves declared.
1986	Pumicestone Passage Marine Park declared
1988	Northern Moreton Bay Marine Park proposed
1990	Marine Parks Regulation made
1991	Second Draft Moreton Bay Strategic Plan released (the first document to specify a need for a marine park over the whole area)
1992	<i>Nature Conservation Act 1992</i>
1992	Myora Extension Fish Habitat Reserve declared
1993	Moreton Bay Strategic Plan gazetted Moreton Bay Marine Park gazetted Moreton Bay Ramsar site declared
1994	Maritime safety included under the <i>Transport Operations (Maritime Safety) Act 1994</i>
1995	All fish habitat reserves and wetland reserves re-declared under new Fisheries Regulation 1995 as 'fish habitat areas'
1997	Pumicestone Passage Marine Park revoked and Pumicestone Passage included within Moreton Bay Marine Park First zoning plan for Moreton Bay Marine Park implemented
1998	Pumicestone Channel Fish Habitat Area declared (amalgamated Pumicestone Passage and Bribie Island Fish Habitat Areas)
1999	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
1992	Myora-Amity Banks Fish Habitat Area declared (amalgamated Myora and Myora Extension)
2003	Grey Nurse Shark areas declared under the <i>Fisheries Act 1994</i> and Marine Parks (Moreton Bay) Zoning Plan 1997
2009	Second Zoning Plan for Moreton Bay Marine Park implemented

Moreton Bay and the [Brisbane River](#) were critical to the early and continuing settlement of South East Queensland. Following non-Indigenous incursion into the region, Moreton Bay appears to have been treated as a 'commons', that is, under open access (Aboriginal ownership and management arrangements not being formally recognised at the time). There was a strong utilitarian focus on the Bay with animals and fish being exploited for commercial and recreational purposes, and other recreation especially yachting. Following the near extermination of dugong under unrestricted hunting from the 1850s, restrictions commenced in 1881 (commercial dugong hunting was prohibited altogether in 1969). Commercial whaling occurred from 1952 to 1962, with a base at [Tangalooma](#) on [Moreton Island](#). The closure was a commercial decision, related to over-

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exploitation, not a policy decision.

Fisheries management in Queensland, including Moreton Bay, commenced with the *Oyster Fisheries Act 1863*, which licensed the cultivation of oysters (17). Habitat protection commenced in 1951 with the closure of Coombabah Lake (Coomera catchment, Gold Coast area) to fishing. From 1969, the mechanism of declaring fisheries habitat reserves was adopted to protect fish habitats: seven were declared that year and a further four in 1971. A further four were declared in 1983, and a distinction introduced between fish habitat, and wetlands, reserves. It is important to note that these protections were put in place by fisheries managers with the goal of sustainable management of fish stocks rather than protection of biodiversity more generally, and they have a single purpose, that is, protecting fish habitat.

Coastal planning commenced under the *Coastal Protection and Management Act 1995*. This assisted the development of plans to protect coastline habitat and prevent impact from coastal processes. The coastal plans, however, were not integrated with habitat protection measures with many components operating with different specialisations and at different scales or marine parks.

Protection of migratory birds commenced in 1981, through an agreement with Japan, and agreements with China (1988) and Korea (2007) followed. A Partnership for the Conservation of Migratory Waterbirds and the Sustainable Use of their Habitats in the East Asian–Australasian Flyway was launched in 2006 and enables sharing of information, and collaboration between all sectors with an aim to protect migratory birds, their habitats and the livelihood of people dependent on them. Ramsar protects wetlands and their resources, an important component of bird habitat. These various agreements recognise the global dynamics of migratory shorebirds, but there is a long way to go, and numbers of several migratory birds utilising Moreton Bay have declined (8).

