IUCN

Large-Scale Marine Protected Areas:

Guidelines for design and management

Prepared by Big Ocean and the IUCN WCPA Large-Scale MPA Task Force

Authors: Nai'a Lewis, Jon C. Day, 'Aulani Wilhelm, Daniel Wagner, Carlos Gaymer, John Parks, Alan Friedlander, Susan White, Charles Sheppard, Mark Spalding, Gustavo San Martin, Andrew Skeat, Sue Taei, Tukabu Teroroko and Jacqueline Evans

Craig Groves, Series Editor

WCPA
WORLD COMMISSION
ON PROTECTED AREAS

Convention on
Biological Diversity

BIG OCEAN
A Network of the World's Large-Scale Marine Managed Areas

IUCN WCPA's BEST PRACTICE PROTECTED AREA GUIDELINES SERIES
IUCN-WCPA's Best Practice Protected Area Guidelines are the world's authoritative resource for protected area managers. Involving collaboration among specialist practitioners dedicated to supporting better implementation of ideas in the field, the Guidelines distil learning and advice drawn from across IUCN. Applied in the field, they build institutional and individual capacity to manage protected area systems effectively, equitably and sustainably, and to cope with the myriad of challenges faced in practice. The Guidelines also assist national governments, protected area agencies, non-governmental organisations, communities and private sector partners in meeting their commitments and goals, and especially the Convention on Biological Diversity's Programme of Work on Protected Areas.

A full set of Guidelines is available at: www.iucn.org/pa_Guidelines
Complementary resources are available at: www.cbd.int/protected/tools/
Contribute to developing capacity for a Protected Planet at: www.protectedplanet.net/

IUCN PROTECTED AREA DEFINITION, MANAGEMENT CATEGORIES AND GOVERNANCE TYPES

IUCN defines a protected area as:
A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

The definition is expanded by six management categories (one with a subdivision), summarised below.
Ia. Strict nature reserve: Strictly protected for biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.
Ib. Wilderness area: Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.
II. National park: Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
III. Natural monument or feature: Areas set aside to protect a specific natural monument, which can be a landform, seamount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.
IV. Habitat/species management area: Areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.
V. Protected landscape or seascape: Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
VI. Protected areas with sustainable use of natural resources: Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management (where low-level non-industrial natural resource use compatible with nature conservation is seen as one of the main aims).

The category should be based around the primary management objective(s), which should apply to at least three-quarters of the protected area – the 75% rule.

The management categories are applied with a typology of governance types – a description of who holds authority and responsibility for the protected area. IUCN defines four governance types.
Type A. Governance by government: Federal or national ministry/agency in charge; sub-national ministry or agency in charge (e.g. at regional, provincial, municipal level); government-delegated management (e.g. to NGO).
Type B. Shared governance: Trans-boundary governance (formal and informal arrangements between two or more countries); collaborative governance (through various ways in which diverse actors and institutions work together); joint governance (pluralist board or other multi-party governing body).
Type C. Private governance: Conserved areas established and run by individual landowners; non-profit organisations (e.g. NGOs, universities) and for-profit organisations (e.g. corporate landowners).
Type D. Governance by Indigenous peoples and local communities: Indigenous peoples' conserved areas and territories - established and run by Indigenous peoples; community conserved areas – established and run by local communities.

For more information on the IUCN definition, categories and governance types *see* Dudley (2008). *Guidelines for applying protected area management categories,* which can be downloaded at: www.iucn.org/pa_categories

For more on governance types, *see* Borrini-Feyerabend, et al., (2013). *Governance of Protected Areas – from understanding to action*, which can be downloaded at https://portals.iucn.org/library/sites/library/files/documents/PAG-020.pdf

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Octopus in the waters of Parque Marino Nazca-Desventuradas. © Enric Sala

Foreword

When the government of Australia created the Great Barrier Reef Region (346,000 km^2) in 1975 and subsequently declared parts as sections of the Great Barrier Reef Marine Park, the protected area greatly surpassed all existing marine protected areas (MPAs) in both scope and scale. Yet it would be nearly 30 years before a second LSMPA or areas greater than 150,000 km^2 (*see* Box 1) was declared. Established as the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve in 2000, the new site was the first truly remote LSMPA. In 2006, the area was slightly expanded and recognised as the Papahānaumokuākea Marine National Monument (362,074 km^2), and expanded again in 2016 (1,508,870 km^2) to become the largest MPA globally.

The Republic of Kiribati soon followed with the Phoenix Islands Protected Area (408,250 km^2) in 2008, which for a short while was the largest MPA. Between 2009 and 2017, a further 14 LSMPAs were established and more are currently either in the process of becoming legally established or have been proposed. Big Ocean member sites represent the majority of LSMPAs globally (*see* Table 1 and Figure 1) and are proof of the increased momentum for the establishment of LSMPAs and substantive management regimes. Some of the most recent designations are of areas larger than 1 million km^2.

Through these vast LSMPAs, the level of global marine protection has significantly increased. While accounting for only 1 million km^2 in 2006, established LSMPAs now account for more than 11 million km^2 and collectively, and MPAs of all scales now protect more than 23 million km^2 – just over 6% of the world's oceans. This has begun to shift fundamentally the way we think about marine protection (Toonen, et al., 2013). In addition to greatly increasing the size of the total ocean area under protection, LSMPAs offer a variety of unique benefits, including the protection of entire ecosystems (Toonen, et al., 2011).

Rapid growth has also brought criticism. Concerns about the overall conservation value of LSMPAs have been raised (e.g. Devillers, et al., 2015; Jones and De Santo, 2016), posing some questions whether such areas are anything more than 'paper parks' (i.e. existing only in legislation, but not in practice). Others (Dulvy 2013; Singleton and Roberts, 2014) assert that LSMPAs are ineffective in protecting large areas of ocean because the capabilities of most management and enforcement agencies are insufficient. As equitable and effective management is also a core priority in the CBD Programme of Work on Protected Areas, there are concerns that LSMPAs do not address wider links to key social issues, including negative impacts on local communities, Indigenous peoples' rights, benefit-cost sharing, poverty, gender equity, food security and livelihoods.

The history of most individual LSMPAs is still short, so further enhancing site design and management will require time. Many initiatives around the world are being developed to improve how ocean governance supports are scaling up marine conservation. One example is the use of systematic conservation planning and increased collaboration between LSMPAs and partners (e.g. international organisations, government agencies, NGOs and Indigenous peoples). The suite of best practice guidance specific to marine management at scale continues to improve and become more accessible.

In support of improved marine management globally, WCPA-Marine agreed to create a task force with IUCN specifically to further our understanding the challenges and benefits of marine protection and conservation at a large scale and to further best practice management standards. In 2013, Big Ocean was engaged to bring the most experienced practitioners in the field together to formally establish the group's membership. With the ability to leverage the expertise of a much broader range of conservation professionals, the newly launched LSMPA Task Force was able to support Big Ocean in initiating production on this publication, which is now a volume within the IUCN WCPA Best Practice Protected Area Guidelines Series. Hundreds of MPA professionals and conservation experts from around the world contributed to these Guidelines through workshops or peer-review.

Although focused on aiding managers, these Guidelines are for anyone involved in supporting LSMPAs or the communities that hold an interest in them. It is hoped these Guidelines will also assist new LSMPAs from the earliest design phase, and enhance the management of existing LSMPAs from planning and implementation through ongoing evaluation. As Singleton and Roberts (2014: 9) conclude "If there is a political mood to create (LSMPAs), let us seize that opportunity before it is taken away... or before resources degrade through intensified use. (LSMPAS) alone may not represent the perfect conservation strategy, but if they can help us embed the message ... in public and political pysches, we will be in a much stronger position to argue for more...". Ultimately, the goal is to increase the effectiveness of LSMPAs so that they contribute to global conservation targets in ways that truly benefit humanity.

'Aulani Wilhelm
Chair, IUCN Large-Scale MPA Task Force

Jon Day
Deputy Chair, IUCN Large-Scale MPA Task Force

Dr Dan Laffoley
Vice Chair, IUCN WCPA-Marine

Big Ocean Member Site Map

Papahānaumokuākea
Marine National Monu...

Marianas Trench
Marine National
Monument

Pa...
Ma...

Palau National
Marine Sanctuary

Coral Sea
Commonwealth
Marine Reserve

Great Barrier Reef
Marine Park

Phoenix Islands
Protected Area

British Indian Ocean
Territory MPA

Argo-Rowley Terrace
Commonwealth Marine Reserve

Marae Moa...
COOK ISLAN...

South-west Corner
Commonwealth Marine Reserve

Norfolk Commonwealth
Marine Reserve

Parc Naturel
de la Mer de Corail

Macquarie Island Commonwealth
Marine Reserve

Figure 1. Location of Big Ocean member sites © Big Ocean

Table 1. Current Big Ocean member LSMPAs

The 16 member LSMPAs within Big Ocean's network (at the time of publication) represent eight countries and collectively protect more than 10 million km^2 of ocean, an area that makes up more than half of the global protected marine estate. This table also provides the acronyms for each site.

	Site	Country	Size	Established
1	Great Barrier Reef Marine Park GBRMP	Australia	344,400 km^2	1975
	First established LSMPA; comprises the world's most extensive coral reef ecosystem. Aboriginal and Torres Strait Islander peoples are the Traditional Owners of the Great Barrier Reef region, which is home to many endemic species and globally threatened species.			
2	Papahānaumokuākea Marine National Monument PMNM	United States	1,508,870 km^2	2006
	Originally established in 2006 and expanded in 2016, this region is home to numerous endemic, endangered and threatened species, both terrestrial and marine, and has deep water seamounts with areas of high biological diversity and species new to science. This fully protected site also has deep cosmological and traditional significance to Native Hawaiians.			
3	Phoenix Islands Protected Area PIPA	Kiribati	408,250 km^2	2008
	Consists of a wide range of marine environments that display high levels of species abundance, increasingly rare in the tropics, and especially in the case of apex predators, sea turtles, seabirds, corals, giant clams and coconut crabs that have been depleted elsewhere.			
4	Marianas Trench Marine National Monument MTMNM	United States	250,487 km^2	2009
	Deepest ocean trench, with millions of kilometers of unknown characteristics; the most volcanically active region on Earth. This vast and unique area holds near-pristine coral reef ecosystems, diverse submarine volcanoes and hydrothermal vent life. The vast majority of MTMNM, potentially filled with valuable discoveries for the world, has yet to be explored and researched.			
5	Motu Motiro Hiva Marine Park MMHMP	Chile	150,000 km^2	2010
	No-take marine protected area surrounding the small island of Salas y Gómez in the South Pacific Ocean. MMHMP expanded Chile's total marine protected area more than a hundredfold, and it protects an important number of seamounts and associated vulnerable marine ecosystems; abundant populations of commercial species, such as the endemic Easter Island lobster; and vulnerable species such as the Galapagos shark.			
6	British Indian Ocean Territory Marine Protected Area BIOT	United Kingdom	640,000 km^2	2010
	A no-take marine reserve within which all commercial fishing activity is prohibited. Encompasses the world's largest coral atoll, the Great Chagos Bank, and 55 tiny islands. The waters of the Chagos Archipelago are rich with biodiversity, containing at least 220 coral species and over 1,000 species of fish. Many islands are critically important seabird colonies.			
7	Coral Sea Commonwealth Marine Reserve CSCMR	Australia	989,842 million km^2	2012
	Internationally recognised for its rich biodiversity, unique species and important heritage values.			
8	South-west Corner Commonwealth Marine Reserve SCCMR	Australia	271,898 km^2	2012
	Home to a wide range of important ecosystems in both shallow and deep water, reaching abyssal depths of up to 6,400 meters.			
9	Norfolk Commonwealth Marine Reserve NCMR	Australia	188,433 km^2	2012
	Supports benthic habitats thought to act as stepping stones for faunal dispersal, connecting deep water fauna from New Caledonia to New Zealand.			
10	Macquarie Island Commonwealth Marine Reserve MICMR	Australia	162,000 km^2	2012
	Sustains important habitat for seabirds including five albatross species, and foraging areas for New Zealand, Antarctic and subantarctic fur seals and penguins during the breeding season.			
11	Argo-Rowley Terrace Commonwealth Marine Reserve ARTCMR	Australia	146,099 km^2	2012
	Contains foraging areas for migratory seabirds and the endangered loggerhead turtle, as well as unique seafloor features and protection for the communities and habitats of the deeper offshore waters of the region in depth ranges from 220 metres to over 5,000 metres. The reserve also provides connectivity between the existing Mermaid Reef Marine National Nature Reserve and reefs of the Western Australian Rowley Shoals Marine Park and the deeper waters of the region.			

Table 1. continued

	Site	Country	Size	Established
12	Parc Naturel de la Mer de Corail – Natural Park of the Coral Sea NPCS	France	1.3 million km²	2014
	Multi-use marine protected area that covers all of New Caledonia's EEZ and protects exceptional biodiversity, including ridges, deep sediment basins, seamounts, coral reefs and volcanic structures.			
13	Pacific Remote Islands Marine National Monument PRIMNM	United States	1,269,065 km²	2009
	Originally established in 2009 with an expansion in 2014. This serial site is composed of seven remote islands, atolls, reefs, pelagic waters and seamounts scattered across the Central Pacific Ocean, from Wake Atoll in the northwest to Jarvis Island in the southeast.			
14	Palau National Marine Sanctuary PNMS	Palau	500,000 km²	2015
	With more than 1,300 species of fish and 700 species of coral around hundreds of tiny islands, Palau created its sanctuary to reverse the degradation from industrial fishing and to make the entire ocean territory of the country as a regenerative zone for sharks, whales, tuna and countless other precious species.			
15	Parque Marino Nazca-Desventuradas PMND	Chile	297,000 km²	2015
	As a fully protected no-take zone where fishing and other extractive activities are prohibited, this park seeks to protect one of the last potentially pristine marine environments in South America. There are deep underwater mountains with species new to science, abundant giant lobster and a relict population of the Juan Fernández fur seal, once thought extinct.			
16	Marae Moana: Cook Islands Marine Park CIMP	Cook Islands	1,900,000 km²	2017
	Largest commitment by a single country to date for integrated ocean conservation and management across its whole Exclusive Economic Zone (EEZ); CIMP includes remote atolls and high volcanic islands surrounded by fringing reefs and unspoiled fauna associated with underwater mountains.			

Preface

Developing the Guidelines

In 2011, at Big Ocean's third network business meeting, the original six member LSMPAs began conceptualising these Guidelines as a repository of their collective experience in designing and managing LSMPAs. The hope was that they would provide useful resources and tools for existing, new, and future LSMPAs. The development of the first draft of a manuscript commenced in 2012 during the IUCN World Conservation Congress in Jeju, Republic of Korea. Big Ocean invited marine management professionals and international experts to contribute to the draft manuscript. In early 2013, the network established its partnership with IUCN and WCPA-Marine, which increased the momentum for the development of the manuscript. Shortly thereafter, Big Ocean was asked to help develop the IUCN WCPA LSMPA Task Force, and then became the network's lead partner on this publication. The first publicly available consultative draft was reviewed in 2013 at the 3rd International Marine Protected Area Congress in Marseille, France. Two rounds of peer review followed, the second of which directly engaged members of IUCN's WCPA Commission following the IUCN World Parks Congress 2014 in Sydney, Australia.

Intended to supplement and build upon the existing IUCN materials and MPA guidance cited throughout this document, the content for these Guidelines was extracted from four main sources: (1) shared experiences documented by Big Ocean members during the network's first five business meetings, site-to-site exchange visits and other network events; (2) focus group interviews with senior managers, scientists and staff of member sites; (3) international partner and peer inputs, including contributions from hundreds of marine managers and conservation professionals, and (4) collaborations with key reviewers and subject matter experts. Relevant peer-reviewed and professional publications were also utilised.

Our intent and audience

In 2017, when these Guidelines were first published, sixteen LSMPAs were already declared around the world. The reality was that only a few of those LSMPAs had any real management experience (two obvious exceptions were the Great Barrier Reef and Papahanaumokuakea). Since the day most of the remaining LSMPAs were declared, each have been seeking the best available practical advice to ensure the management of their LSMPA is as effective as possible. Similarly, as new LSMPAs are undoubtedly declared in the future, learning from other's experience will be sought. One of the key objectives of these guidelines therefore, is to provide practical guidance to any LSMPA seeking to improve their management.

This document is written in a practical manner, with site managers and their teams in mind, as well as elected officials, government decision makers, and Indigenous peoples and local communities who may be contemplating the benefits and challenges of large-scale marine protection. The intent is also to assist both developing and developed nations, as contributions and lessons learned have come from each.

Though the aim is to provide a balanced and objective tone about the potential benefits and known challenges of LSMPAs, we are early in the learning process, and the text is oriented toward remote, uninhabited or small island areas where challenges are common. As pointed out by some (e.g. Devillers, et al., 2015; Jones and De Santo, 2016), a diversity of MPAs of different sizes, configurations and purposes is required to sustain global marine protection efforts through time.

Big Ocean's members care as much about people and society as sea life and marine ecosystems. This document therefore also works to highlight the benefits and services very large MPAs can provide humanity. Our experience, to date, illustrates that 'Going Big' is realistic and feasible; while we move forward with caution, we are optimistic about the future of marine protection.

– Big Ocean Member Site Managers

A dwarf minke whale swims in the waters of the Coral Sea Commonwealth Marine Reserve. © Matt Curnock

Big Ocean

With the support of IUCN, the member sites or Large-Scale Marine Protected Areas (LSMPAs) of Big Ocean were able to realise their concept for a managers' guidebook. Now being published as part of the IUCN Protected Area Best Practice Guidelines Series, these Guidelines are intended to the development of additional tools and resources specifically designed for the unique needs and challenges of large-scale marine management.

Who is Big Ocean?

Big Ocean is the only peer-learning network created 'by managers for managers' (and managers in the making) of large-scale marine protected areas.

- Our focus is management and best practice.
- Our goal is to support each other and the growing field of LSMPAs.
- Our purpose is to develop and enhance the professional standards of practice and the long-term, effective management of large-scale marine protected areas.

Origins of the network

Recognising the need to learn from each other, site managers from the world's largest MPAs met on 6 December 2010 in Honolulu and launched Big Ocean: A Network of the World's Large-Scale Marine Managed Areas. Co-convened by managers of Papahānaumokuākea Marine National Monument and World Heritage Site and the Phoenix Islands Protected Area and World Heritage Site under a bilateral 'sister-site' relationship, this historic, inaugural meeting produced the first-ever Managers' Communiqué on the importance, contributions and needs of LSMPAs.

www.bigoceanmanagers.org

> In these Guidelines, an LSMPA is considered to encompass at least 150,000 square kilometers (km^2). *See* Box 1 for more detail.

Big Ocean members from across the globe gathered at the 6th meeting of Big Ocean, held in Sydney, Australia in conjunction with the IUCN World Parks Congress 2014. © Big Ocean

BIG OCEAN
A Network of the World's Large-Scale Marine Managed Areas

International Union for Conservation of Nature (IUCN)
IUCN helps the world find pragmatic solutions to our most pressing environmental and development challenges. IUCN works on biodiversity, climate change, energy, human livelihoods and greening the world economy by supporting scientific research, managing field projects all over the world, and bringing governments, non-governmental organisations (NGOs), the United Nations (UN) and companies together to develop policy, laws and best practice. IUCN is the world's oldest and largest global environmental organisation, with 1,300 Member organisations and the input of 16,000 experts in 160 countries. IUCN's work is supported by over 1,000 staff in 45 offices and hundreds of partners in public, NGO and private sectors around the world.
www.iucn.org

Convention on Biological Diversity (CBD)
The Convention on Biological Diversity, which entered into force in December 1993, is an international treaty for the conservation of biodiversity, the sustainable use of the components of biodiversity, and the equitable sharing of the benefits derived from the use of genetic resources. With 193 Parties, CBD has near-universal participation among countries. CBD seeks to address all threats to biodiversity and ecosystem services through scientific assessments; the development of tools, incentives and processes; the transfer of technologies and good practices; and the full and active involvement of relevant stakeholders, including Indigenous and local communities, youth, NGOs, women and the business community. The tenth meeting of the Conference of the Parties to the CBD, held in 2010, adopted a revised and updated Strategic Plan for Biodiversity (Plan) for 2011 to 2020, comprising five strategic goals and 20 Aichi Biodiversity Targets. The Plan is the overarching framework on biodiversity, not only for the biodiversity-related conventions but for the entire United Nations system.
www.cbd.int

IUCN World Commission on Protected Areas (WCPA)
IUCN WCPA is the world's premier network of protected area expertise. It is administered by IUCN's Programme on Protected Areas and has over 2,500 members, spanning 140 countries. IUCN WCPA works by helping governments and others plan protected areas and integrate them into all sectors, by providing strategic advice to policy makers, by strengthening capacity and investment in protected areas, and by convening the diverse constituency of protected area stakeholders to address challenging issues. For more than 50 years, IUCN and WCPA have been at the forefront of global action on protected areas.
www.iucn.org/wcpa

National Oceanic and Atmospheric Administration (NOAA)
From daily weather forecasts, severe storm warnings and climate monitoring to fisheries management, coastal restoration and supporting marine commerce, NOAA's products and services support economic vitality and affect more than one-third of U.S. gross domestic product. NOAA's dedicated scientists use cutting-edge research and high-tech instrumentation to provide citizens, planners, emergency managers and other decision makers with reliable information whenever needed. NOAA's roots date back to 1807, when the United States' first scientific agency, the Survey of the Coast, was established. Since then, NOAA has evolved to meet the needs of a changing country. NOAA maintains a presence in every state and has emerged as an international leader on scientific and environmental matters.
www.noaa.gov

Office of National Marine Sanctuaries (ONMS)
NOAA's Office of National Marine Sanctuaries is committed to building a stronger, more resilient future for America's communities, ecosystems and economy. The Office of National Marine Sanctuaries serves as the trustee for a network of 14 marine protected areas in the United States that includes 13 national marine sanctuaries and Papahānaumokuākea Marine National Monument.
www.sanctuaries.noaa.gov

National Marine Sanctuary Foundation (NMSF)
The National Marine Sanctuary Foundation, a private, non-profit, 501(c)(3) tax-exempt organisation, was created to assist the federally managed National Marine Sanctuary Program with education and outreach programs designed to preserve, protect and promote meaningful opportunities for public interaction with the nation's marine sanctuaries.
www.nmsfocean.org

Conservation International (CI)
Building upon a strong foundation of science, partnership and field demonstration, CI empowers societies to responsibly and sustainably care for nature, our global biodiversity for the well-being of people. Founded in 1987, CI is headquartered in the Washington, D.C. area and employs more than 800 staff in 30 countries on six continents, and has nearly 1,000 partners around the world.
www.conservation.org

New England Aquarium (NEAQ)
The New England Aquarium is one of the most prominent and popular aquariums in the United States. Beyond its exhibit halls, the aquarium is also a leading ocean conservation organisation with research scientists working around the globe, biologists rescuing stranded marine animals in New England and staff consulting with the major seafood businesses to promote sustainable fisheries.
www.neaq.org

Oceana
Oceana is the largest international advocacy group working solely to protect the world's oceans. Oceana wins policy victories for the oceans using science-based campaigns. Since 2001, Oceana has protected over 1.2 million square miles of ocean and innumerable sea turtles, sharks, dolphins and other sea creatures. Oceana, which is global in scope, has offices in North, South and Central America, Europe and Asia, and the support of more than 600,000 members and environmental activists.
www.oceana.org

Great Barrier Reef Marine Park Authority (GBRMPA)
The Great Barrier Reef Marine Park Authority's fundamental obligation is to protect the Great Barrier Reef Marine Park and the World Heritage Area. This is accomplished by using the best available scientific information available and engaging with experts and the community, includeing four Reef Advisory Committees and 12 Local Marine Advisory Committees. The services provided range from issuing permits, providing advice on marine management, and operating the education centre Reef HQ Aquarium. Out on the water, field management and enforcement of zoning rules is carried out with Queensland and Australian Government agencies on GBRMPAs behalf.
www.gbrmpa.gov.au

British Indian Ocean Territory Administration (BIOT)
At a quarter of a million square miles, the Chagos Marine Protected Area (MPA) is one of the world's largest no-take marine reserves. Set within the British Indian Ocean Territory, the MPA was declared by the British government in 2010, an act that doubled the coverage of the world's oceans then under full protection. The reserve's wide variety of habitats coupled with near-pristine marine systems, provide a unique refuge for the rich biodiversity of the Indian Ocean. Management of the MPA is overseen by the Administration of the British Indian Ocean Territory, which, in conjunction with its partners, looks to ensure that BIOT continues to act as a reference site for global conservation efforts and an observatory for undisturbed ecosystems.
www.biot.gov.io

International Coral Reef Initiative (ICRI)
The International Coral Reef Initiative (ICRI) is a partnership between nations and organisations that strives to preserve coral reefs and related ecosystems around the world. ICRI was initiated by eight governments at the First Conference of the Parties of the Convention on Biological Diversity in 1994 and now counts over 60 members. ICRI's objectives are to encourage the adoption of best practice in sustainable management of coral reefs and associated ecosystems, build capacity and raise awareness at all levels on the plight of coral reefs around the world. In light of these objectives, ICRI renewed its Call to Action and Framework for Action at its 28th General Meeting in 2013. Although the Initiative is an informal group whose decisions are not binding on its members, its actions have been pivotal in continuing to globally highlight the importance of coral reefs and related ecosystems to environmental sustainability, food security and social and cultural well-being.
www.icriforum.org

Délégation Permanente auprès des Organismes Internationaux à caractère scientifique, environnemental et humanitaire
The Permanent Delegation to the International Organisations of a Scientific, Environmental and Humanitarian Nature acts inside the Department of International Affairs on foreign affairs and cooperation. As such, it is responsible for: (1) Making preparations for the Principality to join a variety of UN bodies and other multilateral environmental fora, and for participating in these bodies; (2) coordinating the participation of other government departments in these international entities; (3) Relations between government departments and some intergovernmental international organisations with headquarters in the Principality (the UN Environment Programme (UNEP), the Convention on Migratory Species (CMS); the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), Agreement on the Protection of the Marine Environment and Coastal Zone of the Mediterranean Sea (RAMOGE), etc.); (4) Managing non-statutory, voluntary involvement in certain multilateral bodies; and (5) Overseeing cooperation in regional multilateral actions supported by the Principality (such as the Eastern Pacific Marine Corridor, the Palau Sanctuary, the Polar Regions, RAMOGE, Pelagos Sanctuary Agreement, the International Coral Reef Initiative, the Sargasso Sea declaration, etc.).
www.gouv.mc

Chagos Conservation Trust (CCT)
The Chagos Conservation Trust is an independent NGO whose members have been central to both the research and conservation of the archipelago and providing advice to the government. Together with several leading NGOs and science societies, CCT formed the Chagos Environment Network (CEN), which, in 2010, succeeded in persuading the government to create the BIOT Marine Reserve. Members of CEN included the Chagos Conservation Trust, the Royal Society, the Zoological Society of London, the Royal Botanic Gardens Kew, the Royal Society for the Protection of Birds, the Linnean Society of London, the Marine Conservation Society, the Pew Environment Group and Professor Charles Sheppard.
www.chagos-trust.org

Woods Hole Oceanographic Institution (WHOI)
Woods Hole is an internationally renowned research engineering and education organisation focused primarily on the marine environment. With a staff of over 1,000 people including approximately 150 scientists and engineers, WHOI is the largest private oceanographic facility in the world. Founded in 1930 at the behest of a National Academy of Sciences Committee on Oceanography through a gift from the Rockefeller Foundation, WHOI has been at the forefront of ocean science and engineering since its inception.
www.whoi.edu

Robertson Foundation
The Robertson Foundation is a private foundation established in 1996 by Tiger Management founder Julian H. Robertson Jr., his wife, Josie, and their family. The foundation takes a targeted, businesslike, results-oriented approach to philanthropy. The foundation makes large, transformative grants. Its objective is to leverage these grants by partnering with proven grantees and aligned funders. It seeks measurable outcomes in either the intermediate or longer term.
www.robertsonfoundation.org

Acknowledgements

Acknowledgements cont.

Peer Reviewers

The next generation of resource managers perpetuate important cultural practices in Papahānaumokuākea. © Jamie Makasobe

Abbreviations and acronyms

ABNJ	Areas Beyond National Jurisdiction
AFP	Australian Federal Police
AIMS	Australian Institute of Marine Science
AUVs	Autonomous Underwater Vehicles
BIOT	British Indian Ocean Territory (UK)
BMPs	Best Management Practices
CBD	Convention on Biological Diversity
CDPP	Commonwealth Director of Public Prosecution
CI	Conservation International
CIMP	Cook Islands Marine Park
CMP	Conservation Measures Partnership
COP	Conference of the Parties
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
DSM	Deep Sea Mining
DSS	Decision Support Systems (DSS)
EBSA	Ecologically or Biologically Significant Marine Areas
ECD	Electronic Controlled Device
EEZ	Exclusive Economic Zone
EMC	Environmental Management Charge
ERAs	Ecological Risk Assessments
FLECs	Future Leaders Eco Challenges
FWS	United States Fish and Wildlife Service
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park (Australia)
GBRMPA	Great Barrier Reef Marine Park Authority
GEF	Global Environment Facility
GIS	Geographical Information Systems
GPS	Global Positioning Systems
HINWR	Hawaiian Islands National Wildlife Refuge (U.S.)
IAP2	International Association for Public Participation
ICC	Inter-agency Coordinating Committee
ICMMPA	Committee on Marine Mammal Protected Areas
ICOMOS	International Council on Monuments and Sites
ICRI	International Coral Reef Initiative
IMMA	Important Marine Mammal Areas
IMO	International Maritime Organization
IT	Information Technology
IUCN	International Union for Conservation of Nature and Natural Resources
IUU	Illegal, Unreported and Unregulated
KAP	Knowledge, Attitudes and Practices
KBA	Key Biodiversity Area
LAN	Local Area Network
LMMA	Locally-Managed Marine Area
LSMPA	Large-Scale Marine Protected Area
LTMP	Long-term monitoring programme
MANWR	Midway Atoll National Wildlife Refuge (U.S.)
MARXAN	Software designed for use in systematic reserve design in conservation planning, fusing MARine, and speXAN, itself an acronym for Spatially Explicit Annealing
MCS	Monitoring Control and Surveillance
MELAD	Ministry of Environment, Lands and Agricultural Development (Kiribati)
MMB	Marine Management Board
MMHMP	Motu Motiro Hiva Marine Park (Chile)
MNP	Marine National Park Zone
MPA	Marine Protected Area
MSP	Marine Spatial Planning
MTMNM	Marianas Trench Marine National Monument (U.S.)
NEAQ	New England Aquarium
NGO	Non-governmental organisation
NMSF	National Marine Sanctuary Foundation
NOAA	National Oceanic and Atmospheric Administration (U.S.)
NWHI	Northwestern Hawaiian Islands

Abbreviations continued

NWHICRER	Hawaiian Islands Coral Reef Ecosystem Reserve
OHA	Office of Hawaiian Affairs
ONMS	Office of National Marine Sanctuaries (U.S.)
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention), short for Oslo and Paris
PCA	Project Cooperation Agreement
PDF	Portable Document Format
PIPA	Phoenix Islands Protected Area (Kiribati)
PMNM	Papahānaumokuākea Marine National Monument (U.S.)
PNMS	Palau National Marine Sanctuary
PRIMNM	US Pacific Remote Islands Marine National Monument (U.S.)
REA	Rapid Ecological Assessment
SEA	Sea Education Association
SIDS	Small Island Developing States
SMART	Specific, Measurable, Achievable, Realistic and Time-bound
SOC-MON	Global Socioeconomic Monitoring Initiative for Coastal Management
SPREP	Secretariat of the Pacific Regional Environment Programme
SSC	Scientific Steering Committee
TUMRA	Traditional Use of Marine Resource Agreement
UAVs	Unmanned Aerial Vehicles
UH	University of Hawaiʻi
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USCG	U.S. Coast Guard
VMS	Vessel Monitoring Systems
WCC	IUCN World Conservation Congress
WCPA	IUCN World Commission on Protected Areas
WIO	Western Indian Ocean

REMINDER: Another listing of Big Ocean member site name acronyms can be found within Table 1 on pages xiv-xv.