There was no systematic protection of Moreton Bay's waters prior to 1993. A marine park over the northern part of the Bay was first proposed in 1988, and strategic planning commenced in 1989. The first Moreton Bay Marine Park, with minimal protection by today's standards, was declared in 1993. Much tighter zoning was introduced in 2009. Public acceptance was difficult in both periods, with mixed public support and some sharp divisions between viewpoints favouring conservation versus unrestricted access to recreational and commercial fishing and related pursuits. This may be a legacy of the periods in which Moreton Bay was a commons with open access. The public has been obliged to accept and adapt to new regimes involving losses of former freedoms, and attitudes may be slow to follow the legislative changes. Indigenous people throughout Australia have always treated their estates – land and

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sea – as common (shared) property, operating under specific cultural rules, rather than as open access.

From 1994, maritime safety became part of the mixture of management arrangements under the *Transport Operations (Maritime Safety) Act 1994*. There were antecedents in some legislation promoting navigation safety under the *Harbours Act 1955*.

Aboriginal management over a large part of the Bay has been strengthened with a new level of formality under the 2011 native title settlement providing Quandamooka (Stradbroke Island, Moreton Island, the southern Bay islands and associated waters, and parts of the mainland coast south from the Brisbane River) with a combination of exclusive and non-exclusive (use) rights over land and water. The Australian and state governments, two city councils ([Brisbane and Redland](#)), and a range of commercial interests, including mining, fishing, infrastructure providers and oyster growers, participated in the negotiations. This determination places the Quandamooka peoples (Dandrubin Gorenpul, Ngugi and Noonucal) in a much stronger position for managing their country; in many cases other organisations must now negotiate with the native title holders over particular issues of land and water use. The native title parties have formed an association, The Quandamooka Yoolooburrabee Aboriginal Corporation, to coordinate their decision-making and activities, and provide a point of liaison with other organisations.

The current management situation

We argue that there are two types of management over Moreton Bay and the waterways of the catchments. There is an overt and official type, focused on legislation and formally appointed bodies, as well as an unofficial and overlooked set of contributors focused on Indigenous, voluntary non-Indigenous, and advocacy efforts. There is some overlap between these roles, where governments offer funding to voluntary organisations. The formal, government-led, management focuses on Moreton Bay Marine Park; fishing (traditional, recreational and commercial); shipping, navigation and marine safety; and meeting water quality objectives. Here the state and local governments are prominent, though their responsibilities require regulation and management of others.

The overlooked, unofficial, dimensions of management include the contributions of Aboriginal Traditional Custodians, activist organisations and peak bodies, stewardship and citizen science groups, science organisations, and some recreational groups. Blending across these are two former collaborations, now merged as Healthy Land and Water. Healthy Waterways focused on strategy, monitoring, and encouragement of implementation partners towards improving water quality in Moreton Bay and the

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catchment rivers. SEQ Catchments, as a regional body for natural resource management, had a broader natural resource management brief, and by mutual agreement focused more on on-ground works, including support of local stewardship organisations. It also gained influence over urban and regional planning by having its natural resource management plan adopted as the regional plan’s natural resource management component. This represents a shift towards a governance approach for managing Moreton Bay whereby collaborative relationships are sought among government and non-government actors to work effectively to manage natural resource systems. Table 2 shows the many forms of management extant over the waters and coastal land of Moreton Bay and the catchments.

Table 2: Managing parties, foci and forms of management over Moreton Bay and its catchments

Geographical scale	Managing party(ies)	Focus or function	Nature/type of management
Aboriginal			Customary stewardship activity, following cultural responsibilities and using traditional ecological as well as local knowledge
Local	Aboriginal Traditional Owners and their organisations	Holistic care for their country, including land and marine areas, and species	Managing specific areas (e.g. native title lands and waters, and one Indigenous Protected Area)
	e.g. incorporated Traditional Owner associations; native title representative bodies		Being involved as partners in a wide variety of programs and actions (e.g. the Moreton Island oil spill in 2009)
			Specific land and water initiatives (e.g. restoring Myora Springs on Stradbroke Island)

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Geographical scale	Chapter 8 Moreton Bay Marine Park Managing party(ies)	Focus or function	Nature/type of management
Governments	Federal ministers, government departments (environment, heritage responsibilities)	<p>Specific international conservation agreements:</p> <p>National habitat management agreements</p> <p>Ramsar agreement: governs wetlands (including any area of the Bay and surrounding areas with depth of less than 6m)</p> <p>Bilateral migratory bird agreements :</p> <ul style="list-style-type: none"> · CAMBA (China Australia Migratory Bird Agreement) · JAMBA (Japan Australia Migratory Bird Agreement) · RKMBA (Republic of Korea Migratory Bird Agreement) 	<p>Can involve campaigning</p> <p>Associations provide capacity and logistical ability for the management actions</p> <p>Signatory to international agreements</p> <p>Practical management delegated to state governments, which must report, and deal with threats</p> <p>Declaration of species and habitats for protection</p>
Federal			

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Geographical scale	Chapter 8 Moreton Bay Marine Park Managing party(ies)	Focus or function	Nature/type of management
State	Minister, department, responsible for fisheries	National conservation legislation	Environmental impact assessments over certain types of development with international implications (e.g. Toondah Harbour development)
		Environment Protection and Biodiversity Conservation Act 1999 : governs nationally recognised threatened species and habitats	Air navigation, infrastructure (airports), air safety Brisbane’s airport adjoins and has impacts on Moreton Bay and designated wetlands (e.g. expanding runways involve sand extraction, local aquatic impacts)
		Airports	Fisheries management legislation : · Fisheries Act 1994 , Fisheries Regulation 2008 (except for fish habitat areas) Policies, resource access rights and quotas, allowable technologies (types of gear etc.), management of bycatch, science and monitoring
	Note: In 2012 fish habitat areas and marine parks were brought under a single portfolio.		

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Geographical scale	Chapter 8 Moreton Bay Marine Park Managing party(ies)	Focus or function	Nature/type of management
State	Minister, department, responsible for the environment	Marine park	<p>Marine park legislation and implementation roles:</p> <ul style="list-style-type: none"> · Marine Parks Act 2004 : governs establishment and management of Moreton Bay Marine Park (established 1992 though with low levels of protection). · Moreton Bay Marine Park Zoning Plan 2009 (rezoned the marine park to increase the level of protection) <p>Management activities include zoning and enforcement; behaviour codes (e.g. boat speeds); science and monitoring; commercial activity (e.g. sand extraction)</p> <p>Environmental protection; water</p> <p>Environmental protection legislation :</p> <ul style="list-style-type: none"> · Environmental Protection Act 1994 · Environmental Protection (Water) Policy 2009

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Geographical scale	Managing party(ies)	Focus or function	Nature/type of management
State	Water resources, supply and treatment	Coastal management and development	Sustainable development of water in rivers, streams, wetlands, lakes, aquifers, estuaries and coastal areas; monitor water quality and ecosystem health · Coastal Protection and Management Act 1995 · Coastal Protection and Management Regulation 2017
		Bulk water supply	Infrastructure and logistics towards water supply system, including dams Implications for water quality including sediment delivery affecting dams, water treatment, Moreton Bay
		Water supply (retail, to some but not all local government areas)	Water management in catchment
		Sewage treatment	Implications for water quality in rivers and Bay
		Recycled water	

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Geographical scale	Chapter 8 Moreton Bay Marine Park Managing party(ies)	Focus or function	Nature/type of management
State	Minister, department, responsible for maritime safety	Shipping and maritime activity	Ports, shipping routes and channels, navigational beacons, pilots Regulate use of waterways including speed limits, boat licences, vessel registration Maritime safety (e.g. smaller boats)
State	Minister, department, responsible for planning	Boat-sourced pollution	Manage vessel-sourced pollution · Planning Act 2016 , Planning Regulation 2017 Land-use planning and development assessment, towards ecological sustainability Implications for Marine Park, coastal zone, water quality in catchments
Local	Elected councils and staff for councils adjoining and covering waters and islands for Moreton Bay, and for inland areas of the catchment	Planning, development approvals	Planning, development application of building codes etc. Services including waste management Sewage treatment plants (some councils) Manage stormwater