Executive summary

Large-scale marine protected areas: an indispensable tool for healthy oceans

The Earth's oceans continue to face significant, pervasive threats such as overfishing, habitat destruction and pollution. In addition, climate change, inclusive of sea temperature rise and ocean acidification, is altering the Earth's marine ecosystems in ways we may not fully understand for decades. Profound ecological changes are occurring and will continue to have a negative impact on the oceans, their resources and the people and communities whose very survival depends on the sea. In the face of these challenges, there is an urgent to need not only to 'go big' with our marine conservation efforts, but to do so in ways that increase and strengthen models of best practice management across MPAs at all scales. LSMPAs are important components of local, regional and international strategies aimed at comprehensively improving the efforts and outcomes of protected area networks and marine conservation globally (*see* Box 1 and 2)**.**

LSMPAs defined

For the purposes of these Guidelines, LSMPAs are areas greater than 150,000 km^2. Based on research conducted by Big Ocean on the actual sizes of LSMPAs worldwide, just prior to launching the network in 2010, this size and extent served as a practical starting point to bring together managers whose needs were similar in scope and scale. Very large MPAs are certainly not more important than smaller ones, but many of their needs, challenges and benefits differ. The current definition is intended to make LSMPA design and management targeted and effective rather than to exclude other MPAs from benefitting (*see* Box 1 for additional information).

In governance terms, LSMPAs are currently established by national governments but can include state, provincial, or local governments in collaborative management with NGOs, research institutions, communities and other relevant organisations.

How are they distinctive?

LSMPAs are distinctive from smaller MPAs in several ways. Some examples are:

- Encompass entire marine ecosystems and ecological processes.

- Encompass areas large enough to protect critical habitats of many migratory species.

- Exemplify a precautionary approach in the face of major climatic uncertainties.

- Act as living laboratories and provide scientific baselines that can increase our understanding of the differences between local and global stressor.

- Protect extensive cultural spaces, such as traditional voyage routes.

Why are they globally important?

Beyond the numerous ecological, economic and cultural benefits that LSMPAs provide, they are our greatest hope for achieving marine conservation goals such as the Convention on Biodiversity's Aichi Target 11, which calls for at least 10% of marine and coastal areas to be conserved. The size of LSMPAs accentuates their inter-governmental and global significance; they can often affect international marine policies in ways that smaller scale MPAs cannot. The UN and other international groups are exploring the possibility of establishing MPAs on the high seas in areas beyond national jurisdiction, clearly signaling that large-scale marine conservation is of global importance.

Creating a starting point

Though the past two decades have seen an increasing call for marine protection on a larger scale, there are limited examples of effective long-term governance and management models at scale to use as models.

By combining lessons from both mature and recently established LSMPAs, these Guidelines provide a starting point from which current managers can build, and are intended to complement current resources for MPA managers. Beginning in Chapter 1, with the connection between equitable and effective governance and successful ongoing management, the chapters that follow lead the reader from the first stage of site design through active management and evaluation. We recommend reviewing each chapter to understand how phases are interrelated.

The field is still evolving

Because guidance for the design and management of LSMPAs is still in development, and the needs of existing sites are not necessarily consistent, the advice provided should not be seen as final. These processes do not need to be implemented in a linear fashion, and many of the strategies and tools outlined will need to be, or should be, employed repeatedly in order for management to be sustainable and remain adaptive.

Benefits and challenges

Based on information from current members, establishing an LSMPA can:

- Promote and preserve biodiversity across entire ecosystems.

- Protect entire cultural landscapes/seascapes, perpetuate cultural practices and provide windows into environments that have inspired and sustained previous generations.

- Enhance food security by supporting commercial as well as artisanal fishers, and protect essential habitats from overfishing.

- Support international cooperation and the sharing of resources to enhance management and research.

- Enhance protected area networks and comprehensive national conservation strategies.

Existing managers consistently cite the following challenges. It can be difficult to:

- Achieve effective jurisdiction and interagency coordination.

- Maintain sufficient budgets and develop viable sustainable financing plan.

- Address stakeholder rights, including those of Indigenous peoples and local communities.

- Conduct consistent, ongoing research and monitoring.

- Provide surveillance and enforcement.

Good design is essential

Chapter 2 advises designing an LSMPA as a series of interrelated steps that should be thoughtfully planned and executed. If the extent of a possible LSMPA has yet to be chosen, Devilliers, et al., (2015) recommend a four-step framework for planners and policy makers to maximise the effectiveness of MPAs for conservation and to minimise any tendency to choose 'residual' protected areas.

The experiences of the most seasoned LSMPA managers show that addressing the internal and external needs of a site in parallel is the best way to ensure that a site's purpose and the mission of management are complementary and achievable.

Key considerations:

- Assess the most critical needs and hire qualified staff early on.

- Make hiring a qualified science or research coordinator a priority.

- Build partnerships or at least establish a foundation to do so later.

- Assess the relationship between governance and management entities, and cultivate positive working relationships early on.

- Utilise existing legislation first, but also ensure that other options are clearly understood by those working to develop new legislation or regulations.

- Characterise the biophysical and social science aspects of the site in parallel.

- Employ systematic conservation strategies and adaptive management practices.

- Engage with empathy, and listen carefully, to those whose livelihoods, cultural practices and heritage are associated with the site.

- Be thoughtful in developing communications and outreach materials for the site, as the messages initially offered to the public will likely be permanent.

Management planning

The design phase should provide the blueprint or framework for developing an effective management planning process and final document that reflects the values and perspectives of both management and the wider community. This is often accomplished through an integrated coastal management or marine spatial planning

approach that involves all of the stakeholders. The planning should involve an environmental impact assessment that includes a cultural landscape or seascape approach. Chapter 3 explores important elements of management planning and the logistical considerations that should be made when developing a timeline for individual elements as well as the overarching process.

A timeline for management planning for an LSMPA should be tailored to the political and social complexities of each area. Experience shows that it is not unusual for planning to take several years or longer. The scale of LSMPAs means there is usually a much larger group of rights-holders and stakeholders involved. The importance of effectively engaging the public, including mandatory public comment periods for draft management plans, calls for revisiting timelines on a consistent basis (e.g. quarterly).

Elements that may affect the timing of a management plan include:

- Political uncertainties, including a change in administration.

- Multiple meetings (or a similar substantive public scoping process) to adequately address a large stakeholder base, including rights-holders, Indigenous peoples and local communities.

- Public comment periods for the draft management plan.

- Gathering sufficient scientific data.

- Defining rights of access and delineating use (zoning).

- Addressing the often-conflicting requirements of multiple management agencies.

- Review and final approval of the plan.

Some of the most important considerations specific to developing the plan itself are the need to:

- Involve key stakeholders and the public early on; identify and build working relationships with both supporters and detractors.

- Hire or partner with professional facilitators; the issues surrounding a site are complex and there is a likelihood for conflict to arise; therefore many issues are better managed by a neutral party.

- Address rights-holders' issues early and directly.

- Write vision and mission statements in a way that articulates the value of the site to humanity.

- Develop a research plan that includes Indigenous and local knowledge systems, as well as scientific systems.

- Develop goals, objectives and strategies to be flexible enough to accommodate changing priorities over time.

Managing LSMPAs

While the principles of good management for MPAs of all scales are similar, the guidance outlined in Chapter 4 is a mix of scientific insights coupled with the experiences of the world's current LSMPAs. It is important to note that all but three existing LSMPAs have less than a decade of management experience. As such, active management will require using these Guidelines along with self-judgment, existing guidance from smaller scale sites, personal

experience and input from others with specific knowledge about the LSMPA in question.

Helpful process principles to apply:

- Keep an open mind when approaching management activities and recognise that nearly all activities take longer than planned. Set realistic expectations and time horizons and revise as necessary throughout the implementation process.

- Be prepared and willing to engage in international affairs and diplomacy, including building international political and management partnerships, especially if a site includes transboundary waters.

- Grow and strengthen partnerships that provide financial and technical capacity, as needs in these areas may likely arise, particularly within developing countries where the lack of these capacities may inherently constrain implementation.

- Remain open to change and consider new ways of working and balancing competing priorities, particularly given funding and human resource limitations.

- Consider the use of advisory councils for stakeholder involvement at all stages.

In terms of daily operations and ongoing management activities, priorities should include:

- Make an effort to sustain political will; maintain good relationships and communication channels with decision makers and elected officials.

- Develop regulations to carefully establish or complement legislation in order to avoid polices that can complicate management.

- Develop effective internal administrative systems.

- Prioritise data management and storage.

- Minimise staff turnover, hire committed individuals and invest in ongoing staff development.

- Create informational materials that are clear and easily understood. Doing so will emphasise the value and importance of the site.

- Create a quality collection of high-impact visuals (e.g. photos, illustrations).

- Provide media training to all staff and partners, especially around contentious or complex issues.

- Develop and maintain partnerships for all areas of management.

- Encourage user compliance in combination with surveillance and enforcement efforts.

Singleton & Roberts (2014: 9) point out that LSMPAs "…benefit from both economies of scale and centralised governance to coordinate policing efforts, which potentially render enforcement cheaper and more effective".

Comprehensive evaluation

Among the small number of LSMPAs currently in operation, most are either still in the design or management planning phase and/or have yet to attempt performance measurement. At the time these Guidelines were being written, only two LSMPAs (GBRMP, PMNM) had sufficient management experience and longevity to allow for iterative attempts at measuring management effectiveness. Therefore, our guidance is based on limited experience of these two sites and should be regarded as preliminary.

When developing evaluation measures for LSMPAs, performance must be measured within commensurate temporal and spatial scales. Working on a larger scale means increased logistical challenges in consistent monitoring over a wide geographic area and over time, as well as higher field costs for management activities.

LSMPAs can serve as sentinel sites for understanding global-level changes that often occur over long periods of time, so despite the long-term commitment required to create substantive evaluation and monitoring protocols, the outcomes have relevance for global conservation efforts in the broadest sense.

Assessing the social processes associated with LSMPAs is critical. A number of methods and frameworks exist for this (e.g. Schreckenberg, et al., 2010), though none of these have been applied in the context of LSMPAs to date. Social impact assessments and collaborative initiatives and research are being developed for large MPAs.

Measuring performance is vital for assessing the condition of natural and cultural resources of a site, as well as the effectiveness of management activities. Regardless of scale, to measure performance it is important that the site:

- Builds a multidisciplinary evaluation team that includes external stakeholders to bring transparency and integrity to the process.

- Carefully considers performance indicators that are methodologically sound and repeatable. Doing so is essential for consistent monitoring over decades.

- Commit to fixed evaluation cycles to encourage consistent measurement and evaluation of the site.

Examples of successful management can be seen at several LSMPAs in the Pacific that have collaborated to achieve their management and scientific goals. These include bilateral agreements and learning exchanges, as well as research, monitoring and enforcement activities. By working together, Pacific LSMPAs have been able to overcome some of the management and scientific challenges associated with conserving vast areas of the oceans (Friedlander, et al., 2016).

Using the Guidelines

What to expect

Regardless of whether readers are new to large-scale marine management or seasoned professionals, the hope is that these Guidelines provide valuable insights and new perspectives (*see* Table 2). General advice and real-world examples in the form of short case studies are provided. However, due to the fairly recent history of LSMPAs – as well as their small number, diversity of experience and the need for the field to mature – the examples are drawn mainly from Great Barrier Reef Marine Park and Papahānaumokuākea Marine National Monument. In addition, managers should consult the full range of existing advice and best practice management standards should be considered and used in parallel with this publication (*see* Boxes 1 and 2 for additional resources).

Where does the guidance come from?

Of all LSMPAs globally, 16 are member sites of Big Ocean (at the time of publication). The management teams of these sites utilised the support of the network to develop this publication in order to share lessons learned. However, guidance is given generally and applicable to all LSMPAs. To assist in locating the LSMPAs that contributed to these Guidelines (*see* Figure 1 and Table 1).

Referencing LSMPAs

Although the full names of the LSMPAs mentioned will be used, in most cases the areas are referenced by acronym.

Table 1 and the abbreviations and acronym list (pages xix-xx) provide both sets of information.

Table 2. Purpose of these Guidelines

These Guidelines are…	These Guidelines are not…
… focused on the big-picture process for practical use, even by new managers	… highly technical or detailed
… a reflection of best available practice in LSMPAs; real-world experience plus technical expertise	… comprehensive/shared experience across all MPA sizes
… mostly based on experience from LSMPAs in the developed world	… equally grounded in both developing and developed world experience
… a living document, subject to change	… perfect guidance that is fully developed or accepted
… supportive of the critical and complementary value of smaller MPAs	… advocating or promoting larger MPAs over smaller ones
… flexible and capable of being applied in multiple ways	… rigid and linear, requiring a specified process for application

Box 1

What is an LSMPA?

How big is 'big'? At the time Big Ocean was launched, research was conducted on the actual size of LSMPAs globally. Using various databases, there was natural clustering of LSMPAs that were 100,000 square kilometers or less and those that were 100,000 square miles or more. The clear dividing point was between the five largest existing and two proposed areas, and the eight next largest areas. Ultimately, 150,000 km^2 is the size of the smallest LSMPA that falls within these general parameters. **It is important to note that this figure was a practical starting place to help focus the efforts of Big Ocean.**

Big Ocean's definition also includes the condition that LSMPAs are *"actively managed for protection across the entire geographic extent of the area … the term does not apply to geographic designations of habitat, foraging areas or harvest restrictions that are not also accompanied by a corresponding management regime, agency or consortium of agencies." (Big Ocean 2013)* This definition was chosen for a variety of reasons but mainly to emphasize active management. As a network by and for protected area managers, Big Ocean aims to enhance standards of best practice and to work with others who are endeavouring to do the same in order to achieve the purposes and goals of their respective LSMPAs, not to promote LSMPAs or grapple with the various definitions.

Other useful resources

As these Guidelines are meant to build upon existing guidance, it is critical for those with an interest in improving large-scale marine governance and management to draw from the full suite of relevant resources and to utilise information and strategies that will improve both the biophysical and the sociocultural components of LSMPAs.

Following are some key resources for managers working at any scale:

- Kelleher and Kenchington (1992) Guidelines for establishing MPAs.

- Kelleher (1999) Guidelines for MPAs.

- Salm, et al. (2000) Marine and coastal protected areas: a guide for planners and managers

- C. R. Margules & R. L. Pressey (2000) 'Systematic Conservation Planning'.

- Hockings, M., Stolton, S. and Dudley, N. (2000) Evaluating Effectiveness: A Framework for Assessing the Management of Protected Areas. IUCN.

- Thomas, Lee and Middleton, Julie, (2003) *Guidelines for Management Planning of Protected Areas*. IUCN.

- Pomeroy, R.S., Parks, J.E. and Watson, L.M. (2004) *How is your MPA doing?*

- Fernandes, et al., (2005), Establishing representative no-take areas in the Great Barrier Reef: large-scale implementation of theory on marine protected areas.

- Leslie (2005), Synthesis of Marine Conservation Planning Approaches.

- Federal Geographic Data Committee's (FGDC) Marine Boundary Working Group (2006) *Marine Managed Areas: Best Practices for Boundary Making.*

- IUCN-WCPA (2008) *Establishing resilient marine protected area networks: making it happen.*

- Day, et al. (2012) *Guidelines for applying the IUCN protected area management categories to marine protected areas.*

- Green, et al., (2013) *Designing MPA networks to achieve fisheries, biodiversity and climate change objectives in tropical ecosystems: a practitioner guide.*

- Supplement of the Aquatic Conservation: Marine and Freshwater Ecosystems journal: Building Networks of MPAs: new insights from IMPAC 3 (2014) Regional Conservation Resources.

- Day, JC, Laffoley, D. and Zischka, K. (2015) Marine Protected Area Management. Chapter 21 in Protected Area Governance and Management (2015), pp. 609-650. Australian National University Press, Canberra.

- Worboys G.L., Lockwood M., Kothari A., Feary S., and Pulsford I. (2015). (Eds) *Protected Area Governance and Management.* 966 pages, Australian National University Press, Canberra, Australia.

- Groves, C.R., and E. T. Game. (2016). *Conservation Planning: Informed Decisions for a Healthier Planet.* MacMillan Publishers.

Note: *see* Box 13 for resources specific to social and cultural aspects of establishing MPAs.

"Our advice to managers and communities is to keep an open mind, do the best they can with the resources they have, and remember their passion for the ocean."

– BIG OCEAN PLANNING TEAM

Important resources and adaptive planning processes

Although the guidance outlined in this document is presented in a linear fashion (i.e. first design, then planning, then management and eventually, evaluation), every site will follow its own progression. Managers (and stakeholders when applicable) will need to cycle back through various aspects of the design and management process such as public engagement, again and again, over time. Some current LSMPAs have actually been developed in an unplanned, adaptive manner without the benefit of design and management guidance. Even with guidance, it is likely that the development of these areas will have to be adapted to the prevailing conditions.

In terms of planning at the site level, management teams will need to continually assess the available resources and capacity relative to their highest priority needs and goals. Table 3 provides a quick reference to the most common tools that Big Ocean site managers consider important at various points in design and management.

Table 3. Overview of the important tools that complement the five basic processes in the LSMPA management cycle. For a more detailed table that connects management needs with specific sections of these Guidelines, please *see* Appendix 2 and the Index.

	1: DESIGN Create a site with a clear purpose and mission	2: PLAN Develop management strategies & activities	3: IMPLEMENT On-the-ground operations	4: EVALUATE Assess management effectiveness	5: LEARN Document and share lessons; remain adaptive
Management Tools					
Admin and operations	●	●	●	●	●
Enabling legislation	●	●	●		
Policy	●	●	●	●	●
Public engagement	●	●	●	●	●
Communication/ community awareness	●	●	●	●	●
Partnerships	●	●	●	●	●
Scientific research	●	●	●		
Compliance		●	●	●	●
Site planning		●	●		●
Monitoring			●	●	
Restoration/Ecological Stewardship		●	●	●	
Impact assessment		●	●	●	
Permits and licenses		●	●	●	
Economic instruments and valuation		●	●		

Adaptive and systematic planning

Managers from the LSMPAs that contributed directly to these Guidelines are finding that adaptive, systematic planning processes should be used throughout the full spectrum of management – such as raising community awareness in the design phase, developing a stand-alone plan in the management planning phase, or creating the framework for ongoing outreach activities as a site matures. Adaptive planning processes are cyclical, seek to engage multiple perspectives, and offer repeated opportunities for review and refinement of a project or strategy's purpose, objectives and outputs.

One good planning example (Figure 2) is from the Open Standards for the Practice of Conservation by the Conservation Measures Partnership (CMP), a consortium of conservation organisations that has developed a set of Open Standards to aid conservation project management. These Open Standards have been designed to act as a roadmap for conservation actions, with the goal of increasing the effectiveness of conservation projects. Although Open Standards are represented graphically as a cycle, we suggest thinking about the project management process as iterative and dynamic.
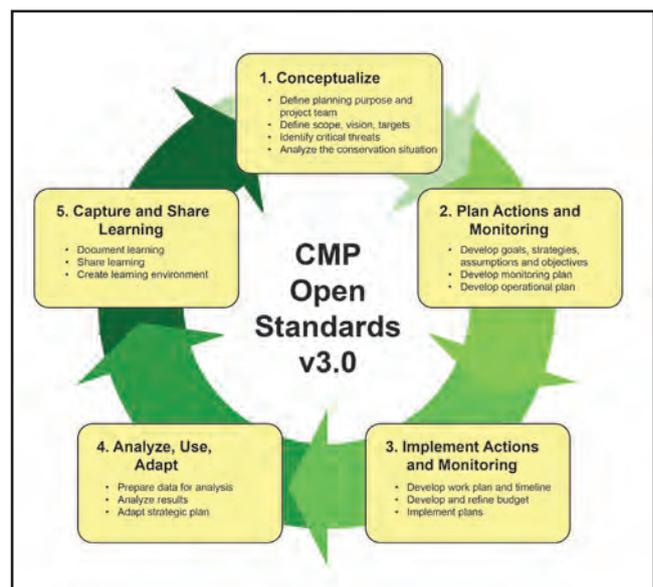
Figure 2. Conservation Measures Partnership Open Standards Process

Each step in Figure 2 has numerous sub-steps and the diverse nature of conservation projects and conservation actions necessitates that adaptation from Open Standards may be required. CMP has concluded that throughout every step of the Open Standards process, a set of general principles should be followed that includes involving stakeholders, developing and cultivating partnerships, embracing learning, documenting key decisions and adjusting as necessary.

Suggested steps for developing an LSMPA site management plan include Step 1: create the plan's overarching framework; Step 2: develop objectives, activities and initial work plans that consider the capacity of the planning team; Step 3: refine work plans, cost and time requirements; Step 4: assess the plan and seek internal review; and Step 5: share the plan publicly, allow document input and prepare to repeat the process, as the planning team conceptualises the next version of the plan based on feedback and moves into the second step once a full analysis is made.

For updated versions of materials that support the *Standards* and for more information about CMP, please go to the website: www.conservationmeasures.org. CMP also encourages feedback from anyone who uses these Open Standards – please send e-mail to: CMPinfo@conservationmeasures.org.

"Not everyone is naturally good at project management and budget tracking, but having staff with these skills is vital to creating successful outcomes over time and sustainability for management. Investing in building staff capacity in these areas is priceless."

– MOANI PAI, PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT

1
Introduction

1.1   Governance sets the foundation

To better understand the role of governance in LSMPAs it is important to look at the past two decades, which have seen an increasing call for marine protection (*see* Box 3), especially at larger scales (*see* Section 1.3) and including the high seas (marine areas beyond national jurisdiction, or ABNJs). Operating at a large-scale offers a range of potential benefits that include, but are not limited to, the protection of entire ecosystems and vital ecological processes, the creation of refuges for migratory species, a buffer for habitat shifts that may occur as a result of climatic changes, and the preservation of pristine areasthat

erve as scientific baselines for identifying stressors and levels of degradation in the marine environment. Due to these benefits, support for large-scale marine protection is increasing in numerous scientific studies, consensus statements, international agreements and their supporting declarations, as in the conservation literature, including best practice handbooks.

An increasing number of scientific papers have also reviewed the reasons why LSMPAs are needed, why they must be included, and the criteria for ensuring that they will function as intended (e.g. Claudet, et al., 2008; Graham and

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Box 3

Defining marine protected areas

At one time IUCN recognised that, at a minimum, an MPA must meet the following definition of a protected area: A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (IUCN, 2008).

IUCN currently recognises that in some cases, the following types of marine-managed areas may not necessarily qualify as MPAs (Day, et al., 2012), though it is noted that many areas will have several objectives:

- Fishery management areas with no wider stated conservation aims.

- Community areas managed primarily for sustainable extraction of marine products.

- Marine and coastal management systems managed primarily for tourism.

- Wind farms and oil platforms that incidentally help to build up biodiversity around underwater structures by excluding fishing and other vessels.

- Marine and coastal areas set aside for other purposes but that have an indirect conservation benefit (e.g. military training areas, disaster mitigation zones, communications cable and pipeline protection areas, shipping lanes).

- Large areas (e.g. regions, provinces, countries) where certain species are protected by law across the entire region.

There is increasing recognition of areas that are managed through voluntary and ancillary conservation efforts (*see Governance of Protected Areas*, IUCN Best Practice Protected Area Guidelines Series No. 20, for further detail). These may fall within the definition of a protected area, or they may complement other protected areas in the wider coastal and marine system, a core aspect of achieving Aichi Target 11. As our knowledge and experience with MPAs increases, it is likely that we will have a much better collective understanding of the full range of objectives and the ways in which diverse MPAs contribute to conservation.

Large-scale MPAs like PIPA protect important ecosystem-level functions, including preserving unique habitat and promoting biodiversity.
© Keith Ellenbogen and New England Aquarium

McClanahan, 2013; Edgar, et al., 2014; White and Costello, 2014). The biological effects and benefits of LSMPAs have been demonstrated both in general terms and for specific instances (e.g. Lester, et al., 2009; Sheppard, et al., 2012). As with smaller MPAs, very large sites improve biodiversity and productivity of the systems included within them, providing sources and reservoirs of many species of importance. It is widely understood that a lack of protection leads to significant and sometimes rapidly depleted resources (Fenner, 2014), and that pelagic areas, which have too often been neglected or under-represented in protected area systems, are as crucial as the sometimes more iconic shallow areas (e.g. Game, et al., 2009).

Calls for increasing marine protection abound. The most influential is the Convention on Biological Diversity's **Aichi Target 11** (*see* Box 4). In 2010, the Parties agreed to protect at least 10% of the world's marine and coastal ecoregions by 2020. With just 3% of the world's oceans currently protected,

in Harmony with Nature, 2013). Not only did the rate of establishment increase, but so did the size and scale of MPAs. The more recently established LSMPAs are near or exceed 1,000,000 km^2, three times larger than the Great Barrier Reef, Papahānaumokuākea Marine National Monument and the Phoenix Islands Protected Area (*see* Table 1). On 19 June 2015, the UN General Assembly (UNGA) started the process to develop a treaty for the conservation of marine biodiversity on the 'high seas' that will likely include conservation measures such as marine protected areas (UNGA Resolution 69/292).

LSMPAs continue to be proposed by both governments and NGOs worldwide; as these vast areas are formally established, progress toward global conservation targets will be closer to attainment. It is critical, however, that long-term management plans, grounded in best practice management standards, are developed and implemented to ensure that these gains in conservation areas translate into meaningful conservation outcomes and benefits that can be felt in the daily lives of the communities most closely connected to these LSMPAs.

The 2016 World Conservation Congress in Hawai'i passed a motion (Motion 053), part of which encourages IUCN State and Government agency members to designate and implement at least 30% of each marine habitat in a network of highly protected MPAs, with the ultimate aim of creating a fully sustainable ocean at least 30% of which has no extractive activities by 2030.

Governing human activities in the world's oceans has evolved significantly during recent decades and has shifted from an approach that generally lacked conservation objectives to one that is now supporting an ecosystem-based management approach, even for areas located in the high seas (e.g. Crowder, et al., 2006) (*see* Box 5). This shift, as well as increased international best practice guidance for effective and equitable governance, has been a key driver in the establishment of global-level targets and the furthering of international marine resource laws, particularly in the form of international conventions (e.g. the International Maritime

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Box 4

Aichi Target 11

By 2020, at least 17% of the world's terrestrial and inland water areas and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape (CBD Decision X/2 (2010).

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effective conservation, cross-sector partnerships and LSMPAs will play a critical role in achieving this target.

Many believed Aichi Target 11 to be overly ambitious; at the time, MPAs of all scales encompassed only about 1% of marine habitats (Wood, et al., 2008; Toropova, et al., 2010; Marinesque, et al., 2012; Spalding, et al., 2013). However, momentum quickly began building around large-scale marine protection efforts. The trend in scaling-up marine protection has continued and has been highlighted as a fundamental part of the marine conservation strategy (Secretariat for the Convention on Biological Diversity 2012, Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets: Living

> "By 'going big' with marine protection we are evolving our nations' thinking and practices relating to ocean governance."
>
> **– SUE TAEI, CONSERVATION INTERNATIONAL**

Box 5

What is governance? Why is it important?

Principles of good governance are critical at any scale. Governance refers to who makes decisions and how those decisions are made. Governance also describes who has the influence, authority and accountability with respect to the rights of all legitimate parties. Governance is important within the management framework for a protected area from planning and design through implementation. Ensuring that all governing entities are committed to the core purpose and goals of an MPA is important in effective and equitable management (Jones, et al., 2011). A number of publications, particularly IUCN Guidelines No. 20 (Borrini-Feyerabend, et al., 2013), provide a comprehensive review of these principles more broadly in the context of protected areas.

Working towards effective and equitable management of MPAs requires governance systems that are also effective, inclusive, diverse and vibrant. Decisions must consider both the ecological and social aspects of the conservation initiative. Ultimately, governance can be

the main variable that determines whether countries will be able to expand the coverage and effectiveness of their protected areas and other conservation measures (Borrini-Feyerabend, et al., 2013).

Governance within the context of the high seas is also an important consideration for working with LSMPAs. Of the world's oceans, 64% are in areas beyond the reach of national laws. The future of marine protection across important biological and ecological areas of the oceans will require cooperation amongst nations. For several years, the Convention on Biological Diversity (CBD) has supported a process to identify ecologically and biologically important areas in national and international waters that meet international criteria (*see* www.cbd.int/ebsa). Shared governance of the significant marine resources and ecosystems in our oceans will help support functional processes for the health of the marine realm and all of us who rely on it for subsistence, cultural, economic and other reasons.

Organization Convention and the UN Convention on the Law of the Sea). Coastal nations have also begun to more effectively govern and sustainably manage larger portions of their EEZ.

Only a **few direct examples of long-term effective governance and management models exist at scale** in the relatively recent history of LSMPAs (*see* Table 1). Looking to the terrestrial realm for examples can be helpful, as conservation practices have existed in these protected areas for over a century. However, it may be too early to develop definitive governance models as the purposes and objectives of existing LSMPAs are transitional, and sites are increasingly prioritising the perpetuation of cultural practice and community welfare. While early LSMPAs, like Papahānaumokuākea, were designed as co-managed, no-take protected areas, newer proposals are integrating community governance to a far greater extent, and are zoned as mixed-use areas, containing both large no-take areas and areas where fishing and other human uses are regulated.

LSMPAs are not a panacea. Based on the experience of marine managers who have worked at scale for at least a decade, marine governance and management of these areas can be challenging. They can overlay multiple jurisdictions and community and customary boundaries and can impact access to important natural and cultural resources, as well as affect cultural practices and livelihoods in ways that smaller scale MPAs do not. Some have also argued that the flaws of target-driven conservation are exacerbated in very large areas, especially in situations where countries with overseas territories scale up their marine protection in far-off locations to avoid the more contentious and challenging task of designating areas closer to home (De Santo, 2013). However, LSMPAs will often be designed for areas that are relatively remote because they are not subject to as much exploitation, industry and development. These Guidelines emphasise appropriate size, scale and placement in parallel with comprehensive, quality management that is keenly aware of challenges and long-term commitments. Despite the challenges, LSMPAs can provide unique benefits and help reach global targets in meaningful ways when developed within the context of an overarching national or regional ecosystem-based approach to ocean governance that includes managing society's interactions within ecosystems (Wilhelm, et al., 2014).

For LSMPAs that require formal establishment through national legislation, managers may have little influence on the overarching governance mechanisms affecting the areas, but they can and should **cultivate strong, positive relationships with governing entities**. Based on the experience of current LSMPA managers, it may also take more time than anticipated to develop and effectively implement regulations and policies that comprehensively support governance, management and the wider community. The key is for all players to commit to effective and equitable governance and management that seeks to conserve biodiversity in parallel with influencing, for the better, the economic, social and political drivers that affect ecosystem management, nature-based livelihoods, and the rights and responsibilities for nature (IUCN, 2012).

1.2   Management at a large-scale

The perception that LSMPAs are not a realistic management tool for developing countries is challenged in practice, as evidenced by the Phoenix Islands Protected Area in Kiribati and Marae Moana in the Cook Islands.

> "In our Pacific Islands Ocean region the ocean unites and divides, connects and separates, sustains and threatens our very survival. For all those who venture within this, the world's largest ocean, and who have made it their home, the ocean influences every aspect of life. It has done so for millennia."
>
> **– ANOTE TONG, PRESIDENT OF KIRIBATI**

At an ecosystem level, LSMPAs can:

- **Promote conservation** through the protection of a greater diversity of genes, species, habitats and ecosystems (Lester, et al., 2009).

- **Encompass entire ecosystems and a greater diversity of seascapes** (e.g. pelagic and deep benthic habitats), characteristics typically not shared with smaller areas (Sheppard, et al., 2012).

- **Include significantly larger areas where the impacts of humans are minimised**, thus providing resilience from global stressors such as climate change (*see* Box 6) (Micheli, et al., 2012).

- **Contain relatively pristine, regionally or globally relevant ecosystems,** which serve as natural laboratories, sentinel sites or scientific baselines that can be used to assess the status of ecosystems in more populated and impacted areas (Friedlander & DeMartini, 2002; Sandin, et al., 2008; Sheppard, et al., 2008).

- **Encompass larger-scale ecological processes**, such as connectivity (migratory corridors, larval recruitment), and harbour entire life cycles of many species (Koldewey, et al., 2010; Toonen, et al., 2011)

- **Enable differentiation between global (e.g. climate change) and local stressors**, as local stressors are often absent in remote LSMPAs (Knowlton & Jackson, 2008).

> "Broad-scale integrated management is more effective than a series of small, isolated, highly protected areas within a broader, unmanaged area."
>
> **– JON DAY, ARC CENTRE FOR CORAL REEF STUDIES, JAMES COOK UNIVERSITY**
>
>   **(PREVIOUSLY AT GREAT BARRIER REEF MARINE PARK AUTHORITY)**

At a **cultural** level, LSMPAs can:

- **Identify and consider the diverse socio-economic, historical and cultural values** and interests of the public in the area, particularly those of Indigenous peoples and other local communities.

- **Engage and empower connections to a wider diversity of human cultures** that may be overlooked at smaller scales.

- **Provide access to complete cultural landscapes and seascapes**, including heritage that represents the combined works of nature and humans, in order to perpetuate intergenerational traditional practices.

- **Promote local and national food security and nutrition interests** and address related socio-economic issues by supporting artisanal, seasonal and small-scale fisheries, which are rooted in local communities and include long-standing cultural practices, traditions and values.

Large MPAs can help support small-scale fisheries. A fisherman holds up his catch in PIPA. © Cat Holloway

- **Secure livelihood options** that support sustainable national economic development agendas.

- **Increase knowledge** and the public's understanding of ocean systems and the full range of their potential benefits, through the application of biocultural research approaches across entire ecosystems and cultural landscapes.

- **Protect sacred areas or regions**, while also allowing for the perpetuation of spiritual and religious practices.

- **Support national policy interests** relating to the establishment of protected areas and the enhancement of protected area systems for natural and cultural heritage.

- **Enhance a nation's efforts to address wider social and economic issues** (poverty, human rights, tenure, food security, human welfare, gender equity, etc.).

- More **directly reflect comprehensive national policy interests** relating to marine resource management and governance, including spatially defined targets for protection.

- **Contribute to national tenure systems** and provide an opportunity to better understand how to manage natural resources equitably, especially those related to fisheries and sharing of benefits.

- **Encourage nations to assume responsibility** for the protection and management of their marine resources, better control foreign extractive interests (e.g. fishing, oil drilling and mining), and actively contribute to the global management of our oceans

- **Facilitate policy debate and political will** at multiple levels, while also advancing public interest and commitment to marine protection.

Box 6

Addressing climate change at scale

In a 2011 survey of the six founding Big Ocean member LSMPAs (GBRMP, PMNM, PIPA, MTMNM, MMHMP, BIOT), responses from 14 veteran LSMPA managers and scientists showed that the most commonly shared scientific knowledge gaps, as well as the highest priority research themes, included climate change and addressing the unknown effects caused by impending changes in temperature, weather, circulation, ocean water chemistry and sea levels (Big Ocean, 2013).

This information helped managers of these often remote and comparatively pristine ecosystems realise that these areas could and should be used as modern-day baselines for comparison to other time periods and to quantify human impacts in other more populated areas. Through development of a Shared Research Agenda for Large-Scale Marine Managed Areas, managers hope to better understand and utilise the benefits derived from the LSMPAs they care for. As most current LSMPAs do not experience the many local stressors associated with human activities, research on global anthropogenic impacts like climate change would not be compounded by other local anthropogenic impacts. As LSMPAs are far more likely to encompass and protect critical habitat or processes that maintain populations and ecosystem stability, they can also prove to be more resilient to large-scale disturbances like climate change (Toonen, 2013).

Through the Shared Research Agenda, Big Ocean sites hope to identify historic and ongoing data sources from as many member LSMPAs as possible and to synthesise the data. Once the variables are measured and their sampling frequency established, managers will better understand how temporal trends are being quantified at each site. Subsequently, the data can be used to improve the design and management of LSMPAs globally and to enhance management efforts at MPAs of all scales to more effectively adapt to the changes being brought on by climate change.

> "We need to go large, but we must start small and get the support of our people first."
>
> – ALIFERETI TAWAKE, FIJI LOCALLY-MANAGED MARINE AREA NETWORK

- **Support regional collaboration and international cooperation** in ocean management through leveraging resources and aggregating capacity and information.
- **Focus increasing surveillance** and enforcement interests beyond inshore waters.
- **Streamline policy** and regulatory development and implementation.
- **Focus global attention** on important social, environmental and economic issues.

1.3   The case for 'Going Big'

The following section is a synopsis of the current rationale that on-the-ground managers and decision makers have identified as benefits of LSMPAs. Based on surveying managers of the largest MPAs in the world (e.g. the Big Ocean member sites), eight reasons are frequently cited for expanding the size of MPAs for marine protection. Each of these is briefly discussed below and summarised in Table 4.

Table 4. Reasons for increased size of MPAs

Benefits of establishing large-scale MPAs
i. Tackles wide-scale threats
ii. Contributes to a diverse and robust national system of MPAs, of varying sizes, that can enhance the resilience of natural and cultural resources as well as communities
iii. Meets global obligations to increase marine protection
iv. Perpetuates and preserves cultural heritage and traditions
v. Utilises large and interconnected areas to protect natural diversity
vi. Supports economic contributions from large-scale areas
vii. Highlights the unique value large areas provide to humanity
viii. Matches scale of large ecosystems

1.3.1   *Expansion of MPAs tackles wide-ranging threats*

The creation of LSMPAs offers an opportunity to address the depth, breadth and cumulative impacts of **multiple threats** to the marine environment at a range of scales. Managing at large scales means there is both greater opportunity and risk due to the size of the MPA (Wilhelm, et al., 2014). In recent decades, an increase in the number and severity of anthropogenic impacts has threatened the oceans. These include:

- **Climate change impacts** (e.g. ocean acidification, increase in sea surface temperature, sea-level rise and more severe storm events; *see* Box 6).
- **Unsustainable use of marine resources** through extractive practices such as overfishing, oil drilling and mining.
- The **spread of invasive alien species**.
- The **global spread of marine debris**.
- Increasing **downstream impacts from land-based sources of pollution**.
- **Habitat destruction and degradation**.
- **Underwater noise**.

The number of managers and scientists in the marine conservation community advocating for the use of LSMPAs to buffer marine resources against impacts from such threats is growing. Successful early examples, such as the Great Barrier Reef Marine Park and Papahānaumokuākea Marine National Monument, appear to have increased the willingness of nations to consider scaling-up ocean governance and management processes; this trend is reflected in the increased number and size of formally established LSMPAs. For example, the Republic of Kiribati chose to create to address the overexploitation of fishery stocks by industrial fishing fleets, including expanding IUU fisheries.

1.3.2   *LSMPAs contribute to a diverse and robust national system of various-sized MPAs, which can enhance the resilience of both natural and cultural resources.*

While the creation of LSMPAs provides significant progress towards achieving the Aichi Target 11, this does not mean less emphasis should be placed on creating effective smaller MPAs. **Managing LSMPAs is compatible and complementary to the management of smaller MPAs and networks of MPAs**. Marine conservation must occur at multiple scales and protection levels to reflect local ecological, social, cultural and governance imperatives (Toonen, et al., 2013; Edgar, et al., 2014). Current experience tells us that managing both small and large-scale MPAs is necessary to achieve comprehensive and resilient marine resource management. For example, in the Pacific Islands, governments and Indigenous communities are declaring and implementing both locally-managed marine areas (LMMAs) and large-scale MPAs (e.g. Fiji Islands, Cook Islands, New Caledonia, Hawaiian Islands, U.S. Pacific Remote Islands).

> "Large-scale marine protection allows a country, even a small one, to be recognised as a global marine conservation leader by passing on a legacy that will benefit future generations around the world. It makes for a true gift to the planet."
>
> – ATTENDEE AT IUCN WORLD CONSERVATION CONGRESS 2012

Some small-scale MPAs have actually paved the way for the declaration of larger areas. For example, reinvigorated *ra'ui* (customary marine managed areas) across the Cook Islands served as the foundation for the concept of Marae Moana (Vierros, et al., 2010).

LSMPAs offer an opportunity for nations to **evolve and enhance their current systems** of spatial planning and marine management by building in larger efforts that complement and amplify smaller-scale investments. This becomes highly relevant when attempting to demonstrate the effects and possible management options for human impacts at the ecosystem scale. In particular, LSMPAs help **ensure there is replication and redundancy in terms of the protection of species, habitats and ecosystems, as well as increased social resilience**. Functionally, LSMPAs can serve as an insurance policy for the future by protecting ecologically functional swaths of ocean that may be more resilient to multiple and unknown impacts, particularly given the uncertainty of climate change impacts, increases in human use and the cumulative impacts of all of these stressors.

For example, in Motu Motiro Hiva and the Great Barrier Reef Marine Park, nationally directed management initiatives occur at scales commensurate with ecosystem-level pressures and threats, such as controlling levels of commercial fishing and minimising broad-scale downstream impacts from land-based sources of pollution. Additionally, in Australia, the national and Queensland state governments recognise the value of, and actively manage, smaller MPAs around this area.

From a sociocultural standpoint, when appropriately utilised within a larger national network **LSMPAs can amplify the work of and benefits from smaller-scale areas** and make significant contributions to the social and cultural resilience of communities through increasing the capacity of and alliances within networks of communities, diverse stakeholders or rights-holders, and managers (IUCN WCPA, 2008). These kinds of benefits are already shown in LMMAs across Asia and the Pacific that have been successfully sharing knowledge and building community capacity to improve marine governance and management for more than a decade (White, et al., 2006; Govan, et al., 2008). From a large-scale management perspective, Big Ocean member site managers are working to create similar networks and alliances between and amongst LSMPAs, as well as with other entities interested in improving management at scale, like LMMAs, NGOs and research institutions.

1.3.3 *MPA expansion meets global obligations to increase marine protection*

Between 2000 and 2017, **the extent of the world's oceans under protection increased** from less than 1% to more than 5%; (World Database on Protected Areas, June 2017). This significant increase was mainly due to the establishment of the last seven LSMPAs (*see* Table 1). However, to continue this legacy of growth, LSMPAs require substantial support and enabling mechanisms.

Although increased coverage of ocean protection is an important reason for establishing LSMPAs, managers of these vast areas have an increasing need to build capacity around adaptive, relevant and effective management that can address wider social issues. Giving attention to ecosystem quality as well as quantity (De Santo, 2013) can ensure targets are on their way to being met appropriately. Protection must be

Boobies nest atop a ceremonial shrine on Mokumanamana in PMNM, a site that acts to protect both cultural and natural heritage. © Kaleomanuiwa Wong

spread across all biogeographic regions and areas where human benefits are particularly high (often near population centres) (Spalding, et al., 2013), recognising that LSMPAs will not be appropriate or viable in all areas.

1.3.4 *LSMPAs perpetuate cultural heritage and traditions*

There is an inextricable link between biological and cultural diversity (Posey and Overal, 1990), and modern environmental conservation is rooted in the traditional knowledge and practices of ancient cultures across the globe. Several existing LSMPAs have been designed with the explicit intent of perpetuating traditional knowledge and cultural practices as well as strengthening Indigenous peoples' identities, while also safeguarding important ecosystems. For example, PMNM is mandated to support cultural access and does so through its management plan and integrated permitting system. Management has created specific opportunities for Indigenous communities to connect with cultural heritage, including providing access to significant archeological and historical sites.

Cultural landscapes and their links to conservation were formally recognised under the 1972 UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (The World Heritage Convention). Of the existing LSMPAs worldwide, three are World Heritage Marine Sites: the Great Barrier Reef Marine Park, Phoenix Islands Protected Area and Papahānaumokuākea Marine National Monument. Of these three, Papahānaumokuākea is a mixed natural/cultural site and was the first to be inscribed as a 'seascape' or a marine area with high biodiversity and tight integration of cultural values and ecologically sustainable use (UNESCO, 2010; Abdulla, et al., 2013).

1.3.5 *MPA expansion utilises large and interconnected areas to protect natural diversity*

LSMPAs allow for extensive biodiversity protection by encompassing biodiversity hot spots, areas with high species richness, or areas important for reproduction (e.g. Atkinson, et al., 2011; Selig, et al., 2014). Furthermore, LSMPAs allow for the protection of a greater number of species, including migratory species, by encompassing many species' routes or larval dispersal corridors (Ebel, et al., 2011; Rivera, et al.,

2011). Given the habitat size or foraging range of many marine species, implementing dynamic management that connects MPAs with other ocean management processes can enhance their effectiveness (Corrigan, et al., 2014).

Larger areas can be designed to protect geological, chemical and oceanographic diversity, which is also a key climate change adaptation strategy (Groves, et al., 2002). This may include features such as deep-sea vents and abyssal trenches, critical chemical processes such as oxygen and nutrient cycling and carbon dioxide sinks; or physical oceanographic characteristics, such as upwelling and currents. Larger protected areas can also buffer external impacts, thereby allowing an inner core area to remain relatively pristine.

Preserving the full range of natural marine diversity benefits nature. Some of the most pristine ecosystems on the planet occur in many large and remote MPAs, where they provide scientific baselines for understanding wildlife in its natural state (Sheppard, et al., 2012; Big Ocean, 2013; Toonen, et al., 2013). These relatively undisturbed ecosystems serve as important natural barometers for Earth's oceans and, as such, are increasingly of scientific interest.

1.3.6 *MPA expansion supports economic contributions from large-scale areas*

A driving rationale behind the creation of some LSMPAs is the advancement of national development agendas. Common examples include promotion of sustainable fisheries, increased tourism revenue and designated areas for deep-sea mining and drilling. Management and conservation planning for an LSMPA can facilitate more appropriate planning for economic development activities in the wider seascape and ensure a reduction in conflict between conservation and development goals (e.g. fishing, mining, shipping, energy and recreation). Using spatial allocation management models to differentiate between ocean demands, needs and impacts from a range of sectorial interests works well at a larger scale, particularly when MPAs include a variety of management objectives, such as biodiversity, social, cultural and economic protection.

The language used in the enabling legislation and declaration documents of **LSMPAs can support ecologically sustainable activities that also allow for sustainable economic development**, including commercial, recreational, traditional and research activities. Furthermore, the creation of very large MPAs can set a national approach for waters

Large and unique geologic features, such as the deep-sea trenches and vents of MTMNM, require protection on a large-scale. © NOAA Pacific Marine Environmental Laboratory

beyond the territorial sea, including the EEZ, deep-water habitat, seamounts and offshore continental shelf.

1.3.7 *MPA expansion highlights the unique value large areas provide to humanity*

Remote areas provide an opportunity to enhance management controls over wide-ranging threats because of their distance from many anthropogenic impacts. In the face of increasing global climate change, **these areas may also serve as critical lifelines by acting as biodiversity refuges**. In some cases, managers will also be able to abate a specific threat for the first time in remote regions. For example, within the Hawaiian Islands, managers introduced and refined controls over archipelago-wide threats, such as invasive alien species and fishing pressure, within the remote northwestern islands of Papahānaumokuākea Marine National Monument, in the hope that such models will strengthen implementation of similar measures around the densely populated main islands. Scientists at this same site are also comparing ocean acidification and sea-level rise in the uninhabited northwestern islands to those in the inhabited main islands, where such global changes have the potential to immediately impact society.

1.3.8 *MPA expansion matches the scale of large ecosystems*

LSMPAs are capable of protecting significant phenomena or features in marine ecosystems.A number of large MPAs were established because of large ecosystems associated with a coral reef system (e.g. Great Barrier Reef) or large trenches (e.g. Marianas Trench Marine National Monument). Singleton and Roberts (2014: 8) note that "… a larger reserve might offer refuge to more species, with a greater range of mobility and larval dispersal distances". The Sargasso Sea, which has been called a golden floating rainforest, is another good example of a large ecosystem that has inspired calls for protective measures to conserve the rich biological communities based upon Sargassum weed that provides food, shelter and a nursery for important species, including many that are threatened or endangered (Laffoley, et al., 2011).

1.4 Challenges

The known **governance and management challenges** of LSMPAs apply to MPAs of all sizes, but the factors of size and scale almost inevitably amplify them. Because these Guidelines have emphasised that LSMPAs can increase efficiency in use and distribution of resources, including manpower, it may seem contradictory that size and scale also add complexity. Yet it is important to recognise that despite the increased planning, logistics and expenses, there can still be an increase in the benefits derived per square kilometer or per hour worked or per dollar spent over time. . A fisheries economist from UBC noted, "(LSMPAs) ... that ban fishing can be cost-effective… a small reserve can cost 100 times more per square kilometre to set up and administer than giant one" (Strub quoted in Pala 2013: 641).

Table 5 describes the challenges identified through lessons learned by current managers of the world's largest MPAs. Invariably some of the challenges overlap into one or more categories.

Table 5. Key considerations for decision makers and managers

i. Governance
National jurisdictions may overlap or there may be conflicting legal mandates for neighbouring or transboundary LSMPAs.
Effectively and equitably addressing the full range of diverse stakeholders and all legitimate parties, especially Indigenous peoples and traditional or local communities, can be a challenge.*
ii. Management
The amount of funding required can be significant.
Enforcement and surveillance can be costly and logistically challenging.
Finding qualified staff with skills and experiences relevant to large-scale MPAs can be difficult.
Political support can change from one political administration to another.
Acquiring and managing data requires a significant, long-term investment.
iii. Social considerations
It may be difficult to showcase the contributions of LSMPAs to the social and economic well-being of communities and to highlight differential and secondary impacts of management on segments of the population; this is even more the case for remote areas.
Adequately supporting culturally related access and the perpetuation of key cultural practices and knowledge systems is essential.
Due to a higher public profile, large-scale MPAs can come under a great deal of public scrutiny, be affected by misinformation, and be held to a higher standard.
iv. Research and monitoring
A lack of sufficient technical capacity and expertise often arises due to the sheer size of the area and number of priority research questions.
Specialised equipment and technology is costly.
It may be cost-prohibitive and logistically impractical to acquire sufficient sample sizes to characterise the entire MPA.
The limited pool of research institutions in any single country can make developing science partnerships challenging, and engaging with international partners is costlier.
v. Cross-cutting issues
There is an inherent uncertainty involved in making informed management decisions.
Additional time and effort are required for nearly every management action.
Ongoing financial constraints are to be expected.
Multiple languages may be spoken.
Sometimes there are few comparable examples from which to derive lessons learned.

This is a key cross-cutting issue but successfully addressing this issue begins with a governance framework that supports managers in this endeavour.

1.4.1 *Governance*

Multiple jurisdictions and conflicting or competing legal mandates of governing entities are inescapable and crucial considerations in the effort to achieve and maintain effective management. The participation of multiple government agencies may complicate communication among all management interests, create new or more complex bureaucracies, and increase inter-agency jurisdictional conflicts and rivalries. For transboundary LSMPAs or those that are adjacent to or within the high seas, where legal clarity, national jurisdiction and guidance may be lacking or contested, the issues may be even more complex. As the field of large-scale marine management matures, as more LSMPAs are established, and as integrating management across protected area systems increases, these challenges will evolve.

Adequately addressing the rights of all parties, especially Indigenous peoples and local communities, can be a challenge from a resource standpoint, as facilitating these processes can require a significant amount of time, effort and money. These challenges also require certain skills including facilitation, conflict resolution and negotiation. Moreover, the sheer number of stakeholders and their varying (and possibly conflicting) perspectives requires experience in handling these kinds of public engagement processes. The power relations between interest groups with actual land or access rights to a site may need to be managed at multiple scales, and sometimes between governments when the issues cross national boundaries. Many other interested parties may need to be included, such as international groups, industry representatives, corporate interests, and ministries of energy, tourism, finance, national security or the coast guard.

Engaging local communities is a skilled and difficult task. It takes time to build trust and mutual understanding; in many instances these communities will also require support and capacity-building to be able to engage with governance bodies effectively, and to understand highly technical marine spatial planning processes that are attempting to integrate different knowledge systems. When engaging Indigenous peoples and local communities, clear protocols must be followed, including the need to obtain free, prior and informed consent, ensuring the fair and equitable sharing of benefits arising out of the process (or the genetic resources that are utilised), as well as respecting the intellectual property rights regarding the use, application and sharing of traditional knowledge. Managers should address these issues with all stakeholders consistently over time.

1.4.2 *Management*

One of the most commonly recognised challenges of effectively managing LSMPAs is the **significant level of funding required**. This issue becomes even more complicated for remote areas. Furthermore, even if adequate funding is secured initially, maintaining the minimum level of financing typically becomes problematic, particularly if the public or decision makers think a site is no longer under threat or call into question the relevance of sustaining such levels of funding. The challenge is ongoing but one that can be managed proactively and effectively. For additional information, *see* section 4.5.2.

Enforcement and surveillance are other commonly cited management challenges. Maintaining an on-site presence (patrol boats, ships, etc.) in large marine areas, may be cost-prohibitive and logistically impossible during certain times of the year (Brooke, et al., 2010). Remoteness creates additional logistical and response time issues, particularly when attempting to decrease violations in areas where illegal fishing is known to occur. As a result, managers often face the difficult decision of focusing limited enforcement and surveillance resources (e.g. equipment, personnel, funding) in one area or spreading them thinly across a very large area. As Dulvy (2013: 360) points out, "…without sustained engagement and financing to ensure effective enforcement,

Palau National Marine Sanctuary is working to secure partnerships with surveillance and enforcement service providers to create a collaborative program that will leverage the resources of government agencies, private companies and International NGOs to better protect its marine resources. © PNMS

the hope generated by press releases …may be the only outcome." *See* sections 4.4.2, 4.6.3 and 4.6.4 and Case Study 13.

Engaging local communities to aid in enforcement and surveillance at smaller-scale MPAs has been shown to be effective (Christie, et al., 1994) but this strategy is not as easily applicable on a large scale, especially for areas that are remote.

A collaborative approach that actively involves local resource users and community members should be used whenever possible. Community-based management often evolves in response to the failure or ineffectiveness of more centralised approaches. In cases where stakeholders can't realistically participate in on-the-water surveillance, such as remote LSMPAs, managers can still engage the community both in education and outreach efforts, as well as in the development of enforcement regulations and protocols at a central operations location; this will help ensure management and policy makers consider community-derived rules (Christie & White, 1997).

Emerging technologies, such as remote sensing, satellites and unmanned aerial vehicles (UAV), may offer potential solutions to enforcement and surveillance challenges, particularly as they become more cost-effective and technologically advanced (Brooke, et al., 2015). The adoption of Vessel Monitoring Systems (VMS) and Automatic Identification Systems make tracking legal fishing vessels easier while making it more difficult for illegal vessels to avoid detection. On the other hand, "Fishing fleets (also) now have technology that allows them to penetrate into even remote deep waters that once served as refuges for a lot of fish… There is an urgent need to replace (these refuges) with big manmade protected areas" (Pauley quoted in Pala, 2013:640).

At this stage, many technologies remain under-tested – or have not tested well at the spatial scale necessary to be effective for use in LSMPAs .Furthermore, given overall resource limitations, there may be concerns that spending limited funding on remote LSMPAs may not be as practical or beneficial as focusing resources towards more accessible ones. With that said, there is evidence that surveillance of LSMPAs can actually be cheaper on a per-area basis than in smaller MPAs (MPA News, 2013), and technological advances are increasing the value of new partnerships, such as Global Fishing Watch (*see* http://globalfishingwatch.org/). *See* Box 27 for additional information.

Change in government leadership is another challenge identified by LSMPA managers. As LSMPAs require far more support at the national government level, changes in administration can slow momentum in the process towards establishment. If already established, LSMPAs can be affected in terms of shrinking financial resources, legal protections and even public support, sometimes very rapidly and dramatically. Since management of LSMPAs is led by government agencies, decreased support and funding frequently translate into decreased staffing and capacity at the site level. Managers of LSMPAs must be ready to adapt to changing government leadership in ways that smaller-scale MPA managers may not necessarily have to.

Lack of **professional capacity can be both a quantitative and qualitative challenge**. Some managers may not have the necessary staff to carry out the day-to-day tasks, while others may need to enhance their own capacity if, for example, they lack a background in LSMPA management or in natural

resource management generally. Additionally, if budgets are tight, the ability to develop the capacity of existing staff may be limited or not possible. Experienced LSMPA managers also emphasise the need to retain staff, as this is the only way to develop institutional memory. Given the relatively recent history of LSMPAs, it is critical to ensure that successful mangement systems and processes are documented and lessons learned are shared. *See* sections 4.4.1 and 4.4.3.

Acquisition, management and utilisation of relevant data and information can also test even the most experienced MPA manager when they move from overseeing a smaller scale site to an LSMPA. Lack of socioeconomic and biophysical data can make well-informed management decision-making a challenge. On the other hand, collecting and managing large amounts of data can be equally difficult unless there are staff with the capacity to analyse it, and some data even requires the use of advanced technologies that can be cost-prohibitive. *See* section 4.4.3.

Traditional and local knowledge should be included in the data sets for LSMPAs; however, management teams must acquire and manage such data appropriately. Determining in advance whether there are any pre-existing rights, leases, licences, permits, agreements, or other significant interests in the area and its resources is critical. There may be laws and protocols that should be followed as well as requirements to respect intellectual property rights regarding the use, application and sharing of traditional knowledge. Managers should ensure their ongoing efforts to promote effective stakeholder engagement include these specific issues.

1.4.3 *Social*

One of the most common challenges LSMPA managers face is how to **engage in a balanced dialogue** to increase understanding of the contributions their vast areas make to their respective nation's social and economic well-being. Not only do the benefits often develop too slowly for people to appreciate, strategies to communicate the benefits to the public often need to be customised to address the specific political and social context of each LSMPA, which can include remoteness, limits or restrictions to access, how closely livelihoods are tied to the site, and whether relevant stakeholders have had positive or negative experiences with previous conservation actions. Creating a trusted understanding across multiple communities or the society at large takes time, effort and adequate funding, as well as a strategic approach. Managers should seek to work with diverse stakeholders and local communities from the earliest phases of design and establish a process or mechanism, like an advisory council, to continue the dialogue around human rights and social equity and create new or increased opportunities for sustainable livelihoods after the MPA is established. *See* section 2.4.3.

Managers must work to mitigate adverse effects to livelihoods and culture and consider issues of fair compensation. This process can be even more complex when multiple agencies or rights-holders are involved or if migratory species and cross-boundary issues are applicable. Addressing such issues requires working hand-in-hand with the relevant governing entities and considering internationally recognised laws and policies. The boundaries of an LSMPA should consider people's access and migratory species routes, and in cases where it seems they will be at odds, strategies such as monetary compensation are important potential solutions. However,

developing alternative livelihoods can only be successful if viable, accessible areas are identified for practices like small-scale or artisanal fishing, and if the local economy is assessed and has opportunities for those compensated to spend the money.

Ideally, all large-scale MPAs would be designed to enhance cultural identity and provide access for traditional practices. When this is not done, LSMPA managers may find themselves inadvertently at odds with their own community or in direct conflict with those holding legal rights or legitimate interests in the lands or waters of the site. **The designation of an LSMPA may be perceived as a loss of inherent cultural rights** to conduct certain activities in the site's waters (Leenhardt, et al., 2013). Even where limiting access does not infringe on existing livelihoods, management decisions based on science can infringe upon or misappropriate the rights and knowledge of Indigenous peoples. LSMPAs that do not effectively support ongoing cultural access or the appropriate incorporation of Indigenous and local knowledge in site management may see the support generated by initial stakeholder engagement processes quickly erode (*see* Case Studies 21 and 22)**.**

As these processes do not inherently include gendered knowledge systems (e.g. pertaining to divisions of responsibilities and defining community roles around use and management of natural resources), it is important to incorporate this factor into the design of community engagement processes. This is especially true in rural Pacific island communities where there are often specific resources that women or men have more interaction with and knowledge about, depending on the culture (Kronen, 2002). In Yap, for example, women have a better understanding of near-shore mangrove systems and their use, but certain fishing practices, especially those for pelagic fisheries, are more often conducted by men.

> "Some large MPAs may affect livelihoods, such as fisheries, even at a small scale. Managers must consider the potential hardships for families and communities."
>
> – TUKABU TEROROKO, MANAGER,
>   PHOENIX ISLANDS PROTECTED AREA

Sustaining political will and securing long-term champions for LSMPAs can be a significant challenge. Managers will generally encounter efforts from special interest groups that seek to influence government officials and to devalue the justification for establishing the MPA in the first place. Creating a sense of community or public ownership may not be as easy to achieve for large, remote MPAs and this in turn can make sustaining support for near-pristine areas challenging, especially when funding becomes limited.

One of the most challenging aspects of large-scale management is dealing with public scrutiny and criticism. While this is not unique to LSMPAs, their larger budgets and potential to affect access to vast areas of natural and cultural resources can make them more vulnerable to public scrutiny and criticism than smaller MPAs. LSMPA managers have reported difficulties in coping with misinformed media representatives, unscrupulous user groups who spread

misinformation, donors with questionable or conflicting agendas, and academic-driven inquiry that creates or expands false dichotomies. Yet managers should not try to oversell the benefits of a large site, as this can also lead to a backlash if expectations or commitments are not met, or documented benefits are not produced in a timely manner.

1.4.4 *Research and monitoring challenges*

Science requirements of LSMPAs are not limited to the biophysical. **Knowledge and understanding of social and economic sciences is also important** (Big Ocean, 2013). Even when a management team is fortunate enough to have full-time scientific staff, there may still be a lack of technical capacity and expertise to meet minimum research needs; the sheer size of the area or the total number of priority research questions needing to be addressed may be overwhelming. It is important that LSMPAs use all available sources to collect and analyse data, such as citizen science, traditional and local ecological knowledge, fishery-dependent data and expert opinion.

Some LSMPAs may be so large that managers' research teams may not have the ability to access remote and deep study areas without highly specialised equipment and technology (Brooke, et al., 2010; Big Ocean, 2013) or it may simply be cost-prohibitive to obtain sufficient sample sizes to adequately characterise the entire area. This can result in some managers taking a coarse approach in data collection, which can decrease the level of confidence and accuracy in findings.

Finally, building large-scale scientific research partnerships (e.g. with universities, technical institutes, etc.) is essential, but may be inherently challenging, even within a manager's own country. This is further complicated given the limited pool of experience and institutional readiness to partner internationally in support of ocean-scale research (Big Ocean, 2013). Management will likely be made easier through these partnerships, and **managers should commit to participating in initiatives that aim to share data and lessons learned** in order to enhance LSMPA management more broadly, and to improve marine conservation globally. *See* section 4.6.2 and Case Studies 19 and 20.