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Geographical scale	Managing party(ies)	Focus or function	Nature/type of management
Collaborations	Healthy Land and Water (non-government but collaboration includes government bodies; part of nationally endorsed system of regional bodies for natural resource management)	Water quality in rivers and Moreton Bay, from urban and rural sources	Encourage public engagement with waterways Infrastructure including boat ramps, public access to water Health standards of recreational waters
		Multiple environmental functions including biodiversity Community engagement	Coordination (through collaboration), supporting the partners to fulfil their roles effectively; facilitating on-ground actions Science and monitoring Public awareness and engagement Strategies for solving sources of sediment and pollutants (targeting, best practices) Coordination (through collaboration) Public awareness and engagement Strategies for solving sources (targeting, best practices)

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Geographical scale	Chapter 8 Moreton Bay Marine Park Managing party(ies)	Focus or function	Nature/type of management
Advocacy organisations			No regulatory powers but, by agreement, provides the natural resource component of the statutory SEQ Regional Plan 2009-2031
National	<ul style="list-style-type: none"> · WWF Australia · Australian Marine Conservation Society · Greenpeace · The Nature Conservancy Australia 	Conservation, wildlife, including marine animals, fish and birds	<p>Advocacy roles and processes</p> <p>Influence governments, directly through lobbying or by mobilising the public via campaigns. Involves exploring and summarising the science, a degree of public education.</p>
State	<ul style="list-style-type: none"> · Environmental Defenders Office (Qld) · Queensland Conservation Council 	Support the public to bring public interest cases	<p>As above</p> <p>These organisations may have combined roles (e.g. member services, building public awareness, advocacy)</p>

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Geographical scale	Chapter 8 Moreton Bay Marine Park Managing party(ies)	Focus or function	Nature/type of management
Regional – local	· Wildlife Queensland	Wildlife	Note: Birdwatching associations, stewardship groups (e.g. Seagrass Watch, catchment bodies) may conduct some advocacy.
	· Sunfish Queensland	Represents recreational fishers	
	· Queensland Seafood Industry Association	Represents commercial fishers	As above
	· Moreton Bay Eco Alliance	As above, with regional foci	
	· Save Moreton Bay		
	· Moreton Bay Seafood Industry Association		
Stewardship/community action groups	· Brisbane Region Environment Council		
	All local, though some may connect with national networks	· Catchment management bodies (11 coordinate as the Brisbane Catchments Network, covering the Brisbane River, principally in the Brisbane metropolitan area)	Community-based management of catchments, local areas
· Landcare and coastcare groups. (voluntary organisations focusing on on-ground works to rehabilitate environments)		All are voluntary organisations, run by committees of their members. They also rely heavily on volunteer labour (their members and others), and applying for small grants.	

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Geographical scale	Chapter 8 Moreton Bay Marine Park Managing party(ies)	Focus or function	Nature/type of management
	<ul style="list-style-type: none"> Citizen science/community-based monitoring groups, including birdwatching groups (e.g. Queensland Wader Studies Group), MangroveWatch, Seagrass-Watch, Reef Check 	Monitoring, public awareness	<p>A degree of endorsement and cooperation comes from federal, state and local government funding for certain activities. Many activities involve multiple partners.</p>
	Environmental education centres	Environmental awareness, often with schools and families	<p>All of these centres are coastal, open to the public, often run programs with schools</p>

Formal management

Formal management is framed by a range of legislation and associated regulations, in which three levels of government—federal, state of Queensland and local— play interacting roles alongside aspects of Aboriginal management enjoying legal force under native title legislation. While the Australian Government’s role is not overt other than under the Ramsar Convention and migratory bird agreements, these can trigger Commonwealth environmental impact assessments under the *Environment Protection (Biodiversity Conservation) Act 1999* (e.g. the Wyaralong Dam assessment (9)). While much of the legislation and hence formal management arrangements affecting the Bay and catchments is state legislation, it often requires local governments and industry to act as well. These parties are prominent in the collaborative organisation Healthy Land and Water described below.