1.4.5 *Cross-cutting challenges*

The inherent uncertainty that accompanies the management of LSMPAs can complicate informed decision-making, management-related research and consultation with stakeholder groups. For LSMPA managers and scientists, a critical consideration to keep in mind is that more time and effort will be required to achieve success because of the area's enormous size and complexity. Managers have very few comparable MPAs from which to derive lessons across the full spectrum of management activities.

Financial constraints are one of the most persistent challenges managers face, and this potential limitation cuts across all aspects of LSMPA design and operations. Assessing the finances required for a vast marine area will determine both whether it can be established and whether it can be maintained over time. Devilliers, et al. (2015: 499) understand the harsh political and economic realities in many countries, with the solution often being "… to aim for the 'low-hanging fruit' in an attempt to demonstrate a willingness to establish protected areas….". Increased resources may become available in the future, underscoring

June 6, 2017, Hōkūleʻa, a contemporary doubled-hulled Polynesian voyaging canoe returned to Honolulu, Hawaiʻi after a three-year circumnavigation of the globe. One of the training areas for the crew was the waters of PMNM, which provides the only sailing routes close to the main Hawaiian Islands that can simulate an open ocean, long-distance voyage. © Naiʻa Lewis

the importance of having prioritised management goals and objectives, so that unfunded activities can be reconsidered as new opportunities arise.

The need for consistent funding over time cannot be overstated. For LSMPAs that are very often established in near-pristine areas, sustaining and even requesting increased financial support annually can be a challenge if policy makers do not fully understand the overarching benefits of protecting large, biologically diverse marine areas to the whole of a nation's domain or to humanity. **Managers should track (to the best of their ability) the actual flow of benefits to the LSMPA, as well as to the wider society**, and work to translate this cycle in an easily understood manner to key stakeholders and the wider public. The rapidly developing field of ecosystem services should better enable managers to track the flow of benefits to society in the future.

Even for LSMPAs that have a sufficient budget, securing adequate resources for research and monitoring activities is critical. Managers currently working at scale have noted that it may be necessary to provide scientific data early in the planning process to manage and justify the budget, so finding a means to conduct research is mandatory. As national budgets often fluctuate year to year, it is important to create partnerships that develop or contribute to sustainable financing.

For LSMPAs that need to address communities in multiple languages, education and outreach activities can be especially challenging and costly. **It is essential to use the language of the audience being addressed whenever possible**. As these Guidelines have underscored, for the early, ongoing, consistent and balanced engagement of diverse stakeholders – be they the general public, policy makers, scientific partners, or Indigenous peoples and local communities – it is key to use the most common and easily understood terminology for a wide range of audiences.

2
Designing LSMPAs

Ocellaris clownfish *(Amphiprion ocellaris)* build symbiotic mutualisms with sea anemones in the waters of the Chagos Archipelago. © Anne Sheppard

2.1 Introducing good design

Once the decision to 'Go Big' has been made, either by expanding boundaries or creating a new MPA, it is of utmost importance that the management team, in collaboration with governing agencies (if applicable), **finalise the site's purpose, define boundaries that provide the highest conservation value and prepare to engage diverse stakeholders** to set a foundation for long-term support of management and its mission.

Big Ocean managers recommend that the design process of an LSMPA simultaneously: (1) articulates the purpose of the site, (2) strengthens management's internal capacity (e.g. developing management's mission, building a team), (3) supports implementation of core management strategies and activities within key areas, and (4) addresses external needs (e.g. establishing legislation, setting clear and identifiable site boundaries). There will be many challenges to implementing this advice. Factors such as limited funding and insufficient data can delay establishment and draw focus towards utilising spatial priorities that focus only on biophysical priorities such as biodiversity hotspots, species richness, or cumulative threat maps (Mazor, et al., 2013).

Experience at current LSMPAs shows that using **management approaches developed with a vast geography in mind** from the very start can provide greater benefits than scaling up models from smaller MPAs can provide. As such, the use of regional systematic conservation strategies and adaptive management models and processes (*see* Box 7) are likely to provide the best chance of creating long-term sustainability for an LSMPA. The former utilises staged planning processes in combination with a wide variety of approaches to help locate, define and manage large conservation areas over time – complementing adaptive management models that promote the use and application of multiple knowledge systems and data sets, in the face of changing conditions.

Characterising an LSMPA from a biophysical standpoint is a critical factor in determining boundaries that will provide significant long-term benefit and yield the highest conservation value. As a result, this kind of data collection and assessment will likely be an ongoing priority for managers. Data to better understand an LSMPA's links to the wider society will be important to the design process and

to understanding the links between a site's purpose and the wide-ranging responsibilities of comprehensive management. Designing an LSMPA in a way that considers a wide array of information and perspectives, in combination with a clearly articulated mission, is likely the only way to ensure that initial design goals meet long-term management needs. There are 11 key steps (*see* Box 8) LSMPA managers should consider implementing in order to practice with the planning processes that are proving to be successful globally.

Box 7

Strategic management

Adaptive management addresses the dynamic nature of ecosystems in the face of uncertainty. To be effective, adaptive management should utilise credible models and decision-support tools but also be based on an open, mutually agreed-upon process for monitoring and assessment that includes community and other key stakeholders. An adaptive approach also considers various socio-economic factors and legal and policy barriers, as well as institutional challenges; it requires people and institutions to develop trust, be highly responsive to new information and be willing to engage in a degree of experimentation (Groves & Game, 2016; Knight, et al., 2006; McCarthy & Possingham, 2007).

Systematic conservation planning is still being refined after 25 years of implementation but the discipline has much to offer in the way of new statistical and analytical methodologise that synthesise diverse disciplines and activities into a single, comprehensive process (Pressey & Bottrill, 2008). Managers need to both develop strategies for whole landscapes or seascapes, including areas designated for production and protection, while remaining focused on practical conservation planning as it applies to effective on the ground management, which is critical if we hope to protect a significant portion of today's biodiversity into the future, as the world's population demands on natural resources increases.

Photo by: Kydd Pollock
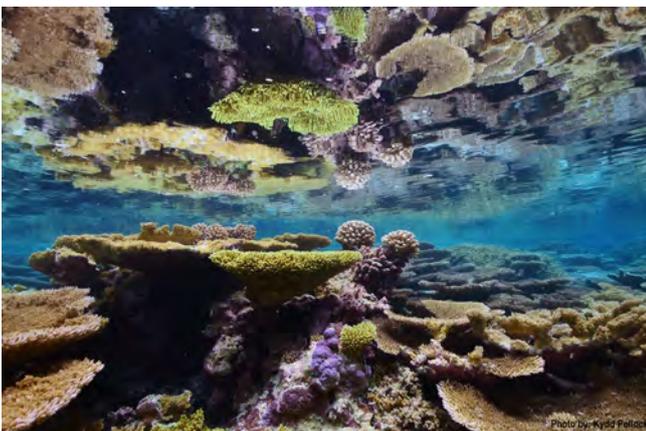
The near-pristine coral reefs of the Pacific Remote Islands Marine Monument help researchers identify scientific baselines for healthy marine ecosystems.
© U.S. Fish and Wildlife Service

Box 8

Stages of systematic conservation planning

Systematic conservation planning can be separated into 11 stages, and some examples of tasks and decisions in each are presented below. This process is not unidirectional; there will be feedback and reasons for altering decisions and repeating various steps based on the unique situation at any given LSMPA (*see* complete table in Pressey & Botrill, 2008). As such, these steps are addressed across chapters 2-4.

1. Scoping and costing

Deciding in the boundaries of the planning region, planning team, budget, required funds, and approach to each step in the process.

2. Identifying and involving stakeholders

Involving, communicating with, and building capacity for stakeholders who will influence or be affected by conservation decisions and implementation of conservation action.

3. Assessing the context for conservation areas

Assessing the social, economic and political context for the planning process, including constraints on and opportunities for establishing conservation areas.

4. Identifying conservation goals

Progressively refining the values of stakeholders from a broad vision statement to specific qualitative goals that shape the rest of the process.

5. Collecting socio-economic data

Collecting and evaluating spatially explicit data on tenure, extractive uses, costs, threats and existing management as a basis for planning decisions.

6. Collecting data on biodiversity and other natural features

Collecting and evaluating spatially explicit data on biodiversity pattern and process, ecosystem services and previous disturbance to potential conservation areas.

7. Setting conservation targets

Translating goals into quantitative targets that reflect the conservation requirements of biodiversity and other natural features.

8. Reviewing target achievement in existing conservation areas

Assessing, by remote data and/or field survey, the achievement of targets in different types of existing conservation areas.

9. Selecting additional conservation areas

With stakeholders, designing an expanded system of conservation areas that achieves targets while integrating commitments, exclusions and preferences.

10. Applying conservation actions to selected areas:

Working through technical and institutional tasks involved in applying effective conservation actions to areas identified in the conservation plan.

11. Maintaining and monitoring established conservation areas

Applying and monitoring long-term management in established conservation areas to promote the persistence of the values for which they were identified.

The first step in designing an LSMPA is to understand the relationship between the purpose of the site and the problems or issues management seeks to address. The following questions can provide a starting point:

- **What needs to be protected** (e.g. habitats, species, people, etc.)? What is management protecting them for or from (e.g. human activities)?

- **What needs to be restored or perpetuated** (e.g. degraded ecosystems, cultural sites, or traditional practices)?

- **Who needs to be engaged** in these efforts (e.g. a management team, Indigenous peoples and local communities, global community)? Who are the decision makers?

- **What decisions need to be made** for the design process to proceed?

It is also important to understand the relationship between internal and external factors and the ways in which this interplay can support or potentially detract from achieving management's long-term objectives. Creating an initial checklist, which can be revised over time, is one simple action that can help return management's focus to the highest priority tasks and needs.

A word of warning – do not mistake good design for perfect design. The latter is neither suggested as a goal nor is it realistic, especially in a changing world. Seasoned managers working in large-scale marine conservation confirm that having to make decisions without all the necessary information or as a result of circumstances beyond anyone's control is the norm. Some of the managers of existing LSMPAs have remarked that while extensive planning during the design phase is essential, in practice, the process can still be quite chaotic and can produce outcomes very different from those originally intended. The bottom line is for management teams to do their best and to thoughtfully and strategically apply their sites' existing resources to the highest priority needs.

"It's not just about designing a large MPA; we must design for the inexorable link between nature and culture."

– 'AULANI WILHELM, BIG OCEAN FOUNDER

Box 9

Process principles

- Utilise multidisciplinary approaches, methods and perspectives; be inclusive of multiple knowledge systems.

- Meet the current needs of the management team and the site without compromising the long-term sustainability of either.

- Support intergenerational capacity building to ensure there are always qualified, passionate managers and community leaders to support the MPA in perpetuity.

- Value a holistic management model that seeks to understand the relationship between nature, culture and the human dimension.

- Deal with uncertainty by taking a precautionary approach that considers the sociocultural, economic and political factors, as well as the environmental ones.

- Use an iterative approach that adapts management strategies as conditions change or new information becomes available.

- Enhance smaller-scale management approaches by complementing existing efforts and leveraging limited resources.

- Create transparent processes.

2.2 Long-term benefits of a good design

The actions and steps taken during the design process will be useful to nearly every subsequent step of a site's development and evolution. By implementing adaptive management and systematic marine conservation strategies, periodic evaluation measures may suggest an amendment to the management plan or even a redesign of the site (e.g. expansion of boundaries). As such, **it is critical to dedicate ample time at the onset to create a thoughtful design and accompanying process** customised to addressing the needs of a unique site. The most experienced managers working on a large scale agree that a periodic re-evaluation and a redesign of their site will be required.

Seeing the design process as cyclical can remind us that: (a) implementation in the real world is usually non-linear; (b) all steps are interrelated and any number of steps can (and will) run in parallel or overlap; and (c) repeating the process can be done either as part of a formal management review process (e.g. site re-evaluation every five years) or on an as-needed basis to enhance a site's relevance and improve management effectiveness. The caveat is to ensure that the application of the process is always consistent and thorough.

Refer to Box 9 when reading through Chapter 2. The list was adapted from the curriculum and training modules used by NOAA's International MPA Capacity Building Program (Kelleher & Lausche, 1988; Walton, et al., 2008) and incorporates internal and external design factors in a somewhat chronological order.

2.3 Internal considerations in large-scale design

Several internal considerations must be included in the design process: (1) the purpose and objectives of a site (the drivers); (2) the make-up of the planning team; (3) an engagement plan and resources; and (4) partnerships. This section outlines how to address all four of these considerations. A site's enabling legislation (i.e. the legal basis for an LSMPA that provides the authority to establish regulations or prohibitions) is also an important consideration in a site's design. However, for the purposes of these Guidelines, the legal basis is discussed as an external consideration (*see* section 2.4), as this is mostly outside of management's direct control. It is also common for the legal basis of a site to lag well behind protection or conservation needs, making it essential that relevant government agencies are central partners from early on in the process and throughout.

Here are some **guiding questions** to consider when designing an LSMPA:

- **Does the area have a clear purpose** and set of related objectives? If so, how does it compare to the missions of similar LSMPAs? If there is a lack of clarity, is this due to outside factors or challenges that are hindering best practice management?

- **Is it clear how the area's boundaries will be determined?** Have key areas of protection that will help fulfil the site's purpose been identified?

- **How many staff are required** to realistically manage the site in the first several years? If people have already been appointed to assist with early-phase design efforts, will these same people be able to remain with the site after establishment?

- **What multidisciplinary skill sets are needed** to manage the site? What skill sets do existing staff have? If there are critical and outstanding staffing needs, can qualified people be found? If so, can they be hired immediately?

- **Is there a discrete Indigenous or local population** connected to the site? If so, have they been appropriately consulted, and is there a plan in place to engage them in the long term? Are there stakeholders that will need to give free, prior and informed consent before any management actions are taken? Are there people with tenure or traditional use relationships with the area under consideration for the LSMPA? (*See* Box 13 for further details.)

- **Who are the most important audiences** to reach during the design of the site? What is known about each of them? Do they have a direct or indirect relationship with the proposed site? How might they position themselves in regards to the designation of the LSMPA?

- **Which stakeholder group(s) are most influential** in terms of the site's designation, either in support or opposition?

- **What are some of the anticipated challenges** for later stages of the designation process?

2.3.1 *Building a management team*

In order to bring the depth and breadth of skill sets required to manage an LSMPA managers need to take a **multidisciplinary approach** to hiring a qualified, diverse staff. Assess management objectives and needs and ensure that they can be fulfilled through the skill sets of those who are hired (Knight, 2006; Reyers, et al., 2010). The overall staff will undoubtedly grow and change over time, but bringing on the right people for the initial design phase is essential. Staff from the early stages of LSMPA development will also become the holders of important institutional knowledge and will likely be the individuals who provide management with the most consistent, quality outputs and leadership over time.

Managers should **consider prioritising positions** that are essential to the first five years of mangement and enable

implementation of critical scientific research activities and similar initiatives that allow for engagement of diverse stakeholders. Consider diversity and equal opportunity programmes, and build a staffing plan around this foundation. Given the significant planning and data management requirements, managers of existing LSMPAs suggest building a slightly larger team with varied skill sets, including biological, social and ecological; region-specific knowledge and experience; project management; information technology (and other specialised skills such as GIS), budgeting and finance, negotiation, permitting, compliance and enforcement (Salafsky, et al., 2002). *See* also section 4.4.1.

Cultural resource management capacity is vital to a well-rounded management team, especially for LSMPAs that may overlay multiple communities and culturally significant ecosystems or areas. It is important to engage or hire cultural experts who are well respected in their communities and have extensive cultural resource management experience, including gendered knowledge that is often key within Indigenous cultures pertaining to specific resources. These may include individuals with decades of experience working at the site or in related communities, as well as those with formal training in one or more of the following fields: anthropology, archaeology, history, linguistics, traditional culture, political science, sociology, social work, or law.

If securing a cultural expert full-time is not possible, lead managers should, at a minimum, **consult regularly with individuals possessing these skill sets and community connections**. Ideally, one or more members of a site's management staff should be able to speak on behalf of, or have close relationships with, any Indigenous peoples or local communities that have ties to the site.

2.3.2 *Defining a site's purpose and objectives*

Clarity and agreement on the site's vision is critical from the start. Initial outreach and messaging should convey the 'why' of a site and the significance of best practice management. Without defining the fundamental purpose for an MPA, gaining support for the site will likely be a futile exercise. In addition, developing strong, effective and appropriate establishing legislation (*see* section 2.4) will only happen if managers can clearly articulate a site's purpose and objectives to those who will actually create and formalise the legal framework of the site. In turn, a site's purpose sets the foundation for establishment of its boundaries and management.

An explicit hierarchy of objectives in mission statements (*see* Box 10) helps provide for a clear system of prioritisation if conflicts arise.

Box 10

Developing effective mission statements

The number of stakeholders and interests in an LSMPA will likely be far more than that of a smaller scale site. As such, managers should actively seek to learn about the mission statements of other LSMPAs. Two useful examples are:

The Great Barrier Reef Marine Park Act of 1975 led to the development of a goal for the GBRMP Authority: **"to provide for the long-term protection, ecologically sustainable use, understanding and enjoyment of the Great Barrier Reef through the care and development of the Great Barrier Reef Marine Park."**

By contrast, the mission statement of the Papahānaumokuākea Marine National Monument,

a site that does not have to account for intense use or ongoing access by the public, is **"to carry out seamless integrated management to ensure ecological integrity and achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture and heritage resources for current and future generations."**

A site's mission must ultimately come from an assessment of the drivers that make the site necessary. Managers must be the most knowledgeable about a site's significance, its protection and its management from biological, social, cultural and operational perspectives.

Managers must be prepared to work with all governing and management entities to identify jurisdictional authorities within the LSMPA and delineate clear boundaries to help develop appropriate establishing legislation and related legal regulations. Formally establishing a site can be a long and challenging journey. Thus, maintaining clarity of purpose is likely to be the best way for managers to expedite the process.

Potential challenges also present potential long-term benefits in terms of learning about and developing relationships with stakeholders. This particular point of the process showcases why addressing the internal and external needs (and drivers) of a site in parallel is so important.

2.3.3 *Preparing a community and stakeholder engagement strategy*

Successful design requires effective engagement with diverse stakeholders, including communities, the public, and NGOs, as well as local, national and international governments and agencies (*see* Boxes 11, 12). Stakeholder engagement is the process by which organisers (e.g. MPA managers) involve people who may be affected by or interested in a decision. Effective engagement provides a mechanism for all stakeholders to influence the decision-making process in a manner that is transparent and accountable. By contrast, traditional communication and marketing processes merely aim to inform stakeholders of a decision that has already been made.

Although stakeholder engagement is critical to high-level initiatives like establishing LSMPAs and the subequent development of its management plan and zoning regime (Pomero & Douvere, 2008), it should also be applied across the life of an LSMPA's management plan for any important

project or initiative. Managers should also consider how this strategy connects to, and complements, strategies that are developed to introduce the many facets of management planning to the public (*see* section 3.4, and for ongoing engagement of the press /media and for education and outreach initatives, *see* section 4.6.1).

There are many best practices for effective stakeholder engagement; it is important to create stakeholder engagement strategies that follow the relevant international instruments designed to create equity for and to protect the rights of all parties (*see* Box 11). In addition, it is helpful to understand what doesn't work and to identify potential barriers to effective engagement, including linguistic and cultural diversity. The

Box 11

Identifying the primary interests of stakeholders

An important product of a stakeholder analysis is the identification of primary interests: What is it that stakeholders ultimately care about or value? Defining primary interests helps make the drivers of key stakeholders' behaviour and decisions more transparent (CMP, 2013). A stakeholder Knowledge, Attitudes and Practices (KAP) survey can provide insight into what stakeholders know about, believe and practice relative to a particular topic (e.g. LSMPA management planning) or conservation initiatives generally (WHO, 2008). Very often, KAP data sets are collected using a structured, standardised questionnaire. Benefits of KAP surveys include easy design, quantifiable data, ease of interpretation, concise presentation of results, applicability of small sample results to a wider population, cross-cultural comparability and speed of implementation and replication. Further guidance is available from the World Health Organisation at http://apps.who.int/iris/bitstream/10665/43790/1/9789241596176_eng.pdf

HIGHLIGHT

Consider using surveys as one tool for ongoing engagement of diverse stakeholders.

objective is not only to design a better long-term strategy, but to minimise barriers whenever possible (Figure 3).

Experiences from the current collection of LSMPAs indicate that **addressing the human dimensions** of LSMPA management must be prioritised and addressed in parallel with that of biophysical research, as one helps inform the other. For example, managers at CIMP engaged communities for approximately two and a half years (public meetings were held from July 2011 to February 2014) in the initial stages of designing the site. Managers realised that these relationships would take time and resources to maintain, but felt that they were essential and would prove invaluable when addressing challenging issues such as mining and large-scale commercial fishing. Working closely with communities remains a core element of management at CIMP and will continue in perpetuity as the site seeks to improve marine management for the whole of the Cook Islands. At the scale of LSMPAs, engaging a wider array of partners and researchers across sectors is essential to better understanding what does and doesn't work, especially for areas that are remote. Management efforts are more effective if communication and partnerships are built with groups already working in the region of the LSMPA on related issues (Stem, et al., 2005).

President of the House of Ariki, and leader of the Marae Moana consultation team, Tou Ariki addresses traditional chiefs on Mangaia to discuss the proposed LSMPA concept. © Marae Moana

Figure 3. Range of benefits from proactive engagement methods

- IAP2 Australasia, Engagement Methods (2014)

Box 12

Rights-holders and stakeholders

Who are the key players? It is important to be clear about the role of management in the community engagement process, as well as the people/groups with whom managers intend to engage. Managers, their staff and potential partners that may include other government agencies or NGOs, are the 'organisers' that are collectively engaging others in the process.

- **Rights-holders:** individuals or groups socially endowed with legal or customary rights with respect to land, water and natural resources of (or possibly adjacent to) the area. This group can often include Indigenous peoples, matrilineal cultures and companies, as well as private individuals.

- **Stakeholders:** all those who need to be considered in establishing a MPA. They possess direct or indirect interests and concerns about the site, but do not necessarily have a legally or socially recognised entitlement. At a minimum, they include Indigenous rights holders, Indigenous peoples and local communities. Managers should be aware of and aim to include diverse stakeholder interests and demographic characteristics (age, ability, gender equality, economic status, ethnicity). Understanding the multiple dimensions of stakeholders' perspectives, socio-economic status and potential rights is key; someone with actual tenure in the region of an LSMPA who has been marginalised may not have the ability to effectively engage with managers. These situations highlight the importance of developing a proactive, transparent engagement strategy.

- **Communities:** interested individuals or groups of people. They may share location, concerns, connections, relationships, etc. Communities are usually important stakeholders. They are also comprised of people from different economic classes, clans or family groups, ethnic groups, gender groups and special interest groups. Every community is different and can potentially include many groups involved directly or indirectly with a marine managed area (DENR, BFAR-DA and DILG, 2001). In addition, LSMPA staff should consider and address two different definitions of community when establishing and managing an MPA:

- **Geographical community:** the people within a specific geographical area.

- **Functional community:** a group of individuals and families who may not be living in the same geographical area, but who share significant aspects of common life, such as customs, manners, traditions and language. An example of a functional community could be groups who share common concerns and practices, like fishers and farmers (Marasigan, 1992).

Furthermore, **groupings of the stakeholders** can be assigned to four basic categories, not exclusive to any one type of stakeholder (World Wildlife Fund, 2000). These include:

- **Primary:** those central to the conservation initiative because of their power, authority, responsibility, or claims over resources.

- **Secondary:** those with an indirect interest in the outcome, such as consumers or employees.

- **Opposition:** those who could adversely influence the outcomes through their influence or control over resources.

- **Marginalised:** members of any of the three previous types, who, however, may lack the influence or capacity to participate on an equal basis, or who were excluded in the past, such as women and minorities.

Engagement covers a suite of disciplines – interpersonal and organisational communication, media relations, public relations, social media, education and outreach (which also overlaps with formal and informal education) – each requiring unique yet complementary skill sets.

Effective community and stakeholder engagement (IAP2, 2014) can:

- **Facilitate new ideas and solutions** that are locally or culturally appropriate.

- **Improve trust** and assist in building capacity and strengthening stakeholders' ability to engage with managers and governing agencies.

- **Help manage expectations** and reduce conflicts.

- **Remove barriers** and enhance the decision-making process.

- **Provide early insight** and technical support to project planning and design.

- **Empower stakeholders** to support community-led endeavours.

- **Save money** in the long run: poor engagement strategies that require corrective action or revisiting communities can be costly.

Questions to help identify potential barriers to engagement:

- **Do some stakeholder groups hold significantly more social, cultural, economic, or political power** than others?

- **Are there any stakeholder groups that hold actual tenure rights** (*see* Box 12) or have historically accessed the region of the LSMPA over time? Are there staff or resources available to adequately address these stakeholders and any potential claims?

- **Is respect being shown** for stakeholder knowledge and expertise about the region and resources within the LSMPA?

- **Are multiple languages spoken** by stakeholders? Are there sufficient resources to provide translators or outreach materials in multiple languages? Are there other related communications issues?

- **Are there logistical constraints** specific to travel or actually being able to reach all of the key stakeholders?

- **Have the cultural and social traditions and practices of stakeholder groups been considered** in the way public presentations will be made as well as perceived?

- **Is there an existing history between the science, policy, local or Indigenous communities** that is pertinent to the process of establishing the LSMPA? If so, is it positive? If there are substantive issues in this area, are there qualified people to help develop effective communication strategies?

- **Do stakeholders trust the process?** Do they trust the motivations of managing agencies and feel that there is adequate transparency?

- **Have the potential benefits been weighed against the challenges,** both known and potential? Will potential benefits be seen fairly quickly or will they take time to quantify? If the latter is true, have steps been taken to help stakeholders understand this?

Engagement essentials

Two of the most important objectives for engagement in the design phase are: (1) raising awareness of the site with key communities, including diverse stakeholders and rights-holders (*see* Box 12) and (2) gaining one or more champions to shift or increase political support for the site.

Unlike smaller-scale MPAs, **the context for very large sites is inherently global**. As well, most of the world's current LSMPAs are remote so rights-holders and stakeholders are not able to physically access the area or engage directly in management activities. As such, it is important to think strategically about the regional and global context of the LSMPA (Box 14) and be sure that staff and other site representatives understand this context, are given accurate messages to communicate, and understand why, when and how best to deliver them. From the start of the engagement process, it is critical that management understands the aspects of the proposal: **context** (i.e. local/national/ international history, background and scale of impact); **scope** (i.e. which elements are non-negotiable, timing, resources needed; **people** (i.e. interests and concerns, impact, influencers); **purpose** (i.e. why internal and external stakeholders must be involved, what they need to know about); and **influence** (i.e. how community and stakeholder roles and relationships will shape outcomes) (Curtis, et al., 2014).

Management efforts should also prioritise the engagement of stakeholders, but reaching media is also important. Support from a wide spectrum of audiences will often influence the perspectives of rights-holders and stakeholders, and vice versa. Current scientific literature includes several useful articles on how to effectively include diverse stakeholders in the design of an MPA, including, Reed, et al. (2009), Pomeroy & Douvere, (2008), Gleason, et al., (2010), Dovers, et al., (2015) and Nutters & da Silva (2012). It is particularly important to work with Indigenous peoples, who are often the rights-holders, (*see* Case Studies 1 and 2; Box 13) and local communities at the earliest stages of proposing and designing the LSMPA. Without this engagement the progress can be significantly delayed or derailed. Further, the process can benefit greatly from input by rights-holders, as they are likely to have a investment in the positive outcomes of protection.

Case Study 1

Engaging diverse stakeholders in the Great Reef Barrier Marine Park

Approximately 70 clans of the Aboriginal and Torres Strait islanders are the Traditional Owners of Sea Country estates in and around the Great Barrier Reef. In an effort to engage these communities in the management of the region, the Australian Government's GBRMPA has established several programs to increase awareness and share knowledge. The programs enable Traditional Owners to continue playing an active role in marine management planning, community dialogue and participation in cultural practices.

Many Aboriginal and Torres Strait islanders use marine resources to practice 'living maritime culture', provide traditional food for families and educate younger generations about traditional and cultural rules. The Sea Country Management Agreement is a formal tool, for ongoing protection, implemented in partnership by Traditional Owner clans and the Australian Commonwealth and State to integrate science,

indigenous knowledge and environmental resource management.

The Sea Country Partnerships Sponsorship Program, established in 2010, strengthens relationships between Traditional Owners, governments, reef stakeholders and communities in order to promote participation in conferences, trainings, workshops and other activities that enhance Sea Country management. Over a hundred Traditional Owners have gained sponsorship opportunities under the program, strengthening their capacity to conserve, protect and manage Sea Country.

Another successful effort, the Sense Activity Program, develops activities utilising sight, taste and touch. Conservation leadership and cultural learning is fostered by cultural mentors, marine educators and scientists who model how to protect and conserve catchment and inshore coastal zones. Since its establishment in 2011, over 140 participants have taken part in the program.

Case Study 2

Integrating Native Hawaiian perspectives into protected area management at Papahānaumokuākea Marine National Monument

Relationship-building with the Native Hawaiian community as a partner in management began in 2000, when President Bill Clinton designated the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (NWHICRER), which encompassed the remote waters and island systems extending between Nihoa and Kure atolls in the northwestern three-quarters of the Hawaiian Archipelago. In 2006, what became known as the Papahānaumokuākea Marine National Monument was only the second LSMPA to have been established globally. Hawaiian fishers and interested community members, the initial catalysts for protection of the region, pushed for greater protections and greater engagement in management.

Initially Native Hawaiians were somewhat hesitant to work with agencies within the U.S. and Hawaiian governments due to the sociopolitical history between the United States and the sovereign nation of Hawai'i. However, over time, Native Hawaiians with NOAA's Office of National Marine Sanctuaries, along with others who had a genuine interest in incorporating Native Hawaiian knowledge and perspectives into management practices, helped establish trust and develop relationships within the Native Hawaiian community.

One of the greatest legacies of incorporating Native Hawaiian perspectives into the management of PMNM is the composition of the NWHICRER Advisory Council, in which three of the 15 seats are designated for Native Hawaiian representatives; of the three, one seat is designated for a Native Hawaiian elder. The advisory council subsequently developed the Native Hawaiian Cultural Working Group (CWG) in order to bring in additional resources and add focus to support ongoing engagement of the Native Hawaiian community and research about Hawaiian cultural practices and cultural resource management. The CWG, administered through the Office of Hawaiian Affairs (OHA), reviews proposed permitted activities within PMNM, discusses implications on the cultural resources of the NWHI, and provides perspectives and recommendations to support the proper and effective management of cultural resources. OHA – one of seven co-managing agencies for PMNM – brings CWG recommendations to the PMNM Management Board, which gives these recommendations important consideration. Many co-managing agencies of PMNM often attend CWG meetings to deepen their understanding of cultural resources and the potential impact of management activities.

2.3.4 *Build partnerships to support good design*

Some of the best partnerships are ones that develop naturally and grow from mutual understanding, trust and a shared vision. However, purposefully identifying potential partners and working to forge new relationships during the initial design of the LSMPA is essential; this can and should be done in the public engagement process, especially with groups already working on related issues in the region of the LSMPA. Successful partnerships **expand the network of support** and can leverage additional resources, including in-kind support, funding, equipment, amplification of messaging and access to staff with specialised skill sets. When partnering with government agencies or organisations in another country it

can be important to assess the status of a country's national governance or of the region overall (*see* Box 14).

Assess **partnership management capacity** at multiple points during the design process as sustaining existing partnerships is essential as new ones are forged. Partnerships that are allowed to fall away from a lack of attention or miscommunication or worse, are neglected or mismanaged, can become a liability. Successful partnerships are built and sustained through positive, strong, strategic relationships. Take time to develop a clear, shared purpose, as well as a set of well-defined, practical objectives. Also, be prepared to put time into managing people's expectations and **remain practical**. Clearly defining the role and responsibilities of partners from the beginning is key to minimising the chances of conflict and miscommunication. *See* also section 4.6.5. for partnership development and active management.

HIGHLIGHT

- Start early to build strategic partnerships, recognising that they will require care and maintenance for the long term.
- Seek out groups that have already been doing relevant work in the region.

Box 13

Engaging Indigenous peoples and local communities

Throughout any phase of LSMPA development covered in these Guidelines, managers should appropriately engage with Indigenous peoples or local communities that are connected to or impacted by the site. Engage them early and throughout the design process and build a foundation that will allow for their participation in long-term management. In all cases, management should consult with people or organisations experienced in working with Indigenous peoples or local communities as these relationships are essential to building sustainable and effective conservation strategies and activities that are socially responsible and empowering.

The UN has committed all of its bodies to a human rights-based approach to development (UN, n.d.). Several guides and resources can help MPA managers, including the Convention on Biological Diversity (CBD) supplementary agreement – the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS). CBD's Programme of Work on Protected Areas urges parties to ensure full and effective participation of Indigenous peoples and local communities. Additionally, managers should seek to understand and implement relevant articles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). As a General Assembly declaration, it is not a legally binding instrument under international law, but is a useful guideline.

These resources are available online, along with information on their relevance to marine conservation and the means to achieve successful implementation – simply search for the titles. The UN also has a simple, easy-to-understand Resource Kit on Indigenous Peoples Issues that can be downloaded at the following link: http://www.un.org/esa/socdev/unpfii/documents/resource_kit_indigenous_2008.pdf

Additional resources for working with Indigenous peoples and local communities

Engagement guidance: COMPACT: Engaging Local Communities in the Stewardship of World Heritage (Brown & Hay-Edie, 2013).

Protocol guidance: Biodiversity and culture: exploring community protocols, rights and consent. *Participatory Learning and Action Series* Number 65 (IIED, 2012).

Policy guidance: *Policy on Social Equity in Conservation and Sustainable Use of Natural Resources* (IUCN, 2000).

Guidelines for conduct: *Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessment regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities* (CBD, 2004b).

Guidelines for conduct: *Tkarihwaiéri: Code of Ethical Conduct to Ensure Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant to the Conservation and Sustainable Use of Biological Diversity* (CBD, 2011).

Indigenous knowledge: *Identifying specific elements for integrating the traditional, scientific, technical and technological knowledge of Indigenous and local communities, and social and cultural criteria and other aspects for the application of scientific criteria for identification of EBSAs as well as the establishment and management of marine protected areas* (CBD, 2012).

Box 14

Governance assessment

The World Bank has developed a national-scale analysis of governance and defined Worldwide Governance Indicators. The analysis ranks vulnerability and showcases recent trends through six indictors:

1. Voice and accountability
2. Political stability and absence of violence
3. Government effectiveness

4. Regulatory quality
5. Rule of law
6. Control of corruption

Updated annually, this resource, along with standard assessment processes such as SWOT (strengths, weaknesses, opportunities and threats) may also help LSMPA managers to gain a general picture of national governance strengths and weaknesses, for their own region, the country or region of a partner site they are looking to collaborate with, or a region where comprehensive, cross-site initiatives are being proposed.

For more information, go to: www.govindicators.org

2.4   External considerations in large-scale design

External needs are no more important than internal ones, but they can be more challenging to address. LSMPA managers will likely face complex situations, in which they have little to no control, but which will have a dramatic impact on their site and significantly test management's effectiveness. In this section we briefly describe **governance, social and biophysical considerations**.

2.4.1   *Governance considerations in large-scale design*

IUCN's recent Guidelines on the governance of protected areas provide an in-depth explanation of governance as it applies to protected areas, as well as how different governance options apply to various categories of protected areas (Borrini-Feyerabend, et al., 2013). These Guidelines summarise the four main governance types recognised by IUCN and the CBD for protected areas, and describe how they are generally relevant to LSMPAs (*see* Table 6).

Given the **complexities of relationships** between governance and natural resource management, there is not always a simple and direct connection between governance and biodiversity outcomes (Barrett, et al., 2001). Still, effective and equitable governance will ultimately sustain management efforts, partnerships and key stakeholder relationships over time. Managers brought into the process after establishment, and possibly after the LSMPA's design and management planning stages, still need to ensure that internationally recognised guidance of best practice for governance and management is followed. Making a priority of developing strong relationships with the agencies that have authority over the LSMPA is as critical as managing staff and daily operations.

Governance, particularly shared governance, is obviously relevant to LSMPAs, because they require formal establishment through a national government, even for sites that were initially proposed or championed by a community or NGO. In addition, effective large-scale marine management usually requires the participation of government or substantive partnerships between government agencies, institutions and NGOs. These two types of governance mechanisms also play a critical role in large-scale transboundary MPAs and/or conservation corridors, which require agreements to be made between multiple governments or government agencies (Vasilijević, et al., 2015).

Community and private governance types may at first seem less important to very large MPAs, but the experience of managers working in the field is that they are vital to understand, and will play an increasingly important role in marine conservation as the importance of MPA networks and regional initiatives increase. Based on an assessment of Big Ocean member sites, both proposals for and establishment and management of LSMPAs are increasingly led by Indigenous

> **HIGHLIGHT**
>
> Never delay action where irreversible damage to the site may occur.

Box 15

Institutional frameworks

Various types of institutional frameworks exist for LSMPAs, empowered by formal legislation or by practices established over time, or by a mix of both. Rarely does a single agency or community have jurisdictional control over all the activities occurring within an LSMPA, so there is usually a need to integrate effective MPA management across a range of agencies, industries and stakeholders (Table 18).

An effective institutional framework exhibits some key principles (UNESCO, et al., 2010):

It is responsive and flexible to cope with emerging concepts, trends and requirements.

It promotes the concepts of empowerment, participation and inclusion, with an open organisational structure and sufficient operational capacity to promote an integrated approach, i.e. working with others.

Organisational decentralisation, when appropriate, brings decision-making closer to the problems of the MPA, favouring community participation and the promotion of sustainable approaches.

Organisations mainly responsible for management:

- Central government (ministries, departments)
- Decentralised government (sub-function)
- Semi-government
- MPA-specific institutions empowered by law
- New hybrid institutions (integrated), joint management
- Local or provincial-level government
- Private trusts
- Organised community groups.

Common sources of secondary support

- Other government implementing agencies
- Non-governmental organisations
- Universities/training institutions
- Research institutions
- Funding bodies (e.g. WWF, Pew, Conservation International)
- Traditional owners and/or community groups
- Professional organisations (e.g. ICOMOS)
- UNESCO World Heritage Centre
- Consultancy Services
- Industry.

Table 6. Protected area governance types and sub-types

Governance types and sub-types		
Adapted from CBD Concept Note 8 (2008) and IUCN Best Practice Guidelines on *Governance of Protected Areas: From understanding to action* (Borrini-Feyerabend, et al., 2013)		
1	Governance by **government** (at various levels and possibly combining various institutions): • Federal or national ministry or agency in charge. • Sub-national ministry or agency in charge (e.g. at regional, provincial, municipal level). • Government-delegated management (e.g. to an NGO).	
2	**Collaborative or shared governance by various rights-holders and diverse stakeholders together:** • Transboundary governance (formal arrangements between one or more sovereign states or territories). • Collaborative governance (through various ways in which diverse actors and institutions work together). • Joint governance (pluralist board or other multi-party governing body).	
3	Governance by **private** individuals and organisations: • Conserved areas established and run by: (a) individual landowners, (b) non-profit organisations (e.g. NGOs, universities) and (c) for-profit organisations (e.g. corporate landowners).	
4	Governance by **Indigenous peoples or local communities**: • Indigenous peoples' conserved territories and areas – established and run by Indigenous peoples. • Community conserved areas and territories – established and run by local communities.	

peoples and local communities. In addition, smaller scale marine areas or larger networks made up of smaller MPAs could be adjacent to or 'nested' within an LSMPA. This is especially likely if the boundaries include coastal areas or span significant portions (or the entirety) of a nation's EEZ. Locally-Managed Marine Areas (LMMAs) and Community Conserved Areas (CCAs) are some of the kinds of area-based management that large MPAs may need to work with. Other areas that fall outside of IUCN or CBD definitions of protected areas (i.e. may not be formally designated, regulated or managed) may also need to be considered. Managers of LSMPAs will probably not have community and private governance as elements of the overarching management of the site, but they may very well have to work directly with other management entities or communities that do.

Approaches to creating legislation for an LSMPA can range from new and specific purpose lengislation to continued use of existing legislation. Also consider whether the site, from the concept stage, is being designated from the 'top-down' (government-driven) or 'bottom-up' (substantive involvement from diverse stakeholders). The ideal may be to combine the two because of the importance of ensuring that an LSMPA becomes part of an integrated, long-term, national resource conservation strategy or plan (*see* Case Study 3) (Kelleher & Kenchington, 1992; Kelleher & Recchia, 1998; Jones, et al., 2001).

As the legal framework for an LSMPA often occurs at local, regional, national and international levels, the time frame for formal establishment will be unique to each large-scale site. It is safe to say that the process will take longer than establishing a smaller site and longer than most managers would like. In many cases, this can take years.

Regardless of the overall time frame, **consider interim measures**, if possible. Engage the relevant government partners to assess whether existing legislation or other

instruments can be used (e.g. executive decrees) to ensure some means of immediate management and protection of the integrity of the site.

A brief overview of governance models is provided in Table 6 and a similar summary of the current management models of the world's formally established LSMPAs in Table 7. Both describe the complex nature of managing a large-scale site.

Utilising existing legislation in the short term can occur in parallel with the development of an approach that is more suited to the site in the long term. If the initial conservation efforts are effective and the community is appropriately engaged, a marked improvement in the overall climate for the establishment of the MPA will be achieved. Consider using complementary measures, such as fishing permits, tourism regulations, commercial licences, direct intergovernmental negotiations or direct community management.

Legal establishment of a site will be **tied directly to community and stakeholder support**. The actions of stakeholders may even affect how legislation is written. This can be challenging for a large-scale site where the boundaries include multiple-use zones. For example, even if opposition to the site's establishment is small, a powerful, vocal group of local stakeholders could place enough pressure on other constituent groups to change their stance. If this happens, the issue may need to be addressed in the legal framework and regulations. On the other hand, if the site has gained broad, substantive support, the law can empower collaboration for the site's long-term management. It can be difficult to balance the needs of day-to-day management with flexibility, but commitment results in progress. In the Cook Islands, one of the first steps was to present the concept of an LSMPA to communities and stakeholders and invite their opinion. This allowed the concept to evolve based on the input received. Responses were summarised and became the basis for a policy document forming the legislation for CIMP.

Table 7. Governance and management frameworks in selected LSMPAs, by date established (see Table 6 for governance definitions)

	Site	Year Est.	Zone/Type	Governance Type	Additional governance models that may apply	Top 2 Management Priorities
1	Great Barrier Reef Marine Park	1975	Multi-use with seven marine zone types	Government and shared governance		1) Long-term protection and conservation of environment, biodiversity and heritage values of the Great Barrier Reef Region 2) Ecologically sustainable use
2	Papahānaumokuākea Marine National Monument	2006*	Permitted access	Government and shared governance (called co-management at the site)		1) Long-term resource protection of natural and cultural resources 2) Cultural resources access
3	Phoenix Islands Protected Area	2008	No-take	Government	MPA is wholly owned by the government and people of Kiribati	1) Ensure long-term banning of all forms of commercial fishing 2) The first natural laboratory in the wild wholly protected
4	Marianas Trench Marine National Monument	2009	Permitted access	Government and shared governance		1) Exploration and research 2) Resource protection
5	Pacific Remote Islands Marine National Monument	2009**	Permitted access	Government and shared governance	Site includes areas managed by the US military.	1) Exploration and research 2) Resource protection
6	Motu Motiro Hiva Marine Park	2010	No-take	Government	The MPA is part of Easter Island marine eco-region including Rapa Nui. The focus of the MPA is support and benefit to the Rapanui people by helping to recover their marine resources.	1) Participatory conservation 2) Research
7	British Indian Ocean Territory Marine Protected Area	2010	No-take	Government	None	1) Conserving wildlife and habitats 2) Reducing threats to natural resources, including illegal fishing
8	Marae Moana: Cook Islands Marine Park	In-train; declared 2012	Multi-use	Government and shared governance***	Site overlays a smaller MPA or network of MPAs that are community managed	1) Environmental protection through cultural heritage 2) Sustainable use of resources
9	Parc Naturel de la Mer de Corail – Natural Park of the Coral Sea	2014	Multi-use	Government and shared governance	Site overlays the Grand Lagoons, which are a marine World Heritage Site, and Parc Natural des Atolls d'Entrecasteaux MPA, which has it own management plan	1) Sustainable development of marine activities, whether they be for economic, social or cultural purposes 2) Conservation of natural heritage, especially deep sea pelagic and reef's ecosystems

PMNM expanded in 2016
*** PRIMNM expanded in 2014*
**** Marae Moana's governance structure is currently being formed and will likely be classified as government or co-management*

In some cases, **existing national regulations can be complex** to the point of confusion for local communities, making voluntary compliance difficult. It is critical to ensure that regulations are easily understood and enforceable, and that any needed capacity building takes place so constituents are able to better engage with management and planning processes. This is especially true when dealing with multiple languages and communities with different cultural traditions. For example, strict no-fishing rules in specific zones or across an entire site are much easier to understand and comply with than 'prohibition of fishing between May and June, between the high-water mark and one mile from the shore' (Kelleher, 1999). Therefore, be sure that educational materials and messaging (including signage) use clear, easy-to-understand explanations, are provided in all applicable languages and are also supported by community workshops or other interactive activities.

Consider using an experienced outside facilitator if stakeholder groups are engaged directly in a public meeting setting. The experience of managers from the oldest LSMPAs underscores existing advice that the leaders of stakeholder engagement need keen negotiating skills and must be able to develop and implement a process that considers social, political, economic and gender dimensions. Bringing in an experienced facilitator will reduce pressure and allow the management team to focus on presenting plans and perspectives appropriately (OSPAR, 2008).

Building regulations around stakeholder interests will not automatically provide adequate levels of protection or ensure success in management efforts (Brody, 1998), but the results may include decreased conflict and increased cooperation, communication and voluntary compliance.

Consider how Indigenous rights and contested sovereignty claims relate to site design. Doing so should help avoid future legal issues or challenges to the site's legality. It may also create a clear legal framework that has Indigenous support for the site's designation. Being aware of and building knowledge about these issues will allow MPA designs that are effective in both environmental and social outcomes.

Although the understanding of gender dimensions in smaller MPAs has shown that women can play a significant role in the site selection, management and enforcement, for management on a large scale, such **gender relationships remain poorly understood**. Nevertheless, gender is important to consider from the very beginning of LSMPA site design, because changing gender roles can impact livelihoods, social equity outcomes and long-term management success (Clabots, 2013). As the gender dimension is an understudied field overall, it might be helpful to consider conducting a gender analysis specific to the LSMPA, with an understanding that gender includes women and men at different ages (children, youth, adult, elderly), classes (economic and social status), cultural backgrounds and ethnicities. It is also helpful to think about how to integrate gender considerations into all aspects of management, from applied research, funding decisions, and establishing project objectives and methodologies, to data gathering, analysing results and evaluation (Buitendijk & Maes, 2015; European Commission, 2015).

Cultural researcher Makani Gregg counts *'opihi*, a Hawaiian delicacy and culturally important species, during a shoreline survey at Nihoa.
© Hoku Johnson/NOAA

Governance becomes more complicated as an LSMPA stretches across multiple legal jurisdictions and regulatory mandates, or when there are efforts to extend the site after its legal establishment. An example of a functional governance mechanism across jurisdictions within a country is the formal Intergovernmental Agreement between Australian federal and state government agencies responsible for the joint management of the Great Barrier Reef Marine Park. This includes complementary legislation so that state laws mirror federal laws and there is joint permitting and shared resourcing. Where a multi-jurisdictional governance structure is not appropriate or is problematic, it may be wise to support the creation of a new management structure as a cost-effective, efficient alternative to a collaborative, multi-agency model.

Because LSMPAs often manage multiple species and habitats, **responsibility is likely to fall under different agencies or institutional authorities**, either by region (e.g. state and federal waters) or by species (e.g. fishery and protected species resource authorities). Designating strategies and frameworks to coordinate multiple agencies is key to effective management and reduction of conflicts. For instance, the management plan for the Phoenix Islands Protected Area outlines the responsibilities of individual agencies and establishes a council for resolving interagency disagreements. PIPA also has a designated plan and specific language to ensure agencies have the adequate structure and financial backing to carry out their responsibilities.

Agencies can have very different internal cultures and policies for how they make decisions, develop management strategies and activities, build partnerships and spend their

funding. Current managers of established LSMPAs recommend having calibration meetings that bring all potential management agencies to the table as early in the development and site design stage as possible. These meetings should address how site operations will likely be conducted and what aspects of management each agency will be responsible for. More importantly, real-world scenarios should be considered and agencies should share how they would handle various situations. During these discussions, areas where agencies will likely have issues in coming to agreement should be noted, and the development of internal decision-making processes should be undertaken immediately. If there is significant disagreement or even conflict between agencies, utilising a professional facilitator is also highly recommended.

Table 8. Examples of actions to support cooperation

Model of cooperation	Example
Communication or information sharing	• Regular communication on actions, problems, opportunities or other relevant issues. • Regular sharing of information, e.g. notification of various management actions in a particular site.
Consultation	• Seeking opinion, feedback or advice from each other, e.g. on how to solve a problem, how to improve a management action, etc. • Cooperative process with the aim to harmonising management
Coordinated action	• Jointly coordinated management actions implemented within the sovereign areas of each party, which contribute to the conservation goals of the entire transboundary ecosystem, e.g. monitoring of species and ecological processes occurs as a regular activity on the territory of each party, but the results contribute to conservation of species or ecosystems in the whole shared ecosystem. • This model is considered to be a form of cooperative management.
Joint implementation of decisions	• Jointly coordinated and implemented management actions across the sovereign boundaries, e.g. joint law enforcement patrols, joint fundraising and project implementation, the production of marketing material that profiles the transboundary conservation areas as a single entity, etc. • This model is considered to be a form of cooperative management.

~ From Borrini-Feyerabend, et al., 2013

Case Study 3

A cooperative approach between state and federal governments in Australia to benefit the Great Barrier Reef Marine Park

The Great Barrier Reef Marine Park covers an area about the size of Italy or Japan and stretches 2,300 km along the eastern coast of Australia. Both Queensland (state) and Commonwealth (federal) waters exist within the outer boundaries of the GBR Region, necessitating a cooperative approach to address jurisdictional complexities and assist park managers within GBRMP.

Given the complexities of distinguishing what were state versus federal waters, both arms of the government agreed to complementary management of the waters and islands in 1979 under the Emerald Agreement. The Offshore Constitutional Settlement Act of 1975, still in use today, states that for MPA planning, the waters of the GBR Region are Commonwealth up to the low-water mark – Commonwealth authority overrides any conflicting state legislation, even legislation which was previously considered settled law, within the 3-mile territorial sea. The Emerald Agreement addressed other legal and administrative matters, such as cases, in which the Commonwealth led in overall park management, Queensland in day-to-day or field management, and together they acted jointly in permitting and enforcement, assisted by mirroring legislation.

The 1975 Act also introduced the Field Management Program, which is jointly funded by Queensland and the Commonwealth to coordinate operations in the GBR, including compliance. The Act also created the GBR Ministerial Council, which facilitates discussions between federal and state ministers responsible for matters relating to the environment, marine parks, science, tourism and/or natural resource management.

Australia's integrated governance and management model has proven to be effective for at least 40 years. Enhancements such as the Intergovernmental Agreement, which replaced the 1979 Emerald Agreement in June of 2009, help to ensure lasting success in an era of new global challenges, such as climate change and catchment water quality.

A larger challenge is the design and management of a large-scale transboundary or multinational MPA that straddles one or more borders between states or areas beyond the limit of national sovereignty or jurisdiction. There can also be circumstances in which two LSMPAs that are not necessarily contiguous must still cooperate to sustain biological migratory pathways for key species. In both cases it will be important to understand that collaboration and communication may be complex and take time. Managers should take into account the additional resources needed to engage a much broader spectrum of diverse stakeholders. More work must be done to provide advice specific to the marine realm, as even the most current IUCN WCPA Best Practice Guidelines on transboundary conservation do not offer detailed advice about the marine context (Vasilijevic, et al., 2015). However, the basic principles and measures of cooperation remain applicable, including communication or sharing of information, consultation, coordinated action and joint implementation of decisions (*see* Table 8). Even though experience from terrestrial and coastal areas indicates that a systematic approach can assist transboundary initiatives, current legal regimes – particularly for the high seas – have proven insufficient in fully realising these objectives. Management institutions do not seem to have an adequate mandate for integrated planning nor the ability to effectively coordinate across multiple management regimes (Ban, 2014).

A site's zoning and areas where multiple or commercial uses are being considered (e.g. seabed mining) must be carefully negotiated, and should be constructed to resolve any existing disputes over contested waters or shared resources. This is important for conflicts at all levels of government, including those involving sovereignty disputes. All of the processes and protocols considered as essential in respecting the rights of Indigenous peoples and local communities, such as gaining free prior informed consent, benefit-sharing and respecting cultural heritage, must also be implemented in agreements developed with other nations.

2.4.2 *Biophysical considerations in large-scale design*

In recent years, the paradigm of managing single species or issues has shifted to managing entire ecosystems, seascapes and ocean corridors. Current LSMPAs provide the opportunity to take an ecosystem-based management approach by protecting whole ecosystems, including populations of important organisms (such as endemic, threatened, endangered or keystone species), as well as the whole life cycles of organisms (such as larval distribution ranges and corridors for highly migratory species) (Levin & Lubchenco, 2008; Crowder & Norse, 2008; Big Ocean, 2013). The 11 biophysical operating principles (*see* Table 9) developed as

Table 9. Biophysical operational principles as recommended by the Scientific Steering Committee, Great Barrier Reef Marine Park Authority (2002)

#	Principle	Explanation
1	Have no-take areas that are a minimum of 20 km along the smallest dimension (except for coastal bioregions; refer to Principle 6).	While no-take areas may be of various shapes and sizes, 20 km should be the minimum distance across any no-take area in order to ensure that the size of each area is adequate to provide for the maintenance of populations of plants and animals within Green Zones (no-take areas) and to insure against edge effects resulting from use of the surrounding areas.
2	Have larger (versus smaller) no-take areas.	For the same amount of area to be protected, protect fewer, larger areas rather than smaller areas, particularly to minimise 'edge effects' resulting from use of the surrounding areas. This principle must be implemented in conjunction with principle 3.
3	Have sufficient no-take areas to insure against negative impacts on some part of a bioregion.	'Sufficient' refers to the amount and configuration of no-take areas and may be different for each bioregion depending on its characteristics. For most bioregions, three to four no-take areas are recommended to spread the risk against negative human impacts affecting all Green Zones within a bioregion. For some very small bioregions fewer areas are recommended, while for some very large or long bioregions, more no-take areas are recommended.
4	Where a reef is incorporated into no-take zones, the whole reef should be included.	Reefs are relatively integral biological units with a high level of connectivity among habitats within them. Accordingly, reefs should not be subject to 'split zoning' so that parts of a reef are 'no-take' and other parts are not.
5	Represent a minimum amount of each reef bioregion in no-take areas.	In each reef bioregion, protect at least three reefs with at least 20% of reef area and reef perimeter included in no-take areas. The number and distribution of no-take areas is described in principle 3.
6	Represent a minimum amount of each non-reef bioregion in no-take areas.	In each non-reef bioregion, protect at least 20% of the area. Two coastal bioregions, which contain finer scale patterns of diversity due to bays, adjacent terrestrial habitat and rivers, require special provisions. The number and distribution of no-take areas is described in principle 3.

Table 9 continued

#	Principle	Explanation
7	Represent cross-shelf and latitudinal diversity in the network of no-take areas.	Many processes create latitudinal and longitudinal (cross-shelf) differences in habitats and communities within the Great Barrier Reef (GBR) World Heritage Area. This diversity is reflected partly in the distribution of the bioregions, but care should be taken to choose no-take areas that include differences in community types and habitats that cover wide latitudinal or cross-shelf ranges (*see* principle 8).
8	Represent a minimum amount of each community type and physical environment type in the overall network taking into account principle 5.	This principle is to ensure that all known communities and habitats that exist within bioregions are included in the network of no-take areas. Communities and habitats were identified for protection in no-take areas based upon the reliability and comprehensiveness of available data. It is important to implement this principle, which is intended to ensure that particularly important habitats are adequately represented in the network of no-take areas.
9	Maximise use of environmental information to determine the configuration of no-take areas to form viable networks.	The network of areas should accommodate what is known about migration patterns, currents and connectivity among habitats. The spatial configurations required to accommodate these processes are not well known, and expert review of candidate networks of areas will be required to implement this principle.
10	Include bio-physically special/unique places	These places might not otherwise be included in the network but will help ensure that the network is comprehensive and adequate to protect biodiversity and the known special or unique areas in the GBRMP. Aim to capture as many bio-physically special or unique places as possible.
11	Include consideration of sea and adjacent land uses in determining no-take areas.	Past and present uses may have influenced the integrity of the biological communities and the GBRMP should consider these effects, where known, when choosing the location of no-take areas. For example, existing no-take areas and areas adjacent to terrestrial national parks are likely to have greater biological integrity than areas that have been used heavily for resource exploitation.
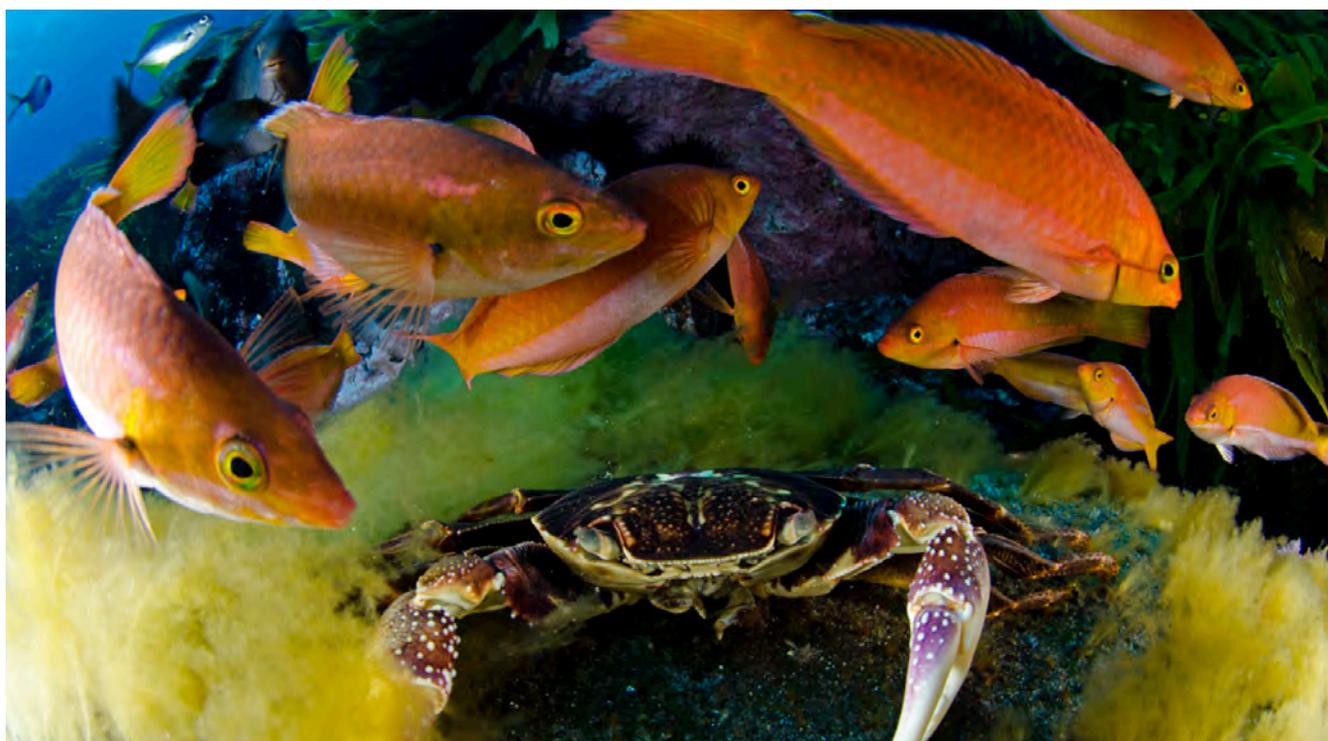
Undulating kelp forests and abundant fish populations of the Nazca-Desventuradas MPA provide stunning visuals. Credit: PRISTINE SEAS, Desventuradas.
© Enric Sala/National Geographic

part of the Great Barrier Reef Marine Park rezoning are a useful guide.

LSMPAs allow us to understand how ecosystems function. Many large-scale ocean features (e.g. seamount chains, ocean gyres and migratory corridors) can only be protected through a large-scale approach. This scale of protection should reflect the full diversity of all natural resources and processes present within the ecosystem, including geological, chemical and physical features.

In some places, LSMPAs will include coastal waters and may even encompass onshore habitat. In such cases, taking an ecosystem-based approach to designing the site will require consideration of upland and land-based impacts.

In order to determine the appropriate level of protection needed across any given LSMPA from both a biophysical and sociocultural standpoint, **a comprehensive spatial planning framework** (i.e. zoning) must be developed. However, zoning alone cannot fully mitigate the following threats (Day, 2015).

- **Water quality** – primary impacts are from land-based sources.

- **Fishing impacts** – MPAs can address some fishing impacts, but cannot directly control those outside their boundaries or illegal and unregulated fishing.

- **Climate change** – increased resilience will likely occur, but other factors such as acidification or rising sea temperatures will not be impacted.

- **Coastal developments, especially ports** – LSMPA regulations will not affect development located outside their jurisdictional control.

- **Shipping and pollution incidents** – delineated shipping lanes help manage ship traffic, but cannot directly control ship groundings or marine pollution.

- **Increasing population growth and recreation** – actions taken within an LSMPA will not likely curtail use or reduce some of the consequential impacts from the needs of a growing populace.

A better means to protect the varied marine ecosystems within LSMPAs is to use a **combination of management 'tools'** or approaches that include input from agencies in other sectors (Day, 2015), such as specific legislation for fisheries management or shipping. However, it is important to ensure that management tools remain subject to the overall zoning framework and remain consistent with the underlying objectives of the area.

There is growing evidence that **no-take reserves** or MPAs that prohibit all extractive uses provide a significant ecological benefit. Well-established and managed marine reserves can increase the size, abundance and diversity of marine life within their boundaries. They can also help preserve the structure and function of intact ecosystems and help replenish fisheries stocks outside their boundaries (Partnership for Interdisciplinary Studies of Coastal Oceans, 2007). These benefits are particularly true when additional elements in a site's design are present: **size** (larger than 100 km^2, as with LSMPAs as defined in these Guidelines), **enforcement** (consistent and effective) , **longevity** (established for 10 years or more), and **remoteness or isolation** by deep water or sand (Edgar, 2014).