Despite recent arrangements to bring fisheries habitat managers and marine parks in Queensland under a single authority (in 2012)[\[2\]](#), the reality of management over Moreton Bay is that it remains highly divided according to specific functions managed by a number of separate authorities. Although applying to the same waters, fisheries, marine park management, the Ramsar site, shipping and maritime safety, are all under separate legislation, policy and organisations.

Recognising native title over much of the Bay and islands means that those native title holders represented by the Quandamooka Yoolooburrabee Aboriginal Corporation are now part of the formal decision-making. Other Traditional Custodian groups are not yet

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brought under formal management, other than some provisions that apply in certain circumstances through cultural heritage and native title legislation, such as the ability to form cultural heritage management plans and Indigenous Land Use Agreements.

There are further management interests in water quantity and quality. The official responsibility for meeting water quality standards in the rivers and Bay rests with the Department of Environment and Science (Queensland), but the practical actions required draw in local governments and a wide range of land and water users. A collaboration of state government, local governments, science organisations, water utilities, commercial organisations and community groups formed in the late 1990s. This was originally under the name of the Moreton Bay Waterways and Catchments Partnership, followed by a number of subsequent name changes including Healthy Waterways, and more recently Healthy Land and Water (6). This began with a focus on the Bay and lower catchments, and extended to the entire catchments of Moreton Bay in the 2000s. Significant achievements of this collaboration are a strong water quality monitoring process, an evidence-based approach with close scientific participation in the collaboration, and significant improvements to water quality in the Bay following upgrades to sewage treatment plants. The Ramsar site ensures Australian Government interest in activities within the Bay. An example is the approvals process for the construction of the Wyaralong Dam, which required consideration of the changes in flows on mud crab populations within Moreton Bay (9).

Below we briefly outline the process for evaluating and adjusting the boundaries and zoning of the Moreton Bay Marine Park. This process is different to other management processes in the Bay. It illustrates challenges of achieving an integrated approach and associated whole-of-Bay outcomes. The range of management frameworks and approaches increases the complexity of the management system, and can be challenging for managers and other stakeholders alike.

While we will not attempt to document the complexity of the management of land areas, it is important to note that catchment management, including cities and rural areas, is separated from marine management. Rivers flow into the Bay, yet there is no statutory or formal connection in their management. Marine park and fisheries legislation and management arrangements have no formal influence beyond their respective aquatic boundaries. This means there is no formal mechanism for guiding land-based activities in the catchments that affect the water quality and other environmental integrity issues in the Bay. This must be achieved through non-statutory collaboration, one of the main functions of Healthy Land and Water.

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Moreton Bay Marine Park zoning processes

The first Moreton Bay Marine Park Zoning Plan was implemented in 1997 (Marine Parks (Moreton Bay) Zoning Plan 1997). The marine park had five zones and provided for green zone protection of 0.5% of the Bay. This 0.5% area did not include representation of all habitat types in the Bay. The 1997 Zoning Plan expired on 1 September 2008, and following a substantial review during 2007/2008, a new zoning plan came into effect on 1 March 2009. The new zoning plan was based on research that had become available over the past 10 years, and on expert advice from an independent panel. The revised zoning plan protected 16% of the Bay, including a minimum of 15% of each habitat type. To support the transition to the new zoning, a structural adjustment package was implemented to buy out licences of commercial fishers who were impacted by changes. The new zoning plan had four zones: green zones (the highest level of protection), yellow zones (highly protected), blue zones (habitat protection), light blue zones (general use), and a series of go slow areas to reduce potential for boat strikes on turtles and marine mammals. These zones were similar to those used in other marine parks, including the Great Barrier Marine Park, and improved consistency in marine park management along the Queensland coast. The zoning plan also includes designated mooring areas allowing for environmentally friendly moorings. A monitoring program assessed social, ecological and economic changes in and around Moreton Bay.

We note that formal management is more focused on 'top-down' control and compliance through regulation than on encouraging desired behaviours. An indicator is the number of signs along the Moreton Bay coast listing forbidden actions, and very few enjoining positive engagement with the coastal and marine environment (Fig. 1). Formal management is also understood in a limited way—other than the native title determination over some two-thirds of the Bay's waters, there is low recognition of Aboriginal custodianship, and of the activities and commitment of stewardship and citizen science groups. Similarly there is little role for the general public, who are treated as users of the environment (often being viewed principally in terms of their damaging actions) rather than positive contributors to its care. Yet a study exploring how people value Moreton Bay and its tributaries (3-5, 10) suggests a strong desire among waterway users throughout the region to protect and look after waterways in South East Queensland to maintain their ecological integrity and ensure people can continue to derive cultural, recreational and economic benefits. (This does not necessarily translate into general public willingness to manage actively, according to surveys conducted on behalf of Healthy Land and Water).

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Figure 1. Signage on Moreton Bay coastline showing different styles of communication which can invoke either positive and negative responses.

Overlooked and unofficial dimensions of management

In a holistic picture of what constitutes ‘management’, a number of other roles and highly committed organisations and members should be recognised.

Traditional Aboriginal Custodians take a holistic and social-ecological perspective over managing their land and sea country that contrasts sharply with the sectoralism of

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government. Native title rights are transitioning the *Quandamooka* peoples into formally recognised governance roles, though the level of effective interaction with government arrangements is yet to be determined. Unfortunately, interaction between Traditional Custodians and other organisations is sporadic. A celebrated exception is the cooperation between Traditional Custodians, state government and other organisations in the clean-up effort following an oil spill off Moreton Island in 2009 (11).

Activist organisations and peak bodies concentrate on political and social influence and educational roles to mobilise public opinion in favour of changes, or influence political decisions directly. Examples are the organisations promoting conservation of Moreton Bay over the decades and those representing fishing interests.

Stewardship groups generally focus on on-ground work in local areas (Landcare and similar groups) or on a wider scale (catchment management bodies, the Brisbane Catchments Network). The catchment management bodies often coordinate, and offer support to, the more local organisations. These organisations are particularly active in restoration, as well as social influence and educational roles.

Science organisations, involving formally qualified scientists mainly working for universities, government and the CSIRO, influence management through research providing an information base, and the design and oversight of environmental monitoring procedures. At times they may assist cautiously in advocacy, especially on behalf of conservation. Citizen science organisations contribute to monitoring particular habitats and species (e.g. reefs (12), mangroves (13), seagrass (14), marine megafauna (15), and birds).

Recreational groups, such as surfers, divers, birdwatchers and fishers, also conduct some stewardship activities and monitoring (e.g. Birds Australia, Carpbusters).

Education organisations such as environmental education centres and the University of Queensland's marine research station on [Stradbroke Island](#) play a role in the capacity building of future generations, increasing stakeholder knowledge of the Bay. This is likely to foster potential for stewardship and improved management in the future.

Media organisations take initiatives in promoting certain information and stories, and are used by other actors such as activist organisations, lobbyists and government for informal influence. For instance, media can be used to influence public opinion, and hence gain support for a policy, leverage in an advocacy campaign, or votes for a local government to commit more strongly to waterway protection.

These organisations and their efforts influence formal governance and sometimes political decisions, contribute constituent support for policies and investment, build and

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contribute local knowledge, and contribute significant and unpaid effort to on-ground management. They are recognised and supported to varying degrees, for example stewardship groups have been supported under federal-state programs since the 1990s (2, 16), and advocacy organisations and peak bodies are periodically consulted at times of policy change. Funding for Aboriginal custodial activity is less clear-cut. In general it is not supported in the same way as non-Indigenous stewardship organisations, but periodically specific funds are available to those organisations conducting specific on-ground activities.

The different actors and types of management also influence one another. For example advocacy organisations seek to achieve policy change, directly by lobbying governments and mobilising the public to support (or resist) the proposed policy changes. In the process of their advocacy, they may undertake—or indirectly achieve—public awareness activity (e.g. recognising the importance of ecological process or threatened species, or of the activities, livelihoods, and sustainable practices of fishers). This can mobilise campaigning in support of their cause. On-ground stewardship groups build community awareness and achieve tangible effects. Governments foster the activities of the stewardship groups, at least to some degree, through programs such as the National Landcare Program, and through part-funding of the regional bodies for natural resource management.