Ideally an LSMPA should be designed to increase or maintain **biological diversity and ecological resilience**. Nations should consider the ways in which LSMPAs can be designed to address the impacts of climate change (e.g. sea-level and temperature rise) and to address wider but related social issues. Design considerations that increase resilience to the impacts of climate change include size, shape, connectivity, and the maintenance of ecosystem function, amongst other factors (Salm, et al., 2006). LSMPAs have several advantages in this area. Their respective size means they are likely to encompass multiple temperature regimes, thereby increasing the chances that some reefs survive events associated with sea temperature changes (McLeod, et al., 2008). LSMPAs are also likely to support high levels of biodiversity and large populations (*see* Box 16), which are instrumental in repopulating affected areas following a climatic disturbance (Salm, et al., 2006; McLeod, et al., 2008). As implementation of LSMPA activities and monitoring must occur across vast

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Box 16

Ecologically or Biologically Significant Areas, key biodiversity areas and important marine mammal areas

Ecologically or Biologically Significant Areas (EBSAs) were initially a response to the need for protecting marine biodiversity in the 'open ocean and deep sea,' which largely falls outside the limits of national jurisdiction (Ardron, et al., 2009). In 2006, an expert meeting of the CBD was held to review various sets of criteria that could be used for identifying EBSAs, which are different than MPAs because they describe important ocean areas scientifically, but are not protection measures. The insights and lessons learned were reviewed and revised into the existing set of seven EBSA site criteria (adapted from CBD, 2008a, Annex I):

1. Uniqueness or rarity.

2. Special importance for life history of species.

3. Importance for threatened, endangered or declining species or habitats.

4. Vulnerability, fragility, sensitivity, slow recovery.

5. Biological productivity.

6. Biological diversity.

7. Naturalness.

Box 16 continued

The EBSA criteria, as well as criteria to guide the development of MPA networks, were adopted at the 9th CBD COP9 in 2008 (CBD, 2008a, Annexes I & II). The EBSA approach has been expanded beyond its original intent and is now also used to support the identification of important ocean areas within national jurisdiction, thereby enabling countries to use this process to help identify potential MPAs. The process can also help inform countries' National Biodiversity Strategies and Action Plans, and provide access to international funding for site-based conservation and spatial conservation planning initiatives (Dunn, et al., 2014). Many EBSAs around the world have been identified through regional workshops organised by the CBD Secretariat and attended by state-nominated experts.

Key Biodiversity Areas (KBAs)

In 2004, the concept of KBAs was developed, using a framework and standardised criteria in which thresholds were based on distribution and population of species requiring site-based conservation strategies (Eken, et al., 2004). The framework was informed by decades of work led by Birdlife International's experience with Important Bird and Biodiversity Areas (IBAs), established in the early 1980s (Birdlife International, 2015). In 2007, a set of Guidelines in the IUCN Best Practices Series was developed to support the identification, prioritisation and gap analysis of KBAs as a means to help governments and others with their commitment to the CBD Programme of Work on Protected Areas. The KBA criteria were designed to be applied consistently across diverse taxonomic groups and biogeographic regions (Langhammer, et al., 2007). To date, KBAs have been extensively applied on land and in freshwater systems across a suite of taxa and biomes. The KBA Standard was approved by the IUCN Council in April 2016 and was endorsed through a Resolution of the 2016 IUCN World Conservation Congress (IUCN 2016).

Unlike the EBSA process, which is focused solely on the marine environment, the KBA process applies to both terrestrial and marine areas. KBAs consider a variety of issues that might affect species to a larger degree in the aquatic environment, such as higher connectivity and more extensive ranges. Since 2012, the KBA approach has been refined to ensure the methodology is pragmatic for conservation practitioners, diverse stakeholders and end users while also remaining scientifically rigorous. The five criteria proposed under the new KBA standard (CBD, 2013) aim to identify sites that contribute significantly to the global persistence of:

- Threatened biodiversity;
- Geographically restricted biodiversity;
- Exceptional ecological integrity and naturalness;
- Critical ecological processes;
- Biodiversity as identified through a comprehensive quantitative analysis of irreplaceability.

Important Marine Mammal Areas (IMMAs)

IUCN's Joint SSC-WCPA Marine Mammal Protected Areas Task Force (MMPATF), together with the International Committee on Marine Mammal Protected Areas has (ICMMPA) embarked on a process to develop criteria and a process for identifying IMMAs (Hoyt & Notarbartolo di Sciara, 2014; Notarbartolo di Sciara, et al., in press). The purpose is to use taxon-specific criteria to identify habitat important for marine mammals and their life-cycle processes. Insights from this proces will be widely useful for marine biodiversity. Important Marine Mammal Areas are intended to contribute to the global sets of EBSAs and KBAs, as well as be useful in their own right. Some areas will be useful in proposing, designing, creating and even expanding or building networks of MPAs. In some cases, IMMAs may be of particular value in addressing threats to marine mammals, such as ship strikes, noise, or by-catch, by using non-spatial tools and national, regional or international policy directives. IMMAs will also reveal if existing MPAs and other conservation tools are positioned to protect marine mammals.

Marine mammals are high-profile, popular species that can serve as a catalysts for MPA efforts. Creating protected areas or networks of areas for these species represent a strategic and potentially cost-effective approach to conservation. Marine mammals:

1. Have a specific vulnerability with nearly 25% as threatened species (IUCN Red List, 2017).

2. Have been overlooked by some national efforts to create MPAs; act as indicators to support the identification of MPAs and spatial protection measures because they are more easily monitored than most other pelagic vertebrates.

3. Are umbrella species which help ensure that a properly designed conservation plan will be beneficial to broader ecosystem communities.

4. Serve as flagship species representing powerful political and public levers for the conservation of less popular or well-known organisms, communities or habitats.

Knowledge of areas that are important for marine mammals will facilitate the balancing of human uses of the sea with the imperative of conserving marine biodiversity. By pointing to the presence of marine areas of particular ecological value, IMMAs will serve the function of promoting the conservation of a much wider spectrum of species, biodiversity and ecosystems, well beyond the specific scope of conserving marine mammals.

For a site to be **resilient** over time, its design must protect a wide range of habitat types that are geographically widespread to increase the chances of key habitats surviving a major catastrophic event (Björk, et al., 2008). It is also important to **maintain biodiversity by creating enough redundancy to compensate for species or habitat loss** (Bellwood, et al., 2004). If the LSMPA has coastal areas, the design must address direct anthropogenic impacts (e.g. coastal runoff, pollution). Through partnerships, the site can engage other sectoral entities that may have more direct control over the sources of the threats. Although site managers will not likely develop a monitoring programme until the middle of the management-planning phase, it is advisable to consider how a site's boundaries and zoning could better support resiliency, a key concept to effectively communicate in the design phase through education and outreach materials.

HIGHLIGHT

Large-scale MPAs should be designed not only with ecological connectivity in mind, but also geophysical and chemical processes.

A second critical biophysical consideration in design is **connectivit**y (Big Ocean, 2013). Connectivity can include ecological processes (e.g. trophic relationships between predators and prey, symbiotic relationships and recruitment dynamics), as well as geophysical processes (e.g. currents, sea temperature regimes and tectonic movement) and chemical processes (e.g. acidity, salinity, cycling of elements and gases) (McCook, et al., 2009). Ideally, an LSMPA will be designed to **maintain the inherent interconnectedness of the site's natural resources and processes**. As previously stated, a large-scale site will also increase connectivity across national networks of MPAs. Similar to networks of MPAs, single LSMPAs can also increase connectivity (Toonen, et al., 2013; Big Ocean, 2013), which is essential to increasing resilience in the face of climate change, natural disasters and social and political fluctuations *See* Case Study 18.

Until recently, MPAs have largely focused on near-shore and shallow-water habitats. LSMPAs create **new momentum to protect offshore and open ocean areas** as well. A characteristic feature of oceanic ecosystems is that key habitats, such as eddies and upwelling zones, will change in location and intensity over time; MPAs that are designed at large-scale will therefore be much more able than smaller MPAs to incorporate dynamic habitats and protect vulnerable and poorly understood marine ecosystems, such as seamounts, trenches or pelagic environments.

Representation of different habitats within the design of an LSMPA is important. Some methodologies can help visualise the representation of resources, such as the Marine Ecoregions of the World, which establishes a hierarchical classification that defines realms, provinces and ecoregions (Spalding, et al., 2007). Managers and scientists can then develop a classification scheme to help identify features that are globally, regionally or nationally significant.

In addition to the experiences drawn directly from existing LSMPAs, the guidance in Box 17 has been adapted from existing MPA network design Guidelines (Goriup, 2017) to address the needs of LSMPAs.

The South-west Corner Commonwealth Marine Reserve in Australia protects productive oceans areas, such as upwelling zones, which are important feeding areas for the threatened white shark. © Parks Australia

Box 17

Applying the IUCN MPA Guidelines to LSMPAs

- LSMPAs and networks should fully represent the range of marine and coastal diversity present within the given area, not only in terms of biology but also geology, chemistry, oceanography, social and cultural charateristics. The collection of large-scale MPAs ideally should reflect the full suite of Earth's ocean habitats and processes.

- Replication is a critical principle in marine protection. In the context of LSMPAs, replication may actually be a by-product given their vast size. Conversely, some large-scale processes may be irreplaceable and not replicable; e.g. a specific ocean gyre.

- LSMPAs should be designed for viability incorporating self-sustaining ocean habitats and processes of sufficient extent to ensure that the biological, chemical, geological and physical oceanographic processes persist through natural cycles of variation.

- Information will inevitably be limited and designers should therefore design an LSMPA based on the best currently available information.

- Permanence in large-scale design should be aimed at long-term protection to effectively conserve the diversity of biological, geological, chemical and physical oceanographic processes, in perpetuity. To ensure long-term conservation, the status of resources needs to be periodically assessed to determine whether different management actions are needed.

- LSMPAs should be designed with connectivity in mind, seeking to maximise and enhance linkages across ocean basins among neighbouring LSMPAs, including the physical movement of living and non-living resources (e.g. genetic, demographic and individual connectivity; cetacean migration; carbon cycle and oxygen pathways; phytoplankton movement).

- Resilience is essential for LSMPAs to maintain natural states and rebound from pronounced disturbances over the long term (e.g. ocean acidification, global warming and sea-level rise).

- Sufficient size and shape is vital to minimising adverse impacts from outside activities while maximising contributions to humanity and nature; e.g. food security, climate change adaptation and livelihood security.

Sustainable human use: collection fisheries and tourism in the Great Barrier Reef Marine Park

The sustainable use of the GBR's resources is critical to the commercial fishing industry, aquarium collectors and tourism operators. As a result, the GBRMPA has implemented programs to ensure that the extraction and use of these resources, including commercial, recreational, Indigenous and charter fishing, occurs in a sustainable manner. The management of people and activities within the GBRMP is shared between the Australian and Queensland governments; in the case of fishing, the principal extractive use within the GBRMP, management agencies work closely with the fishing industry to improve the ecological sustainability of the operations.

Marine aquarium fish and coral collectors actively participate in the Reef Guardian Fishers Programme, which mandates a uniform standard of sustainable hand collection methods. These activities are licenced by Fisheries Queensland and are permitted by the GBRMPA in accordance with strict Guidelines, including detailed logbook reporting, quota monitoring and active industry participation in collaborative ecological risk assessments (ERAs) that are used to modify harvesting based on the needs of specific species or groups of species.

The marine tourism industry is a key partner in protecting and managing the GBR, as nearly 2 million tourists visit the Great Barrier Reef annually, making it the most significant commercial global use of a reef. GBRMP's annual catchment directly and indirectly contributes approximately $5.2 billion to the Australian economy. Tourism operations are closely managed by a permitting system that accounts for level of use and special provisions for sensitive areas. Operators also participate in programmes like Eye on the Reef that build strong industry connections and offer tourists hands-on opportunities to assess the reef environment and provide data that will ultimately help protect the sites they are visiting.

GBRMPA also encourages tourism operators to become certified through its High Standard Tourism Programme, which can award longer permit terms and marketing support, as two examples, for companies that make significant contributions through its programs. In 2013, 64 high-standard operators in the programme carried approximately 64% of all commercial tourists visiting the Great Barrier Reef.

2.4.3 *Social considerations in large-scale design*

Economic considerations

Some decision makers and constituencies are primarily concerned with the **economic benefit** that could be generated by LSMPAs, such as through sustainable tourism. Others focus on the **opportunity costs**, such as the estimated revenue a fishing fleet could earn, but would not if a no-take LSMPA were to be established. The bottom line is that both the positive and negative – the income and expense, the benefit and the challenge – to both the site and the wider society must be considered together (*see* Case Study 4).

> **HIGHLIGHT**
>
> Design the site so that its per-unit-area economic value is higher than its per-unit-area management cost.

The goal should be to develop a better understanding of the potential costs of any conservation action, be it the creation of an LSMPA or a management action taken by an established site, so that the trade-offs between investing in one conservation action over another are clear (Bottrill, et al., 2008). As the distribution of benefits and costs between site management and stakeholders may not always be equitable, this kind of information will be critical in helping differentiate between the conservation value of a site and of its wider social and economic value (Box 18). **Clarity on the economic benefits and opportunity costs is essential** to long-term sustainability of the site and creating the right context to sustain ongoing public support or even livelihoods.

Determining the overall annual cost of management, in addition to the overall biodiversity and conservation value of the LSMPA, is a good starting point. Reasonably consistent data on natural resources (biodiversity, etc.) are available for most regions in the world (Knight, 2010). However, even the best biodiversity data sets are incomplete, so using composite data sets is preferred. Composite data sets provide a more complete picture than a list of features in any one of these sets (Groves, 2002; Noss, 2004; Pressey, 2004).

A variety of data collection measures can be used, from workshops to satellite imagery. Potential income generation

in the long term, as well as non-economic benefits, can also be assessed and presented more accurately. The key is to base the costs of management on the region of the LSMPA itself, as conservation initiatives or ongoing management costs vary by region (e.g. costs in the United States will be different than in Kiribati).

For LSMPAs, the **local, national and regional economic setting** may have a strong level of influence over how a site is designed because of its potential to influence market-scale economics, demand and supply chain structure and international trade considerations. This is important to keep in mind, since the overall cost of large-scale protection may be higher than at smaller MPAs (even if the per-unit-area cost is considerably lower). Therefore, managers must be very clear about the economic value per unit area of their site, as well as the overarching costs, both public (site management) and private (to the surrounding community). This should be communicated effectively for the public and decision makers. For example, tourism in the GBR generates over 5 billion Australian dollars per year for the Australian economy, accounting for over 90% of the direct economic activity in the region (Earthscan Deloitte Access Economics, 2013).

The economic value of a site may be calculated based on various estimated financial returns generated. MPAs of all scales protect habitats that often produce a **valuable and diverse set of goods and services**, from seafood and food security, recreational enjoyment and carbon sequestration to storm protection, increased ecosystem resilience and the conservation of biological and cultural diversity (Alexander, et al., 1997; Daily, 1997; Balmford, et

> **HIGHLIGHT**
>
> - Keep future food security needs in mind when designing the site.
> - Preferential access should be given to those small-scale and traditional fisheries that have traditionally depended on these areas for their livelihoods.
> - Listen carefully – and with empathy – to those whose livelihoods and cultural practices and heritage are associated with the site.

Box 18

Understanding how management benefits people

Although conservation strategies can provide social benefits (e.g. building capacity for good governance or promoting alternative livelihoods), these benefits are not necessarily equivalent to outcomes for human well-being. Measures of human well-being are representative measures of the enhanced condition of people within a region that result from the conservation of an ecosystem, habitat, or species. For example, a project team may implement an eco-certification strategy to improve forest conservation. Part of the logic of the strategy is to increase loggers' income as an incentive to implement certified practices and improve forest conservation. The increased income is a direct (and necessary) result of that

strategy and one that benefits humans. One could take the logic a step further and show how the conserved forest (the ultimate conservation goal) would provide a sustained flow of timber (an ecosystem service) and hence, in turn, would contribute to sustaining human well-being (via a long-term source of timber income). Human well-being would also benefit via other ecosystem services generated by a conserved forest – for example, a provision of clean water. Although conservation projects can benefit humans directly and indirectly, there are often trade-offs that are important to understand and recognise (CMP Open Standards 3.0, 2013).

al., 2002; Sanchirico, et al., 2002; Gravestock & Sheppard, 2015). As the momentum to create MPAs, and especially LSMPAs, increases, it appears that society is placing more value in creating areas free from exploitation within the marine environment. Important questions remain on the goals and uses, location, size and number of MPAs (Walters, 1999; Sanchirico, 2000; McClanahan, et al., 2006). Also, measuring the magnitude and persistence of benefits can be challenging, as most MPAs have not been established primarily for their economic or intrinsic or social value (Garcia-Charton & Perez-Ruzafa, 1999).

The **value based on actual income generation from LSMPAs often includes**: (a) revenues and licence fees from sustainable resource extraction operations (such as fisheries and energy) and other extractive activities (such as mining); (b) investments and returns in the tourism industry; (c) right of passage for commercial shipping and maritime defence in cases where groups pay to pass through the MPA; and (d) job creation and household income generation for management and science professionals associated with the site (staff, contractors, and academic, scientific and NGO partners, local business vendors provide the site with supplies, equipment and fuel, and the wider community of stakeholders and residents who work at these businesses). A World Resources Institute report has quantified the contributions of marine reserves for tourism and fisheries (Cooper, et al., 2008). Managers may also want to communicate the economic value of ecosystem services within the total economic value of the site, should credible economic and scientific research and data exist. This is particularly relevant for nations where there is a high reliance on marine resources for subsistence or small-scale fisheries income.

Protected areas provide important non-economic benefits that can be estimated through contingent valuation methods, such as the value of one's personal connection, cultural identity and intrinsic value of the site (Martín-López, et al., 2007; Martín-López, et al., 2008). However, protected areas, specifically LSMPAs, have important links to wider social issues as they can provide near-pristine natural resources, access to food sources, buffers against weather events, cultural and spiritual values and the raw materials that are the foundation of humanity's well-being, especially for the

poor who most directly rely on them and who are often not considered in valuation assessments (CBD, 2008b). In 2014, a study showing the benefits of ecosystem goods and services in World Heritage Sites reaffirmed the importance of protected areas to human well-being and a range of measures for non-use values of protected areas (Osipova, et al., 2014).

LSMPAs will have important implications for national and regional **food security and nutrition measures**. Current scientific research seeks to increase our knowledge and provide evidence of the benefits of large MPAs, including how they may effectively increase the abundance and biomass of important food fish species (Big Ocean, 2013). Such implications are particularly relevant in regions where there is a continuing struggle to access food and decrease poverty (*see* Case Study 5). These issues will likely grow significantly in the next few decades (White, et al., 2014). Decision makers in some developing countries have supported the creation of LSMPAs, in recognising that such areas may serve as food banks for future generations. For instance, small-scale closures of fishing activities at Apo Island, Philippines, have resulted in substantial increases in the amount and quality of catch (Russ & Alcala, 1996; Russ & Alcala, 2010). There may be rights of access that should be considered as a matter of policy or practice and may be part of applicable international or domestic law. For example, the *FAO International Guidelines on Small-scale Fisheries* (FAO, 2015) suggest a consideration of rights of access that may be important for the livelihoods of fishers. When customary rights are involved, LSMPAs can make accommodations for cultural practitioners or subsistence fishing. This kind of accommodation means the site will not be officially 'no-take' but it can remain highly protected and achieve its conservation goals (*see* Case Study 6).

As one example, Native Hawaiian cultural practitioners are being allowed to conduct small-scale, non-commercial subsistence gathering of ocean resources for consumption while conducting traditional practices within Papahānaumokuākea Marine National Monument. Managers at the site have been able to support these kinds of activities, because the permitting system was specifically designed with these needs in mind. This example also underscores the importance of making sure that a site's establishing legislation,

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Case Study 5

Food security benefits in the Phoenix Islands Protected Area

The vast diversity of marine habitat types within PIPA contribute to strengthening global marine ecosystems and the attendant communities of plants and animals that also contribute to wider socio-economic benefits, like food security. As such, waters within the LSMPA are a globally significant breeding site for numerous nomadic, migratory and pelagic marine and terrestrial species, including the tuna species skipjack, yellowfin and bigeye.

Numerous reports also document the presence of highly-prized inshore resources, including aquarium species, algae, trochus, sea cucumbers, clams, sharks and lobsters, deepwater demersal species such as snappers and groupers, and open deep sea resources, including highly migratory species such as tuna. PIPA also

provides important habitats that may support the entire life cycle of certain marine species, while larval dispersal within the area may enhance recruitment of fish stocks to neighbouring waters and beyond. Transplanting of economic marine reef species depleted in other parts of Kiribati could be sourced from the PIPA as well.

In January 2015, PIPA was closed to extractive activities, which may benefit commercial fishing operations and marketing supply chains by increasing catch outside the protected area from spillover effects. Applying higher fishing fees to distant-water fishing nations operating outside PIPA's outer boundaries will provide additional benefits to Kiribati and could address other current ocean-based issues, such as overfishing, pollution and climate change impacts.

Case Study 6

Considering traditional fishing practices in the design of Marianas Trench Marine National Monument

The managers of the MTMNM, which is protected under Presidential Proclamation 8335, are directed by the secretaries of the Interior and Commerce to ensure proper care and management of MTMNM, to prohibit commercial fishing within the waters off the islands of Maug, Farallon de Pajaros and Asuncion, and to manage sustenance, recreational and traditional fishing as a sustainable activity.

As traditional Indigenous fishing is not practiced at a level commensurate with commercial operations, there is no federal precedent in the U.S. Pacific Islands Region to guide the development of regulations. As such, managers requested that their peers within the NOAA Human Dimensions Research section assess traditional fishing patterns in these waters for guidance in managing non-commercial fishing in MTMNM (Kotowicz, et al., 2013).

Personal interviews of the residents and visitors in the Pacific confirm that sharing one's catch with family and friends has always been a common practice for fishers. However, catches are also frequently used in lieu of money to cover the costs of a fishing trip. This 'customary exchange' is a non-market trade of marine resources for goods and services, or for social, cultural and religious reasons that play an important role in Pacific island life.

In an attempt to balance the desire to conserve marine resources while considering the cultural heritage of Indigenous communities, the regulations developed in partnership with the community allow both recreational and non-commercial fishing in the waters surrounding Maug, Farallon de Pajaros and Asuncion by community residents of Guam or the Commonwealth of the Northern Mariana Islands. The regulations also allow for customary exchanges by non-commercial fishers, consistent with the Proclamation's allowance practices of 'traditional Indigenous fishing'; the regulations include reporting requirements to ensure fishing is sustainable.

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as well as its regulations and management policy, are developed around the same set of priorities.

In many places, biological diversity and economic growth are inherently linked. This is particularly true in protected areas. **Livelihoods may depend on management's ability** to effectively manage the site, both in terms of maintenance of livelihood activities through time (such as subsistence fisheries and tourism), and in providing alternative options when extraction of any kind is prohibited. Identifying alternative sources of income generation and livelihood options during the design phase will be particularly important for long-term political and public support of the site, and managers should be prepared to address compensation needs associated with lost incomes and livelihoods (FAO, 2015). However, identifying alternate ways for generating income is only the beginning, and timing the implementation of these alternatives is critical; they should be initiated before the MPA regulations become enforceable.

The geographical displacement of extractive livelihoods at the site has implications for other places (i.e. by increasing the concentration of livelihood activities in those places). This displacement effect should be carefully managed to prevent it from inadvertently causing ecological harm.

Cultural considerations

In some places, the **cultural connection and significance** of the site may be of equal or greater public interest than socio-economics. This may be particularly true if the LSMPA was created to grow or support the comprehensive management of the site as a holistic, living cultural landscape or requires the historic preservation of unique archeological and maritime heritage resources (e.g. shipwrecks or historic battle sites). Such LSMPAs may require the inclusion of cultural considerations in their design, such as an understanding of: (a) how the boundaries and rules of the site recognise and reflect the traditional ecological knowledge of native

> "Residents may see large MPAs as a loss of control over their own waters and oppose you unless cultural allowances are deliberately designed for and regulated."
>
> – ATTENDEE AT THE 2012 WORLD CONSERVATION CONGRESS

inhabitants or historic preservation laws; (b) how the site will provide for continued or reinvigorated spiritual connection and religious practices, including sacred sites; and (c) how the site is designed to support and perpetuate the cultural identity, customary practices and traditional heritage of residents. **Including cultural considerations** within the design of a site is particularly important when neighbouring residents, key decision makers and influential stakeholder groups include Indigenous peoples or local communities who are tied to the site through cultural heritage, identity and traditions. In some cases, managerial authority may be challenged or legally contested because of opposing sovereignty claims over the site. In such cases, constructive and open engagement with Indigenous groups and leaders, including inviting their involvement, may be one way to build trust, particularly

HIGHLIGHT

- Use culture to highlight and unite biophysical and social considerations.
- Ensure that the design process considers the long-term presence of cultural practitioners and the conduct of traditional and spiritual activities.

where there has been a legacy of contentious relationships (*see* Case Study 7). Some management issues may have delicate, rights-associated implications that managers will need to continually monitor. Some traditional activities may be unsupportable within an LSMPA because of increases in populations or advances in technologies that greatly increase extraction. When managers cannot support all traditional practices, negotiations with Indigenous peoples or local customary communities for compensation or mitigation

should be managed within the parameters of international and regional law and best practice. In some countries the principle of using the least restrictive measure applies when different human rights (such as customary rights and environmental protection rights) have to be balanced. Thus, it is critical that a range of zoning and use options are considered during the planning process, and their respective impacts explored.

PMNM hosted a series of community meetings to develop the framework for its cultural research plan.© Blane Benevedes

Case Study 7

MPA designation through political will and coordinated stakeholder efforts for Motu Motiro Hiva Marine Park

MMHMP was created around the Salas y Gómez Island, more than 400 kilometres east of Easter Island, in October 2010, increasing protection of Chile's EEZ from 0.03% to 4.1% (Toonen, et al., 2013; Wilhelm, et al., 2014).

A successful partnership between political leadership and diverse stakeholders allowed for the designation of MMHMP. Despite some antagonism generated by a lack of formal consultation with the Rapanui community, the process has improved, and beginning in 2012, the local community began to build their own leadership capacity, based on a broadly participatory process, including engaging young Rapanui leaders. The ultimate goal is to establish a process led by the Rapanui and grounded in their world view (Gaymer, et al., 2014), which includes a deep respect for natural and cultural heritage and a close relationship with the sea and its creatures.

An even level of understanding about management and conservation measures among the different stakeholders involved – including authorities, fishers, divers, tourism

operators and government agencies – is being cultivated. This heightened awareness has also facilitated the process of discussing and agreeing upon other conservation measures for Easter Island. That said, adequate time must be allocated to achieve this common baseline, as local communities' time frames may not match that of the decision makers; in the case of the Rapanui, additional time is needed because measures such as marine protected areas are not part of their cultural heritage. Acting without direct involvement of local communities in the decision-making processes risks complete failure of any effort to establish an MPA (Gaymer, et al., 2014).

Given that illegal fishing could still occur within the park (Friedlander, et al., 2013), the local community at Easter Island is asking for effective surveillance and enforcement. Both are challenging to implement due to remoteness, high cost, the lack of a management plan, and the lack of locally-based vessels and aircraft available to MMHMP managers. A remote surveillance strategy could be a solution for this issue.

Including cultural dimensions within the site design may require the consideration of other biophysical and social components. Cultural considerations may serve as an opportunity to bridge seemingly opposing ecological and socio-economic needs. For example, where commercial fishing and marine protection interests may conflict, it is important to highlight ways cultural practices, such as traditional restrictions or prohibitions, have historically allowed for both sets of needs to exist.

While the laws, regulations and management policies of LSMPAs may change the accessibility or access patterns of Indigenous peoples, local communities and the public to the site, they can ultimately **help perpetuate and support traditional practices** by protecting and allowing appropriate uses of sacred or culturally significant sites. Examples include the traditional harvest of otherwise protected marine mammals, perpetuating open-ocean navigation using traditional techniques and transmitting Indigenous knowledge implemented within the context of vast ocean areas. At some LSMPAs, managers consistently integrate and observe traditional protocols and cultural practices on board vessels conducting scientific research, monitoring and surveillance activities.

Not only does management commitment to this level of cultural integration help create capacity in staff and partners, it also offers opportunities for cultural practitioner involvement and cross-cultural learning between Indigenous and non-Indigenous peoples. Managers and policy makers should work to utilise the legal framework of the site to support this commitment.

Some **guiding questions** for framing biophysical, social and governance considerations:

- **What are the site's boundaries?** Do they complement the objectives of the MPA, and is there flexibility to alter these to be more appropriate?

- **Is the minimum amount of biophysical data** and other relevant information necessary to support the design phase available? Is there adequate data to prepare for management planning?

- **Have the relevant conventions,** international agreements and other legal instruments that could support the development of establishing legislation been identified?

- **Have important, diverse stakeholders**, supporters and detractors been engaged? If not, why not?

- **How does the site contribute to broader ocean conservation** and community well-being?

- **Are there activities** happening outside the boundaries of the LSMPA **that are, or could, impact management?** If so, negatively or positively? Are there any potential activities on the horizon that should be considered now?

2.5 Design planning details: experience from existing LSMPAs

The following section provides **an overview of the design phase experience** from several of the earliest LSMPAs, and may provide further insight when used in conjunction with the more general design guidance (*see* Table 10). LSMPA authorities, management teams and stakeholder groups will need to work collaboratively to find the appropriate processes and practices that will achieve sustainability for their particular site.

Table 11 compares important aspects of the design phase experience for two LSMPAs, and Table 12 provides information on the critical successes and challenges in the socio-political, cultural, and biophysical areas of management for a small selection of sites.

Table 10. Summary of design processes and key recommendations from the 10 oldest LSMPAs

Category	Range and Averages
Average time from LSMPA concept to formal proposal	Range: 1–6 years / Average: 2.6 years
Average time to collect sufficient biophysical data (and other relevant information) to secure proposal	Range: 1–2 years / Average: 1.2 years
Average time from concept to formal establishment	Range: 1–7 years / Average 3 years
Average difference in estimated time (by management) and actual time	Range: 0–2 years / Average: 1.5 years
The primary reason for establishmen of the LSMPA	Preserving marine ecosystems
Percentage of LSMPAs dealing with Indigenous peoples and related rights holders or tenure issues	83%
Percentage of LSMPAs dealing with significant commercial interests	17%
Percentage of LSMPAs that had significant existing data to build the site proposal	67%
Key lessons learned – Recommendations:	

- Involve local communities from the beginning of the design and proposal process, and keep them updated.
- Conduct consistent scientific research over time with reliable partners.
- Build staff capacity in systematic and strategic planning processes.
- Prioritise effective communication between managers or management agencies.
- Create an efficient and thoughtful permitting process that complements public engagement activities.

Table 11. Important aspects of the design phase of two LSMPAs: Motu Motiro Hiva Marine Park and Papahānaumokuākea Marine National Monument

Questions	LSMPA	
	Motu Motiro Marine Park	**Papahānaumokuākea MNM**
What was the main driver(s) behind proposal of the site?	Protecting pristine ecosystems, political will, Aichi targets, helping recover fisheries at Easter Island.	To create a puʻuhonua (refuge) and eliminate commercial fishing.
How was the design phase funded and what were the main limitations for management?	The design phase was funded by government agencies and NGOs.	The process was funded by the co-trustees named in Presidential Proclamation 8031 (State of Hawaiʻi, NOAA and FWS).
How much effort was needed to collect enough baseline data to develop the site proposal? Through what means was it collected?	The bio-ecological information is still limited. The support of international NGOs and scientists was key. Two expeditions (2010, 2011) established baseline data.	Data collection began in 2000 and additional analysis occurred throughout the planning process, both prior to the designation of the monument and during the development of the Management Plan.
Who initially led or supported the proposal?	The NGOs Oceana and National Geographic presented the proposal to the Chilean government.	NGO community, Native Hawaiian community and State of Hawaiʻi, and several federal government agencies
How was the initial time estimate for moving the LSMPA proposal from concept to establishment made? What was or is the most significant impact to the timeline?	The process from concept to designation took around 8 months, an extraordinary example of political will. According to Chilean law, the management plan has to be implemented 1 year after designation of an MPA. However, the time frame of the Rapanui people does not necessarily fit that of the broader Chilean technical, legal and/or political processes. It is necessary to develop and to share a common working agenda with the community and this process is particularly sensitive on Easter Island. So far no management plan has been developed; however, a broad empowering and capacity building process has been in place for 3 years, which is setting the basis for developing a participatory management plan.	An initial estimate was not made, as there were no other applicable examples at the time. It took approximately 8 years from concept to establishment of the LSMPA, with active engagement and attention at the highest levels of the national administration.
What plans were made early on to engage diverse stakeholder groups? Was there any strong opposition from any group(s) and how was this handled?	The designation included different stakeholders, but it was mostly a top-down process. The process for generating the management plan is being developed and will be fully participatory.	Stakeholder engagement was a large of part of the planning process. The State of Hawaiʻi, NOAA and United States Fish and Wildlife Service (FWS) conducted formal and informal public involvement sessions that generated 57,000 stakeholder comments. Public sentiment showed support for strong protections and opposition to any increase in commercial fishing. A complete analysis of the impact of commercial and recreational fishing to the Northwestern Hawaiian Islands (NWHI) fishery was completed per the National Marine Sanctuaries Act and a variety of alternatives were considered.

Table 11 continued

Questions	LSMPA	
	Motu Motiro Marine Park	**Papahānaumokuākea MNM**
What were the top two most significant windfalls or successes in the process?	1) NGO funding financed scientific expeditions that generated the information to support marine park creation. 2) After designation, MMHMP fostered the discussion about marine conservation and the sustainability of marine resources on Easter Island. This has already made a contribution to converging objectives among diverse stakeholders.	1) Additional resources and funding provided by the designation of PMNM. 2) Partnerships developed as a result of the co-management structure (e.g. Reserve Advisory Council).
What were the top two most significant delays or oversights in the process?	1) The process to create MMHMP was not a fully open, public process; local communities have been tentative to become involved. 2) An aggressive intervention by an NGO has generated confusion in the Rapanui community and delayed the whole process.	1) Developing a management plan that could meet the objectives, mandates and policies of all co-trustee agencies.
What are the top three lessons learned by the site management team specific to the design phase?	1) Involve local communities from the beginning. 2) Understand the Indigenous community's cosmological vision of the area. 3) Incorporate systematic planning for MPA design.	1) At the onset, have agencies share their organisational lexicon, and the mandatory policies and regulatory requirements that they will have to incorporate into all management planning documents. 2) Ensure both nature and culture are considered in all management decisions from the beginning. 3) Develop a user-friendly permitting process that is easy for agencies to maintain and allows for public engagement.
Additional information or comments	It is fundamental to involve local communities from the beginning, even if this results in the creation process taking longer than planned. MPA management has to solve a real problem of community engagement.	Access to PMNM is challenging (e.g. funding, permits, etc.). Co-trustee agencies created a joint permitting process so a single PMNM permit can be issued to meet legal and regulatory requirements of all agencies. In addition, enforcement of a remote and large-scale area is challenging (e.g. funding, capacity, etc.).

Table 12. Principal challenges and successes experienced by managers in the design of eight LSMPA initiatives

LSMPA SITE	Elements of designing a Large-Scale MPA			
	Social/Cultural/Economic/Political		Ecological/Scientific	
	Top Challenges	Top Successes	Top Challenges	Top Successes
Parc Naturel de la Mer de Corail *Natural Park of the Coral Sea*	A global policy for the management of all the waters under jurisdiction of New Caledonia.	Integration of customary authorities' representatives into the management committee.	Developing zoning phase (MSP).	Created a whale, turtle and shark sanctuary.
Phoenix Islands Protected Area	Collecting, compiling and analysing PIPA's related reports to develop the management plan is very costly and time consuming. Two opposing sides, one for and the other against the establishment of PIPA.	The Phoenix Islands are solely owned by the Kiribati Government so it was easy to make the decision to establish PIPA. Development of historical data and reports on many sectors of the MPA.	Baseline data absent. Verification of previous ecological and scientific reports on the Phoenix Islands not possible.	Certain relevant reports available on the website. Previous research reports on the Phoenix Islands were available.
Marianas Trench Marine National Monument	Agreement between the Commonwealth of the Mariana Islands (CNMI) Government, NGOs and stakeholders to designate or not and if so, using what authority. Desire to balance commercial, recreational and substance/traditional fishing needs with conservation.	MTMNM established January 2009 by presidential proclamation under the Antiquities Act, to be managed by FWS and NOAA in coordination with CNMI Government. Compromise made to not include the water column above the trench and volcanic units in the Monument, preserving these areas for commercial fishing while still protecting other key areas.	Limited information available about these remote and understudied ecosystems available to assist in determining optimal areas to protect. The proposed components of the MTMNM were not one contiguous ecosystem.	A case study was prepared by a third party, which was used as the basis for determining the areas included in the final proposed MTMNM. One contiguous area, the three northernmost islands of MTMNM, was agreed to be of ecological importance and included in the final designation.
Motu Motiro Hiva Marine Park	Incorporating local communities in MPA design. Setting a sound surveillance and enforcement strategy.	Capacity building and participatory work with and by local communities. Rapanui community engaged and empowered in marine conservation issues.	Collecting missing bio-ecological information in an understudied area (e.g. studying the seamounts within the park). Studying connectivity between MMHMP and Easter Island.	Having a baseline for the park. Unique scientific knowledge of the marine biodiversity of the Easter Island ecoregion.
Marae Moana *Cook Islands Marine Park*	The ability to visit all stakeholders on the different islands. Getting government and non-government organizations to envision the long-term benefits of integrated management, to cooperate and work towards one overarching plan.	Being able to present our proposal to most of our isolated communities and to receive 94% support for the Marae Moana concept. Our mining sector's commitment to recognising the public's wishes for restricted mining zones within the Marae Moana.	Gaining stakeholder consensus on zoning the entire EEZ, particularly due to limited information on the benefits of spatial conservation measures for migratory species. Lack of scientific data for manganese nodule extraction and possible impacts on deep ocean ecosystems.	Several international scientific research teams have assisted with data collection for Marae Moana, particularly those that assisted local scientists to lead, coordinate and implement research. The Marae Moana information hub has encouraged schools to inform their students about inshore and oceanic ecosystems.

Table 12. continued

LSMPA SITE	Elements of designing a Large-Scale MPA			
Pacific Remote Islands Marine National Monument	Competing priorities to develop a management plan when 3 new Marine National Monuments were established in 2009	Experience of site managers in developing other Monument management plans, as well as collaborative relationships, will facilitate plan development.	Information on ecological and cultural value of site was scattered across many resources.	Site designation provided opportunity to begin compiling these resources. New resources were identified and brought forward due to increased attention on site following designation.
Papahānaumokuākea Marine National Monument	PMNM co-managing agencies are challenged with understanding and incorporating each agency's individual legal and regulatory mandates into management decisions.	PMNM established by Presidential Proclamation 8031 in 2006 under the Antiquities Act, to be managed by NOAA, FWS, State of Hawai'i and OHA.	PMNM is a large and remote area; large data gaps exist.	Establishment of PMNM and the phaseout of commercial fishing, ensures ultimate protection of the natural and cultural resources within PMNM.
Great Barrier Reef Marine Park	Balancing competing demands for sustainable use (especially fishing and other extractive uses) against the need for the long-term protection of the biodiversity, environment and heritage values. Most of the port exclusions along the coast are outside the jurisdictional control of GBRMP, yet occur within the GBR World Heritage Area and have been shown to have major impacts upon the GBR.	The package of four social-economic-management operating principles used were important considerations that were applied during the rezoning The coordinate-based zoning scheme developed for the 2003 rezoning made it much easier to locate zones boundaries in the field for users and enforcement officers alike (refer to Case Study 12).	At the time of the rezoning, limited information was available for the continental slope/ shelf and deepwater oceanic parts of the GBR, which collectively comprised 31% of the GBR. Despite an increase in the extent of no-take protection to more than 33% of the GBR, some elements of biodiversity continue to decline (e.g. coral cover has declined by approximately 50% over the past 30 years, mainly affecting the southern two-thirds of the GBR, and seagrass meadows along most of the developed coast have declined, primarily because of poor water quality).	The map of 70 bioregions, along with the 11 biophysical operating principles (refer to Table 9), collectively provided a sound systematic basis upon which to develop the rezoning. The systematic and representative approach used to develop the revised zoning has subsequently been shown to have protected representative examples of every known habitat type in the GBR, including some types that were unknown at the time of the rezoning.

This eel is but one of the amazing creatures found in the near pristine waters of the Nazca-Desventuradas Marine Park. © Enric Sala

3
Management Planning

Spectacular white bubble coral *(Plerogyra sinuosa)* thrive in the Marianas Trench Marine National Monument. © U.S. Fish and Wildlife Service

3.1 Working with multiple jurisdictions

When employed thoughtfully and effectively, the design phase discussed in Chapter 2 should **provide the blueprint or outline for developing an effective management planning process** and a final plan that reflects the values and perspectives of the management agencies and the wider community.

Since many management best practices are the same regardless of MPA scale, this section builds upon an extensive body of existing management planning guidance for MPAs (e.g. Salm, et al., 2000; Thomas & Middleton, 2003; Allison & Kaye, 2005). Big Ocean recommends reviewing other IUCN Guidelines about planning for protected areas and protected area systems (including Worboys, et al., 2015; Groves & Game, 2016) as well as evaluating management effectiveness (*see* Chapter 4, section 4.7.2 and Hockings, et al., 2000).

The management plan, as well as the management process itself, will be **significantly influenced by the anticipated levels of use, number of stakeholders, layers of designation, as well as the laws and regulations** affecting the LSMPA. For example, Australia's Great Barrier Reef comprises two jurisdictions, federal and state, with various agencies of both jurisdictions having key management roles due to the site's wide range of stakeholders and types of human-use activities. The Great Barrier Reef is also a UNESCO World Heritage site. In addition, some managing agencies have developed relationships with the Australian Indigenous peoples through Traditional Use of Marine Resource Agreements, known as TUMRAs. Consequently, the Great Barrier Reef has a range of separate multi-level plans that collectively provide an integrated management system for the entire GBRMP (*see* Case Study 8 and Day 2015).

In contrast, the British Indian Ocean Territory MPA, a very remote site with no public access, started without a management plan but is now working on one that will help support continued research of the Chagos Archipelago by more effectively engaging the next generation of scientists. It will also help managers to better understand and address global threats such as climate change. The full range of conservation, protection and research needs across LSMPAs, and the growing suite of global threats, such as climate change, shows that active, long-term strategic management and conservation planning are essential for all sites, including remote sites where access is very limited or prohibited.

3.2 Management planning timeline

The experience of current managers suggests that **large-scale management planning is complex and requires more time and effort than planning for smaller sites,** even though, per unit area, large-scale protection can be more cost-effective and time-effective. It is not unusual for the development of an LSMPA management plan to take several years to finalise and approve. **Managing expectations,** in addition to putting significant time and resources towards effective work plan development and accurate budgeting, is essential (*see* Box 19).

Leaving staff, partners (especially government agencies) and diverse stakeholders to draw their own conclusions about how long the process will take can have negative impacts on critical relationships and partnerships. A comprehensive communication strategy can help create a realistic picture of the scope and scale of the planning process, and provide mechanisms for input to both the process and management plan itself. Effective communication with the public increases transparency, encourages trust and can develop a foundation for a site's long-term education and outreach efforts.

In some cases, developing a comprehensive management plan is not a legal requirement; current managers of LSMPAs highly recommend developing one regardless. A formal plan should document MPA objectives, develop strategies and actions, provide a framework for long-term public and stakeholder engagement, outline indicators that can be monitored and evaluated for effectiveness (a core element of Aichi Target 11) as well as provide the basis for costing management activities and justifying a budget.

Management planning of large MPAs, like the design phase, requires that managers **periodically revisit and recalculate the timelines** not only to remain practical and fiscally responsible but to ensure the management process is adpative. Conditions at a site as well as external factors can create the need to shift the expected time frames – sometimes quite quickly. From a change in political administration (which can usually be planned for), to an extreme weather event (which might necessitate changing an area's short-term priorities almost overnight), changing conditions require that managers of LSMPAs remain flexible and think strategically.

Creating an initial timeline using estimates based on logistical and process requirements is a good starting point. However, **delays are the norm** and can multiply the time required, depending upon how accurate initial calculations are and how well a management team has researched the broader context of the site and understands the perspectives of a diverse set of stakeholders. An additional year or two may be required simply due to a planning process occurring in an important political cycle, if it becomes difficult to pass the legislation required to formally establish an LSMPA. Additionally, as planning timelines increase so can the risk of additional delays due to staff burnout or a lack of capacity.

Two helpful examples can be found at CIMP and MTMNM. Managers at CIMP were committed to working closely with stakeholders despite knowing that this would take additional time. However, it took much longer than expected to identify partner organisations able to fund travel between islands for community consultations. At MTMNM, after the respective agency roles and responsibilities were identified and no substantive issues had arisen, managers felt that the overall process to develop a management plan would be relatively simple. Rather quickly, it became apparent that more effort should have been put towards communication with all parties.

For further information about effective institutional frameworks, *see* Box 15.

Case Study 8

Management planning for the Great Barrier Reef Marine Park

The Great Barrier Reef is so complex that, rather than utilising a single management plan, it has a comprehensive management system comprising a wide range of marine spatial plans and other management tools.

The comprehensive zoning plan is one of the GBRMP's key management tools and is a critical component in helping manage the multiple uses that occur throughout. The current multiple-use zoning network came into effect in July 2004 and covers the entire GBR in seven marine zone types. It provides high levels of protection for key areas (in no-take zones and very small no-go zones) totalling one third (115,500 km^2) of the Marine Park while allowing a wide range of commercial and recreational activities, some of which are managed through a permit system.

The no-take zones were chosen to maximise the protection of biodiversity while minimising the impacts on all other users, including fishers. Today, GBRMP comprises the world's largest systematic network of no-take zones protecting representative examples of each of the 70 broad habitat types (or bioregions) across the entire GBRMP.

While the zoning plan provides a cornerstone for management in the GBRMP, many other spatial and temporal management tools and strategies are also in place and have a legislative basis in either federal or Queensland legislation:

- Plans of management for areas requiring more specific statutory management arrangements, such as limiting numbers or applying approved policies.

- Specialised site plans for areas that may require specific management actions due to high-use or where local arrangements might be applied.

- Other spatial restrictions, such as designated shipping lanes, Defense Training Areas, species-specific protection areas (e.g. for dugong).

- Other plans regulating use, which may or may not be spatial and/or temporal in their restrictions, such as fishery management plans, species recovery plans and formal agreements with Traditional Owners.

- Permits (often tied to specific zones or smaller areas within zones and providing a detailed level of management not possible by zoning alone).

In addition to spatial management tools, various other approaches (including education, planning, environmental impact assessment, monitoring, stewardship, compliance and enforcement) help to regulate access and control and/or mitigate impacts associated with activities (e.g. tourism, fisheries, shipping) or address pressures (including climate change or declining water quality) affecting the GBR.

The maps below (top to bottom) depict part of the 2004 Zoning Plan showing the range of zones in a small area off Townsville in the central part of the GBR, and the same area with other spatial management arrangements (shipping lanes and a plan of management, both of which have a statutory basis in law) shown overlying the zoning. © Great Barrier Reef Marine Park Authority

Revised, final zoning plan 2004
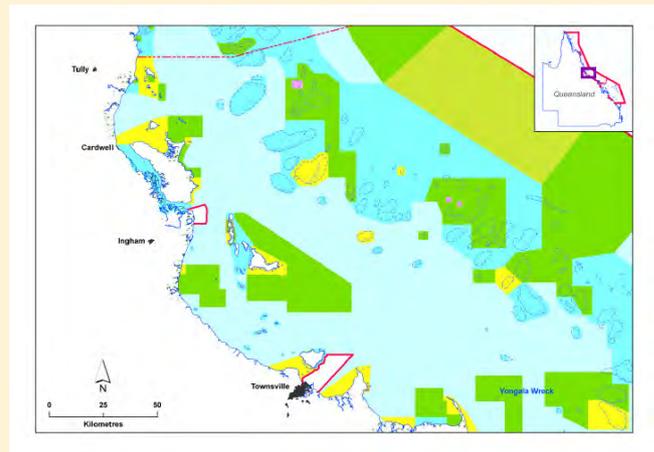
Shipping lanes
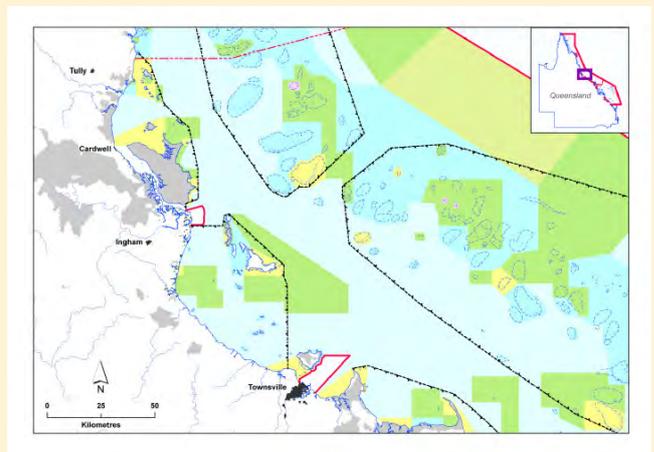
Detailed plan of management for high-use tourism areas
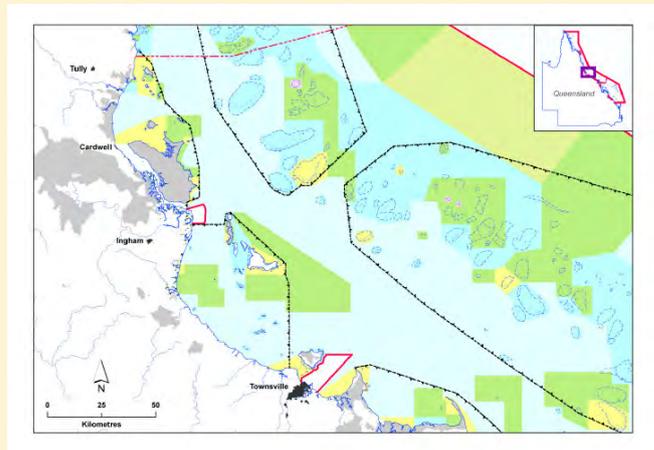
The most extensive time delays were due to difficulties in transferring the submerged lands in the MTMNM's northernmost islands from the U.S. federal government to the Commonwealth of the Northern Mariana Islands Government, and the time needed for the CNMI community to recover from the extensive damage causd by Typhoon Soudelor.

Managers must also carefully consider the time requirements of collecting sufficient baseline information, as well as employing an adaptive management approach that includes how the goals, strategies and objectives are developed (*see* section 3.7 for more information on developing goals, strategies and activities). Analysing the data is critical, but **consistently learning and improving** upon resource management efforts takes time. Managers must develop effective internal, evaluative systems or processes (specific to the needs of the area) to identify real outcomes (Hollings, 1978) that will also benefit future activities (*see* Case Study 9). They must also be ready to take a precautionary approach when there are substantive gaps in the data, even when this may mean additional delays.

Remoteness, scope, scale and widely dispersed stakeholders can all have varying influences on time requirements for LSMPA management. If managers are located a significant distance from the area, then they (and

"Don't wait until you have perfect information or you may never start. Take action with the best available data, and be adaptive while acquiring more knowledge."

– JON DAY, ARC CENTRE FOR CORAL REEF STUDIES, JAMES COOK UNIVERSITY (PREVIOUSLY OF GREAT BARRIER REEF MARINE PARK AUTHORITY)

Box 19

Developing work plans and budgets

Any planning process or implementation strategy can be limited by its budget and potentially fail if work plans and timelines are not managed effectively. LSMPA management teams must develop and use a consistent system for creating and tracking work plans and budgets. The following is a simple list of steps that can be employed for any project, strategy, activity or comprehensive ongoing planning process.

- **Clearly define the project (or activity, etc.).** The description must include the purpose, and enough detail that the scope and scale (including geographic boundaries, if necessary) are understood by all staff and partners, and by stakeholders, if applicable.

- **Develop a work plan and list of prioritised objectives.** Clearly articulate the desired objectives of higher level stages or phases of the project and prioritise them.

- **Create a list of required tasks and activities.** Group them by stages or phases. Reorganising steps is common, so use the assumed best case or desired scenario at first. Make discrete, detailed notes for any tasks or phase where significant delays are probable or not enough is known to make an accurate estimate of the time frame.

- **Develop and prioritise a work plan.** Prioritise each task, activity or phase, and estimate the time needed for its completion. Then prioritise each task or activity within a calendar, organised chronologically. Reassess the annual program once a first iteration has been completed. Develop the desired outcomes for each task or activity (where applicable), taking into consideration the overall priorities and available resources. Once the full

scope and scale of the work plan is completed, go back and assess the highest priority tasks, and identify tasks that could be set aside should it become necessary.

- **Assign costs.** Estimate the cost for each task or each step within a task, if necessary. If the annual budget for the entire site is the project, then be sure that staff from different areas of management are included so that the outcome is a realistic picture of a site's current and future needs and expenses.

- **Identify leads.** Be sure that each task is assigned to a person who understands the task, the desired outcome and its priority.

Ask the hard questions:

- What contribution will each activity make towards achieving the purpose of the site, or of fulfilling the management mission?

- What products are being created or need to be created to enhance management? Is the proposed activity or process going to produce it (i.e. a brochure or a management plan)?

- Can all stages, tasks or activities be implemented? If not, why? What is the potential impact if they are not? Are the priorities accurate and achievable?

Review and revise – Once a comprehensive plan for the project or planning process is completed, go back over each phase or task, including the desired (or required) outputs and the budget. Ask the 'hard questions' to help refine the project or planning process and reassess the priorities. Check for inaccuracies. (Adapted from McKinnon, personal communication; Groves & Game, 2016)

One of the many reef communities that managers of the Great Barrier Reef Marine Park are tasked with caring for. © Great Barrier Reef Marine Park

potentially others) must travel to engage with community or implement certain aspects of planning, and this could add significantly to the time required. For example, managers of PMNM are located at a considerable distance from the area, but they do not need to travel to engage a significant percentage of the local community. By contrast, management for MTMNM is located in Honolulu, Hawai'i, but staff must travel to the Marianas, a nearly 6,437-km (4,000-mile) trip.

Resolving divergent views may cause greatest delays in planning. Divergent perspectives between Indigenous peoples and local communities, management or policy makers may require significant time and resources to address (*see* Box 13). Even remote sites can also face challenges by diverse stakeholders and rights-holders if their locations are important for cultural, commercial or biological reasons.

Table 13 shows the estimated and actual time requirements for key steps in the management planning phase, and Table 14 offers a comparison of early and late-stage outcomes.

Case Study 9

Evaluating data to inform management of Papahānaumokuākea Marine National Monument

In an effort to adapt to the evolving needs of managing PMNM, a protocol to evaluate data anually on the accomplishments and challenges of staff and partner agencies has been developed. All permit holders who access PMNM are asked to answer specific questions and enter other relevant data into spreadsheets that are compiled during in-person interviews. Annual reports are then drafted and shared amongst staff, stakeholders and the public. The data is also entered into an internal web-based reporting tool containing all results from previous reporting periods. Charts, graphs and other visualisations of the data is prepared with the original text retained and made searchable for management staff.

Experience at PMNM has shown that taking the time to collect information about the outcomes of conservation and management activities on a regular basis is essential to remain adaptive. A sophisticated online tool to access and evaluate data is convenient, but it is not a necessity.

Contributions from all partners are critical. The more perspectives and information collected, the more comprehensive and accurate the evaluation process will be. Although being inclusive adds to the complexity of the process and time required, the value gained from the data collection and analysis far outweighs the added costs and ultimately provides invaluable insights that can inform adaptive management.

Table 13. Time estimates for management planning phases

Process	Estimated Time Required
The overall management planning process (the sum total of time for all steps listed below, many of which occur simultaneously)	4-6 years
Planning and communications strategy development	4 months
Implementing initial public scoping activities	2 years
Hosting consultations with various diverse stakeholder groups	3 years
Consultations with Indigenous peoples and local communities (especially rights holders or groups with tenure)	3 years
Analysing agency requirements, especially where an area is managed by multiple agencies or organisations	2 years
Assessing possible legislative requirements that may be necessary before formal establishment can be considered	1 year
Gathering additional data to support research and monitoring activities within the plan	2 years
Developing the actual framework or design of the plan (e.g. threat-based)	2 years
Developing strategies and activities for the plan	2 years
Writing the plan	6-9 months
Refining the document and internal editing	4-6 months
Public scoping or review process (especially for sites where a public review period is required by law)	6-9 months
Internal review and editing (internally)	3 months
Formal plan approval processes (e.g. government)	1-4 month
Final production and public distribution	1-3 month

Pristine Seas divers study the rich coral and seagrass life around Palau. © National Geographic

Table 14. Comparison of the early and late-stage outcomes and lessons learned at two LSMPAs

	Pacific Remote Islands Marine National Monument Experiences from the **early phases** of the management planning process	**Papahānaumokuākea Marine National Monument** Experiences from having **completed** the management planning process
Initiated management planning process:	2011	2001
Estimated time to complete the plan:	3 years from September 2014, the date of expansion.	Estimated: 5 years /Actual: 5 years
Date of finalised plan (if it has been completed):	TBD	2008
Management plan is a legal requirement	Yes	Yes
Public review of the management plan is a legal requirement	Yes	Yes
How many government agencies and/or participating partners are or need to be involved in developing the plan?	2 government agencies are the leads for plan development. Other key partners include NGO and government agency area managers.	7 agencies (federal, state and quasi-state agencies)
Will additional step-down or stand-alone plans be developed (e.g. science, culture, maritime history)?	TBD	Yes. Resources were invested into step-down plans because there was no way to address all of the needed management issues in the main plan. Step-down plans are: 1) Natural Science Research Plan, complete (3 years); 2) Maritime Heritage Resources, complete (2 years); and 3) Cultural Research, writing phase (estimated 3 years).
What is the current status of management efforts? Is the process going as planned or have there been delays? Notable successes or challenges?	Managers are currently working within the federal partnership to develop an approach for the draft management plan and regulations. Due to competing resource needs and difficulties in developing a clear delegation of authority between agencies, the planning process has experienced delays.	This management plan was expedited per the Office of the President and therefore was finalised in 2 years.
How is the management planning process being funded?	Federal management agencies receive appropriated funds through congressional legislative processes. Grants may also be received for specific projects.	There were adequate funds and resources to complete the plan. The top issue was the timeline that was required to complete the process.
How was the initial timeline developed and has management been able to meet its milestones?	A timeline is in development.	1.5 years to write the initial set of strategies. Top challenges: 1) Making the plan meet requirements of 2 federal and 1 state agency; 2) Agreeing on terminology and a lexicon throughout the plan; and 3) Meeting the legal review requirements of each agency involved.
What are the top 3 lessons learned by the site management team specific to the management planning phase? Or what are recommendations for other managers to do or not do?	Management planning is still in progress at this time. Lessons learned cannot be provided at this time.	There were diverse stakeholders on every island. This was a statewide engagement effort. There were 57,000 public comments received; therefore, reviewing and addressing all public comments was a lengthy process and required staff capacity.

Table 14 continued

	Pacific Remote Islands Marine National Monument Experiences from the **early phases** of the management planning process	Papahānaumokuākea Marine National Monument Experiences from having **completed** the management planning process
Did management have public and political support in the early days of developing the proposal for the area? Has this support been maintained? How did this kind of support (or lack thereof) affect the timeline?	There was presidential-level political support for designation and expansion, as well as significant NGO and scientific and public support that continues. Concerns over the expansion were expressed by the fishing industry.	There was significant political support (to the highest levels of the U.S. government), which ensured the agreement-upon, accelerated, timeline was met. There was also significant NGO support.
Was a communication strategy developed in parallel to the proposal and/or design process? What are the top2 or 3 lessons learned about communicating with the public and key stakeholders and with policy makers respectively?	A communication strategy will be considered once management planning is initiated.	A communications strategy was developed in parallel with the planning process. Top lessons learned in communicating with the public: 1) Before engaging the public, provide all staff with communications training and clear agreement on messaging; 2) Provide clear, concise information; avoid using agency jargon; and 3) All management agencies should provide a unified front. Top lessons learned in communicating with policy makers: 1) Thoroughly understand the expectations of each agency and relevant policy makers; and 2) Bring the highest level of government support to the table.

After all the planning processes are completed, the end result should be a management plan that will serve the area, managers, and stakeholders for years to come. However, ongoing monitoring is essential as it may lead to important changes in future proposed management activities.

Key characteristics of all existing LSMPA management plans are provided in Table 15. However, as there are only three LSMPAs that have completed the management planning process, and all plans are quite different in scope and scale, it is imperative for managers entering into or in the middle of the planning process to thoughtfully assess the needs of their sites as well as rights-holder and stakeholder groups.

Bigger and more detailed management plans are not necessarily better then smaller, simpler versions. The main point is to develop a framework that will help all relevant parties engage, care for and remain adaptive to the needs of the LSMPA over time. In the case of the Great Barrier Reef Marine Park there are thousands of people who access it on a daily basis; therefore managers have develped a matrix of management plans, step-down plans and community-based initiatives that work in parallel. In the case of the Phoenix Islands Protected Area, the site is remote and not accessed by many people. As such, managers have not needed an extensive plan to support their education and outreach efforts, research and monitoring activities, and efforts to address the long-term impacts of global threats such as climate change.

3.3 Deciding on the best management approach

Secondary plans, which complements the overarching management plan, **help address more detailed or complex aspects** of LSMPA management, where necessary. They can also keep the main management plan focused and practical, especially for plans that are likely to be quite large despite the use of secondary plans, like those of GBRMP and PMNM.

Secondary plans can be developed for a single topic (e.g. a science plan – *see* Section 4.6.2 – or a maritime heritage resources plan) and tied to a relevant area of an area's main management plan. As one example, PMNM has important cultural resources that require additional engagement of the Native Hawaiian community and the development of research and management activities based on Indigenous and traditional knowledge. The overall management plan was not the appropriate place to address that level of detail, and so a secondary plan was prepared.

Current LSMPA managers suggest that deciding what goes into a primary management or secondary plan can be based on whether the details are statutory (and therefore difficult to amend) or flexible and easier to alter when necessary. The key requirement is to ensure all planning documents collectively provide an integrated management approach across the full scope and scale of an LSMPA. *See* also Case Study 8.