Effective management of Moreton Bay and its catchments as a complex system will depend not only on the involvement and commitment of diverse actor groups, both formal and informal, but also collaboration among them. This will require a 'new governance' approach whereby unofficial management actions receive greater recognition. 'New governance' involves tackling problems in a way that is collective and decentralised, and therefore depends on principles of inclusivity and networked actors (21). Dedicated effort is needed to build relations between the diverse actors operating in natural resource management of Moreton Bay in order to foster and build a new governance approach, whilst also acknowledging the challenges associated with legitimising new roles and responsibilities of different actor groups (22).

Conclusions and implications

Our inclusive analysis suggests that Moreton Bay and its catchments are managed by a system that is part-formal and part-informal, with many specialised components operating at different scales. Their interactions change perpetually as trajectories and outcomes shift according to the land and seascapes being managed. Members of the public harbour awareness, interests and values towards these environments. They need

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to be acknowledged within this management picture as people who care about the outcomes, are willing to contribute their efforts, and who will vote to achieve them.

This suggests some new directions for the management of waterways in South East Queensland. A more expansive view of management would recognise the important customary and often voluntary stewardship roles played by Traditional Custodians, stewardship organisations, such as catchment management bodies and Landcare groups, and voluntary monitoring organisations, such as creek and Waterwatch organisations. The collaboration Healthy Land and Water is already well recognised and connects some of these organisations. The role and uses of collaboration could be more strongly formalised, which would extend the basis for coordination and inclusion, for example by better connecting between land and sea similarly to the way Indigenous people view their coastal estates.

The more holistic view of what constitutes 'management', and who contributes to it, also opens opportunities to move from a dominant reliance on a 'control' way of thinking, focused on preventing damaging activity (e.g. limiting fishing activity, boating speeds through zoning and regulation), to incorporate the positive dimensions of caring and collaboration. A collaborative narrative may foster new opportunities for building relationships between formal and informal organisations that value waterways in South East Queensland in similar ways, and that hold shared objectives to manage these aquatic environments and/or resources sustainably. Monitoring and evaluation can expand from biophysical threats and damage, to social, economic and cultural benefits and contributions, as Healthy Land and Water has been doing since 2015.

The wide range of people's values towards waterways has management and communication implications (3-5). It expands the set of considerations from the past trade-offs between uses and protection, to incorporate love of nature, aesthetic appreciation, and spiritual and symbolic connections. As the region's local governments are already recognising, members of the public have some interests in the Bay and rivers that differ from those that have been the focus of past management. They like some areas to be protected, or restored to a relatively 'intact' state, so as to enjoy and learn from nature firsthand, and other areas to be controlled and maintained in a modified state to allow convenient access for recreation and enjoyment. Others want to see waterways and marine spaces managed to a condition that they know will allow populations of species such as fish, turtles and dugongs to remain viable so close to a high-growth urban area. Expectations in the upper catchments show that local waterway management should be focused on local issues and needs, not necessarily for the benefit of the Bay (10). While the need to control potentially damaging uses will continue, as will purely moral and ecological reasons for protecting areas and species, engaging public interest and cooperation through appeal to the specific ways in which

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they appreciate and use waterways offers a wider repertoire of management options.

Recognising the way in which formal and informal management is conducted will help all stakeholders to engage more effectively and to work to achieve mutual outcomes. Such empowerment is important and will help to ensure that Moreton Bay and catchments are managed for all users into the future, not just for user groups that are well versed in working within a complex management environment.

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[1] with a variety of predecessor names

[2] Fisheries habitat administration and marine park management first came together in 2012 in the then Department of National Parks, Recreation, Sport and Racing; they are now in the Department of Environment and Science. Formally, this means that under the Administrative Arrangement Orders, one minister is responsible for the *Marine Parks Act 2004* and the *Fisheries Act 1994* as they relate to 'fish habitat areas'. The other 'fish habitat' parts of the Fisheries Act (marine plants and fish passage) are the responsibility of the Department of Agriculture and Fisheries.