Table 15. Key characteristics of management plans at three existing LSMPAs that have completed the management planning process

Category	LSMPA		
	Great Barrier Reef Marine Park	**Papahānumokuākea Marine National Monument**	**Phoenix Islands Protected Area**
Time spent developing management plan	The 2003 Zoning Plan (still current today) took 5 years, but it is only part of the management system for the GBRMP (*see* Case Study 8).	7 years	2 years
Time spent for authority to review and approve plan	As subordinate legislation, the zoning plan had to sit in the Australian Parliament for a minimum of 15 days before approval. Six months then passed before the new zoning plan came into effect (July 2004).	8 months	1 year
Number of volumes and pages	The 2003 Zoning Plan is only one of many statutory plans that apply in the GBR today.	5 volumes (~1843 pages)	Revised plan (2015 – 2020) increased in size from 60 to 153 pages
Number of staff involved in developing management plan	A focused team coordinated efforts for the rezoning across virtually the entire agency (i.e. 160 staff), most of whom were involved over the 5 years. At peak times (e.g. public consultation periods), the number of staff involved full-time greatly increased.	35 – 45	14
Number of stakeholders commenting on plan or involved in meetings	Over 31,000 public submissions were received over 2 formal phases, but many group submissions represented many hundreds of stakeholders.	6,578	5 core writers; 31 people representative of community and government provided comments.
Total cost of developing management plan	Difficult to estimate; at least AU $12–$15 million spread over the 5-year period (including staff salaries and operating costs).	TBD	US $30,000
Number of times plan has changed	The first zoning plan for a very small part of the GBRMP was developed in 1981, but it was not until 1988 that the majority of the GBRMP had zoning plans. Some sections of the GBRMP were periodically reviewed, but it was not until 2004 that the current zoning plan for the entire GBRMP came into effect.	1 in process	2
Download Links to LSMPA Management Plans			
Great Barrier Reef Marine Park	http://www.gbrmpa.gov.au/managing-the-reef/strategic-assessment		
Papahānaumokuākea Marine National Monument	http://www.papahanaumokuakea.gov/management/welcome.html		
Phoenix Islands Protected Area	http://www.phoenixislands.org/pdf/2010-2014_FINAL_PIPA_Management_Plan.pdf		

Some **guiding questions** to help determine the best management planning approach for a given area include:

- **How long will it likely take** to build sufficient public support for and involvement in developing a management plan? What factors were used to make this determination? Have upcoming political processes (e.g. a change in administration) been considered? If there is an extended delay to the planning process what are some of the most critical, potential consequences?

- Does the current management team **include anyone with direct experience** working in marine management at a large scale?

- **Which planning approaches** are being seriously considered? Are management plan objectives being developed around the abatement of threats or addressing existing regulatory requirements?

- **What level of public engagement and participation** is required in the development of the management plan? Is there a need to develop a separate or additional communications plan? If there are no requirements, is management planning to do so anyway?

- Is there an **expectation to develop secondary plans**, for example, focusing on research? If so, is there capacity and resources to include scientific research in ongoing management and daily operations?

- Does the current management planning strategy include the **development of a business and financing plan**? If so, have the relevant financing arrangements and partnerships been developed? If not, are there other plans being considered to address the long-term financial sustainability of the area?

- **Who will review and approve** the draft management plan? How will the review and decisions influence the costs and time required to finalise the management plan?

- **How realistic is the overall operating budget** or the area's annual budget? Have considerations been made for the possibility of rapidly escalating costs and for unforeseen contingencies?

- If there are overlapping jurisdictions from different agencies (e.g. federal and state), **will it be necessary to clearly define how disputes will be managed?** Is the current management team prepared to do so early in the process if necessary? If not, what steps need to be taken to address internal disagreements before a significant conflict arises?

3.4 Public engagement and participation

Chapter 2 outlined the importance of identifying and including rights-holders and stakeholders; many of the same processes and principles apply to **engaging the public as part of management planning**.

A key objective for the first phase of area development should be to take the experience, trust and relationships earned in site design into the management planning phase. In turn, a subsequent objective should be to build upon these achievements, and strengthen the relationships through the public scoping process or similar engagement strategies to create the most robust management plan given the area's resources.

The public will only support what they know about and understand. Therefore, raising public awareness of an area's existence and its needs is the first step. Once a baseline level of awareness is achieved, it is also critical to highlight an area's global significance and uniqueness, as well as the valuable services it provides to people. A key factor to success is to be thoughtful in choosing how to engage the public. More than one method will likely be required and may need to be employed simultaneously (Dovers, et al., 2015 and Case Studies 1-3).

Engagement methods should **address the needs and potential learning styles of stakeholders**. Some potential activities include local or town hall dialogues, community or group briefings, workshops, formal education programmes, creating learning experiences using games, door knocking and focused conversations, as well as online discussion forums, the general media, websites, and so on.

Having a thorough **understanding of the range of partners and entities** that will be affected by the establishment of a large MPA will help determine which combination of methods should be used, and how and when. A helpful exercise for managers is to consider how they would feel if the roles were reversed, and to then consider how they want people to feel as a result of their exchanges with management and governance entities.

The International Association for Public Participation (IAP2) developed a Public Participation Spectrum (*see* Figure 4) that showcases how differing levels of participation are legitimate depending on the goals, time frames, resources and levels of concern in the decision to be made. However, and most importantly, the spectrum sets out the promise being made to the public at each participation level (IAP2 2014).

HIGHLIGHT

Consider free, online materials and video training modules to build the capacity of management staff to more effectively engage the public from the earliest stages of the LSMPA design and proposal process. These kinds of resources are not only cost-effective but may also be essential if outside facilitation and support is not available or appropriate. One useful resource is UNESCO's Resource Guide, "Video Collection of Training in Community Based Research." See: http://unescochair-cbrsr.org/unesco/wp-content/uploads/2015/09/CBR-Video-Resource-Guide-Final_20160427.pdf.

INCREASING IMPACT ON THE DECISION

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternative and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision. We will seek your feedback on drafts and proposals.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will work together with you to fomulate solutions and incorporate you advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

Figure 4. IAP2's Public Participation Spectrum *Reproduced with permisison from IAP2 © IAP2 International Federation. All rights reserved.*

Box 20

Some key lessons for public engagement during planning

- **Public meetings are often dominated by only a few individuals**, so ways to allow wider concerns to also be heard should be explored.

- **Recognise the 'noisy minority' usually does not represent the silent majority** and many others who may also have an interest in the LSMPA.

- Remember that **politicians are often more interested in what the wider community thinks** than just those who send written submissions.

- **Don't ignore those stakeholders who choose to remain silent**; telephone polling of the wider public or internet surveys can determine the real level of public understanding and support.

- **Many stakeholders are initially misinformed** about the key issues or pressures, and what may be required to address them. Stakeholders need to first understand the problem (e.g. protecting biodiversity) rather than focusing on potential consequences (e.g. reduced fishing areas).

- **Tailor key messages for different target audiences** (take a strategic approach).

- **Use 'champions'** (e.g. high profile athletes or national celebrities) to endorse the planning process or deliver key messages.

- **Public engagement is more effective when undertaken throughout the planning process**, but this is also more resource intensive.

- **The media can be an influential ally or a challenging opponent.** Work closely with all forms of media so they know the management team. Expect some media to be critical of the LSMPA, and be prepared to counter those views with clear and concise messages.

- **Have a trained media spokesperson** on the team who knows the topic and how to present it well.

- **Do not raise false expectations** with stakeholders or politicians as to the likely outcomes or timelines.

- As almost all planning processes are political **there will likely be compromises** imposed on the planning process. As such, it is important that policy makers have an awareness of the LSMPA, including public opinion, to ensure they make relevant and appropriate recommendations.

- Compromise on all sides is usually essential, but recognise that **some individuals will always see solutions in terms of winners and losers**.

List adapted from *Blue Solutions: Public participation to strengthen and legitimise planning processes*, http://panorama.solutions/en/solution/public-participation-strengthen-and-legitimize-planning-processes

3.5 Sustainable partnerships and financing

As LSMPAs will require substantially more funding – in total – than smaller MPAs, it is critical to consider sustainable financing from the beginning of the proposal process. The development and implementation of these kinds of strategies will come into play during management planning. For example, it is possible that entities providing technical and scientific capacity and expertise may also become integral components of an area's business plan (*see* Box 23) and provide significant support for ongoing research efforts. Although an area may not need to employ these agreements until day-to-day operations are in place, or possibly even years into active management, developing trust between key parties, as well as identifying (or establishing) the appropriate fiscal mechanisms will likely take time (Worboys, 2005). A dialogue regarding sustainable financing could help inform how an area develops and prioritises certain management activities, as well as long-term partnerships. (Section 4.4.2 outlines additional efforts to create sustainable financing over the long-term implementation of an LSMPA).

3.6 Management plan details: vision and mission

Most MPA management plans have two primary components: (1) a broad vision and mission (*see* Table 16); and (2) details (e.g. specific goals and objectives, proposed activities and a timeline for implementing activities). Because language describing a larger vision needs to be written for audiences outside of management, it is often given the most attention during the public engagement and participation process (*see* Chapter 2 and section 3.4). In terms of developing a management plan, **big-picture language can help create mutual understanding** and agreement on the intended outcomes between managers, their constituents and other agencies.

A management plan should take into account the local to global implications and high-impact potential that an LSMPA can bring to conservation, the wider society, the economy and culture as a result of its size and scale. For example, the vision and mission statements of current LSMPAs use the following compelling phrases and words to convey the most significant implications of large-scale management:

- Forever protected.

- Preserved in perpetuity.

- For our natural and cultural heritage.

- An intergenerational promise.

- Global significance.

- Educating the future stewards in our society.

- Promoting sustainable use and livelihoods for our nation.

Genoveese boobie birds, Nazca-Desventuradas. © National Geographic's Pristine Seas Project

Table 16. Vision and mission statements of selected Big Ocean member sites

Site	Vision	Mission
GBRMP	A healthy Great Barrier Reef for future generations.	The long-term protection, ecologically sustainable use, understanding and enjoyment of the Great Barrier Reef for all Australians and the international community, through the care and development of the Marine Park.
PMNM	To forever protect and perpetuate ecosystem health and diversity and Native Hawaiian cultural significance of Papahānaumokuākea.	To carry out seamless integrated management to ensure ecological integrity and achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture and heritage resources for current and future generations.
PIPA	To conserve the natural and cultural heritage of the Phoenix Islands Protected Area for the sustained benefit of the peoples of the Republic of Kiribati and the world.	To implement effective integrated and adaptive management that ensures the natural and cultural heritage values of PIPA are maintained, and where necessary restored, to achieve PIPA's vision.
MMHMP	To preserve the marine ecosystem and those areas associated with the seamounts of the Salas y Gomez ridge, and in general the conservation of all marine biota existing in the area under protection, and to contribute to the conservation of biodiversity of national and international interest.	To: 1) protect one of the last pristine ecosystems in the Pacific and a hotspot of biodiversity (~75% of the fish biomass is endemic), 2) contribute to the recovery of the fishing activities at Easter Island though the spillover of propagules and adults of fish and shellfish, and 3) incorporate the perspectives of the Rapa Nui people in a co-management strategy to support the strong cultural importance of the area to the Rapa Nui.
BIOT	To maintain and enhance the biodiversity and ecological integrity of the British Indian Ocean Territory. To see its ecosystems thrive and its human uses carefully managed, such that BIOT continues to act as a reference area for global conservation efforts and an observatory for undisturbed ecosystems.	The current (interim) management plan aims to build a more coherent framework of environmental protection regulations and management actions, based around a clear understanding of the Territory's needs. It aims to examine and enhance enforcement and to develop effective and cost-effective monitoring, which will be used to ensure that management activities translate into biological outcomes. This work will be communicated, such that others may derive benefit from it, and the broadest array of resources and expertise may be brought to bear.

Big-picture language can clearly convey management priorities to the outside world and educate the public about an area's contribution to humanity. Such language can help frame the relevance of an LSMPA to a nation and be a catalyst for regional cooperation. In addition, this **language can help justify to the outside world the wide scope of responsibility of LSMPA managers**. For example, Papahānaumokuākea Marine National Monument and World Heritage Site has structured its management plan around the following priorities:

- Understanding and interpreting the area's natural, cultural and historic resources.

- Conserving wildlife and habitats.

- Reducing threats to its resources.

- Managing human uses.

- Coordinating conservation and management activities.

- Achieving effective operations.

Finally, when developing the vision and mission statements, it is important to keep in mind the executive decision makers and key stakeholders, and to **choose language that will garner greater understanding and support**. Using the right

HIGHLIGHT

Use words and language in a site's vision and mission statements to articulate the value of the site to the world and to society.

language can influence how decision makers and stakeholders engage, as well as encourage positive interactions that can increase long-term support for an area. For example, the GBRMP's vision and mission statements are phrased in such a way that they encourage widespread consensus about the area's importance to an array of user groups who depend upon its continued health. These vision and mission statements were developed in consultation with numerous community, government, Indigenous and commercial groups, giving all of them a sense of ownership.

3.7 Management plan details: goals, strategies, activities and timelines

The second component of a management plan should focus on specific goals that are complemented by a set of proposed strategies and activities, plus an intended implementation timeline. These details are critical to the management staff for establishing priorities and evaluating progress (*see* sections 4.7–4.9). It is also critical match the level of detail in the strategies and activities to realistically reflect management's capacity and resource limitations.

Goals link to the overarching vision and mission, and provide the framework for the more detailed management strategies and activities. Goal statements should be written after the mission and vision statement and should represent the desired status of the LSMPA's conservation targets over the long term. Each goal should be a formal statement of the ultimate ecological or social impacts that management hopes to achieve. **A good goal meets the following criteria** (CMP, 2013):

- **Specific:** Clearly defined so that all people involved in the project have the same understanding of what the terms in the goal mean.

- **Measurable:** Definable in relation to some standard scale (numbers, percentage, fractions).

- **Linked to targets:** Directly associated with one or more of the conservation targets.

- **Impact-oriented:** Represents the desired future status of the conservation target over the long term.

- **Time limited:** Achievable within a specific period of time, generally 10 or more years.

HIGHLIGHT

- A conservation target is the biological attribute or value of the resource that is the focus of a conservation project. Collectively these targets can act like a "course filter" that help LSMPA managers define what targets are priority (Noss and Cooperrider, 1994, Poiani, et al., 2000) be they species, biological communities, ecological processes, or socio-ecological values. There may be more than one target for any project.

Goal statements should be written in broad enough language to remain inclusive and adaptive but should still **link back to the vision and mission statements**. Some goals may mirror or repeat certain words or phrases from an area's vision and mission statements. This is a key point to remember, as an area's management plan, inclusive of periodic reviews and amendments, should be applicable and relevant for decades.

Goal statements should also:

- **Be written simply**, be easily understood and be marketable to the public.

- **Use bold, compelling language** to entice support from local communities and outside parties.

- **Support the vision and mission statements.**

- **Be easily memorised and articulated** by staff and supporters (even incomplete sentences are acceptable for goal statements – *see* Kelleher, 1999; Salm, et al., 2000; Pomeroy, et al., 2004).

Once the management team has defined specific goals, they can identify the corresponding strategies to implement them, drawing on examples from other sites. Understanding why similar projects may have succeeded or failed can help inform the strategy and more effectively develop actions that will likely be successful in achieving an area's conservation goals. Potential outcomes of a given strategy can be explored using scenario planning, situation analysis and results chains. When selecting strategies, managers should consider whether each option is financially, technically and politically feasible (CMP, 2013).

Strategies and their subsequent activities are the core components of a management plan, because they define how goals and objectives will be achieved (*see* Box 22). They should account for annual work planning needs (including staff time and resources), reflect a realistic time frame, and state how they will help fulfil the overarching management goals.

Considerable time and effort should be devoted to the development of strategies and actions as this is arguably the most important component of management and conservation planning. Groves and Game, (2016) provides detailed information, key references, and case studies on strategy development in conservation and natural resource management. Spoelder, et al., (2015) also provide a useful overview of all aspects of planning.

Once a management plan's big-picture vision and goals and objectives have been developed, the next step is to assess cost and time requirements. This part of the process will help build a multi-year budget, as well as an annual operating budget based on objectives to be completed in a given year. Remember that a management plan can always be amended once initial progress has been evaluated**.**

3.8 Scientific research

Research is not an optional activity for an LSMPA. Research allows managers to understand how best to protect habitats and which factors allow a biological system to function – in short, research provides the understanding that enables the MPA manager to effectively protect the natural system.

As discussed in section 3.3, LSMPA managers should consider developing secondary plans within the overall

Box 21

Site-specific management plan strategy and activity example from Papahānaumokuākea Marine National Monument

Papahānaumokuākea's Management Plan describes a comprehensive and coordinated framework to achieve the vision, mission and guiding principles of the site and to address priority management goals over 15 years. The plan is organised into three main sections: introduction, management framework and 22 action plans that address specific issues related to six priority goals. They are to: 1) understand and interpret Monument resources, 2) conserve wildlife and their habitats, 3) reduce threats to Monument resources, 4) manage human activities, 5) facilitate coordination, and 6) achieve effective operations. Together, the priority management goals, action plans and strategies are aimed at achieving long-term ecosystem protection for PMNM.

The following is an example of one strategy and one of several related activities within the Native Hawaiian Culture and History action plan:

Strategy NHCH-2: Conduct, support and facilitate Native Hawaiian cultural access and research of the NWHI over the life of the plan. Ongoing research and documentation about Native Hawaiian traditions, practices and histories of Papahānaumokuākea are as important as ongoing scientific research in helping us ensure successful management of the PMNM. Thus, working closely with partners, we will continue to conduct and support cultural and historical research and seek ways to facilitate access to the NWHI for such purposes. The Monument Management Board will also work to support complementary Western science and traditional knowledge investigations, management and outreach strategies. This work will be done in cooperation with partners, both organisations and individual researchers. Additionally, research findings may help clarify appropriate cultural activities for an area and aid in gaining appropriate additional protections for cultural resources.

Cultural access includes opportunities for the perpetuation and expansion of traditional knowledge, including natural resources conservation and management. Such access may emphasise the interconnectivity of the entire Hawaiian archipelago and will assist Native Hawaiian practitioners to reconnect to important natural resources and to the knowledge and experience of their ancestors. These kinds of opportunities also increase their capacity to become aware of an inherent kuleana (responsibility and privilege) to foster the possibility of 'ōuli (ancestral signs or omens expressed through nature) and biophysical and spiritual understandings of the environment. In addition, Native Hawaiian mele (songs), oli (chants) and mo'olelo (stories) that refer both to the NWHI and to natural resource abundance are best understood when observed and experienced first-hand.

All of these types of cultural research findings would be integrated and presented as part of an annual meeting to discuss current research being conducted in the NWHI. This annual meeting not only provides an important forum for the NWHI multidisciplinary research community, managers and interested members of the public, it enhances the practice and teaching of traditional resource management in the main Hawaiian Islands.

Activity NHCH-2.3: Facilitate cultural field research and cultural education opportunities annually. Consistent with activities that have already begun in PMNM, the Monument Management Board will continue to facilitate research and education opportunities in the field for students, teachers and cultural specialists during every field season. Such support includes providing berthing space aboard research vessels, logistical support and putting researchers and educators in touch with others doing similar work.

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framework of the management plan, and a separate research plan directly tied to the management plan should be a priority. Section 4.6.2 outlines the development of a comprehensive scientific research plan.

Planning for any management activity requires understanding a site's natural resources, a profoundly different undertaking when conducted at a large scale (Big Ocean, 2013). Because many proposed management activities necessitate substantive research, managers must include this in the management plan when allotting time and resources towards the development of strategies and activities (*see* Boxes 21–22).

3.9 Access and zoning

Some of the most time-consuming and contentious aspects of management planning involve defining rights of access, separating conflicting uses and delineating appropriate areas (zoning) for specific uses. **While zoning is typically**

Intertidal research focused on 'ōpihi or limpets has occurred consistently in PMNM in parallel with cultural research and observations. © NOAA

Box 22

How to write management plan strategies

A management plan broadly outlines what will be done at the LSMPA and provides the vision and mission around which strategies and related activities will be developed. Strategies describe how management goals and objectives will be achieved, and activities are usually the more detailed actions within the strategy.

A good strategy should not only complement management's vision and mission, it should help focus the efforts of staff and partners and create a formalized, step-by-step process to get things done efficiently and effectively. A good strategy should address a core management probelm versus a symptom of it (Groves & Game, 2016). Discovering what the core problem or challenge is requires taking into account existing issues, challenges, barriers and resources (staff, stakeholders, money, materials, etc.), and have a clear time frame to assist with effective implementation and long-term evaluation.

Strategies should always be formed before taking action and should consider the needs of all relevant management entities as well as rights-holders, stakeholders, and community members.

When writing strategies, it is helpful to do so with a diverse group of qualified people who have an understanding of the various components of marine management at a large scale. It is suggested that the strategy writers consider these questions:

- What resources are required and will they be available across the entire time frame of the strategy?

- What is the purpose of the strategy? Is management trying to mitigate, adapt to, reduce, or completely change a particular situation?

- What are the greatest challenges to successful implementation?

- Does it provide clear direction and advance management's vision and mission? Does it connect to specific goals and objectives within the overarching management plan?

- Is the strategy dependent upon the successful outcomes of other related strategies or activities? If so, have those strategies been developed with these questions in mind?

- Has the amount of time required been accurately assessed?

- Does the strategy consider rights-holders, stakeholders and the local community? Does it minimise resistance and barriers?

Once all of the strategies and related activities have been developed, it wise to review them in parallel with management's mission, vision and objectives to ensure that they are all aligned with the management plan itself but are acceptable to all entities involved in management of the LSMPA.

[Adapted from section 4. *Developing Successful Strategies: Planning to Win* from the Community Tool Box - http://ctb.ku.edu/en/table-of-contents/structure/strategic-planning/develop-strategies/main]

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addressed spatially, it also includes a vertical dimension (e.g. depth) when working in the marine environment. This is particularly relevant to LSMPAs, which include widespread deep-sea and pelagic environments (Big Ocean, 2013). For instance, managers may choose to apply different protection levels to the seafloor and the water column as these two areas may be impacted by different threats (e.g. dredging, mining and laying of cables versus water column-fishing, pollution, noise and dumping of waste) or international regulations (*see* Case Study 10).

When working to address access issues that relate to the socio-economic well being of a commuity, cultural access and the perpetuation of traditional practices, or when complying with human rights obligations, **managers should identify zoning options that are the least restrictive but offer the greatest protection** not only to the LSMPA but to the people

who will be most impacted . This may mean that managers and governance agencies will need to demonstrate that a range of options were considered in the planning process and the least restrictive measures allowable by law were taken.

A permitting system may also be considered to control access and if thoughtfully developed, could assist with controlling access in ways that enhance management. In some cases, like for PMNM, this type of application and approval process is mandatory (*see* Case Study 11)

Access and zoning within LSMPAs requires careful consideration. A number of analytical planning tools and Decision Support Systems (DSS) exist and may assist planning and zoning; however planners should be aware that such tools cannot undertake the fine-tuning and political trade-offs that inevitably occur in the final stage of planning (Gilliland & Laffoley, 2008; Agardy, Di Sciara & Christie, 2011), nor can they produce the final pragmatic solution for any planning task.

Some **shortfalls of analytical tools include**:

- **Poor data** will always lead to a poor result; some planning information, especially socio-economic data, may not easily be applied into a DSS.

HIGHLIGHT

Determine boundaries and zones by the objectives to be achieved at the site broadly and in particular zones, not by reference to specific activities.

Managing existing or proposed mining in a large multiple-use MPA – an example from Marae Moana

In 2016, the IUCN World Conservation Congress adopted a motion calling upon governments and relevant authorities to adopt and implement policies restricting environmentally damaging industrial activities and infrastructure development that may have negative impacts on protected areas (WCC-2016-Rec-102). Such industrial activities include deep-sea mining (DSM).

It is acknowledged that there are instances in which mining already occurs within an area proposed as an LSMPA, or where the economic potential of possible mining relative to existing national revenue means that authorities may consider further proposals not only for mining, but also for other infrastructure development. In these cases, IUCN urges the relevant authorities to take measures to ensure that all activities are compatible with the conservation objectives of these areas through appropriate, transparent and rigorous pre-emptive appraisal processes, such as international best practice environmental and social impact assessments, strategic environmental assessments, and appropriate regulation. IUCN recognizes the sensitive nature of such discussions but encourages governments to avoid mining in protected areas, and where such use conflicts do occur, argues for them to be addressed through appropriate spatial planning, regulation and zoning, in accordance with national legislation.

This is the situation in the Cook Islands, where the largest deposit of manganese nodules in a single Exclusive Economic Zone (EEZ) occurs, estimated at 10 billion tonnes. Manganese nodules exist on the seafloor, 5 to 6 kilometres below the ocean's surface, and have been found to contain valuable minerals, including cobalt, nickel, manganese and rare earth elements.

For decades, the Government of the Cook Islands has shown interest in capitalising on this resource, given the enormous potential for economic gains. The associated costs and lack of technology to mine at such depths has been a limiting factor for the DSM industry in the region; however, as land-based resources become exhausted, several countries and corporations are investing in developing technology and ramping up efforts to utilize these resources.

The Cook Islands Government set up the Seabed Minerals Authority in 2009 to oversee the exploratory and future mining industry under Cook Islands jurisdiction. SBMA has worked closely with stakeholders of Marae Moana to create a zoning plan that uses a precautionary approach. SBMA suggests that a 55 km x 110 km zone, or 0.3% of the EEZ, be set aside for mining, with a life expectancy of 15 to 20 years. Designating Marae Moana means that the mining zone will be subject to higher standards of environmental control and will be situated at least 50 nautical miles from any island. It is also proposed that a sovereign wealth fund be established by the government to sustain benefits from mining.

In 2016, the first application phase for DSM tenders expired without any applications received by the SBMA, although there were expressions of interest from some countries. This result was not entirely unexpected, given the current high cost of deep-sea mineral exploration and the depressed global mineral markets.

With the formal establishment of Marae Moana in 2017 covering virtually the entire EEZ, the Cook Islands Marine Park has become the largest multi-use marine park in the world, with most areas expected to remain free from mining. Public consultation has revealed community hesitation concerning uncontrolled DSM, and called for precautionary measures during exploration and mining.

[To review WCC-2016-Rec-102, *see* https://portals. iucn.org/library/sites/library/files/resrecfiles/WCC_2016_ REC_102_EN.pdf]

- While a DSS may generate a **'solution', it is inevitably refined** if/when socio-economic values are introduced. These values are often not represented in the data yet are often some of the most fundamental values for a socially acceptable outcome.
- **Most contemporary DSS tools are unlikely to meet all the needs of a user;** in the GBRMP planning program, even simple 'design rules' – such as "The minimum reserve size needs to be 20 km along the smallest dimension" – were not able to be directly implemented by a DSS.

These tools may be applied during an area's design phase, but should be revisited when management deems it necessary

(*see* Section 2.3). For more information about zoning and marine spatial planning in MPAs, refer to Douvere & Ehler, (2011), Agardy (2010), Gilliand & Laffoely (2008), Day (2011), Kenchington Day (2011), and Grantham, et al. (2013). *See* also Federal Geographic Data Committee's *Marine Boundary Working Group, Marine Managed Areas: Best Practices for Boundary Making* (2006).

Effective access and zoning should:

- **Identify the main objective for each zone** and either define it by activities that are allowed without a permit or by activities that may occur, but only after specific conditions are met. A common mistake is to try to make zones for every activity that may or may not ocurr (Day, 2002).

Case Study 11

Joint permitting systems improve tracking area access at Papahānaumokuākea Marine National Monument

Presidential Proclamation 8031 established the Northwestern Hawaiian Islands as the Papahānaumokuākea Marine National Monument. The PMNM includes a number of existing federal and state-designated conservation areas. In addition to the provisions of the proclamation, each specific designation remains in place and is subject to the applicable state and federal laws. Included are:

- The Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, managed by the U.S. Department of Commerce through NOAA

- Midway Atoll National Wildlife Refuge

- Hawaiian Islands National Wildlife Refuge

- Battle of Midway National Memorial, the latter three all managed by the U.S. Department of the Interior through the U.S. Fish and Wildlife Service

- The Northwestern Hawaiian Islands Marine Refuge, managed by the State of Hawai'i

- The Kure Atoll State Wildlife Sanctuary, managed by the State of Hawai'i

Despite the continued protection of the NWHI and the area's relative isolation in the Pacific, significant global threats still exist, such as sea-level rise, coral bleaching, ocean acidification, alien species and marine debris, which are a result of activities occurring outside the Monument's boundaries. Managers have implemented a comprehensive joint permitting process, allowing for managing, monitoring and reporting activities to evaluate and mitigate cumulative impacts. At the same time, this process enables scientists, managers and Native Hawaiian researchers and cultural practitioners to accomplish activities focused on resource protection, habitat conservation, management and further integration of Hawaiian cultural knowledge and practices with mainstream research and management approaches.

All activities in PMNM are either prohibited, exempted or regulated through the Monument's joint permitting process and authorised by a Monument permit signed by all three co-trustee agencies. Applications are publicly posted on the Papahānaumokuākea's website and are reviewed by managers, scientists and experts within the co-trustee agencies, along with Native Hawaiian cultural specialists.

For activities proposed within the NWHI State Marine Refuge, permit applications must also be approved by the State of Hawai'i Board of Land and Natural Resources.

- **Clearly demarcate and formally legislate** the LSMPA's boundaries (*see* Case Study 12), especially for remote sites, where boundaries need to be unambiguously demarcated and easily navigable (e.g. along straight lines following a specified latitude and longitude).

- **Ensure latitude and longitude coordinates** for the MPA coincide with coordinates on official nautical charts of the U.S. and other nations.Be sure to identify and use a commonly accepted horizontal datum (e.g. NAD83, WGS84 or ITR).

- **Consider using fixed features** (e.g. cables, markers on the land, etc.) to align with zoning boundaries. Doing so will avoid confusion because many natural boundaries move (e.g. low, or high-water mark). Also use or reference existing boundaries (e.g., county or state government boundaries).

- **Provide adequate access and explicit zoning** for traditional use and navigation, cultural and spiritual practices, and the evolution and perpetuation of traditional knowledge systems.

"We undertook rezoning in the early 2000s to maximise the protection of biodiversity from direct uses, rather than focusing on resilience which was not commonly referred to at the time. It turns out that our design has enhanced ecosystem resilience, including to climate change impacts; we have demonstrated this in recent scientific studies on coral disease in no-take zones."

– ANDREW SKEAT, FORMER DIRECTOR OF OPERATIONS AT GBRMPA

3.10 Review and approval of the management plan

When reviewing an LSMPA management plan it may be helpful to examine plans from other areas that share similar biogeographic features or socio-political contexts, even if the area is not an LSMPA. For example, managers developing the plan for the Marianas Trench Marine National Monument reviewed Canada's Endeavour Hydrothermal Vents MPA plan, as both sites contain submerged volcanoes. Three LSMPA sites (GBRMP, PMNM and PIPA) have completed management plans (*see* Table 15).

The final step in the management planning process is to ensure an area's plan accords with the legislative language in its declaration, existing laws, rules, regulations and management authorities. This will likely be mainly related to government agencies, but may also include traditional decision makers and Indigenous bodies who have rights of access and authority. One example is the Traditional Use of Marine Resources Agreement process that exists in the Great Barrier Reef (GBRMPA, 2008).

A public review and comment period may also be required, and plans are likely to be carefully scrutinised and criticised. It is important to allocate adequate time and resources to support this process. Even when a public review process is not required as a matter of law, review still allows a better understanding of the needs and views of stakeholders, and builds support and voluntary compliance for the proposed management plan. In reviewing the draft management plan, consider current definitions, social constructs and accepted legal language to ensure congruence between current rules and regulations and the language used in the area's plan.

The time frame for the final approval of a management plan depends on the nature of the plan, as well as existing laws, rules, regulations and management. For instance, in some cases management plans may need to be reviewed by the legislative body. It is important to allow ample time for the final approval of the plan, as well as to anticipate the potential need for revisions at every step of the process.

Several LSMPAs have opted to add a specific time frame for the duration of the management plan (e.g. 5 years, 10 years, etc.), and require a management plan review at consistent intervals, as well as at the end of the plan. While the requirement for periodic management plan reviews will allow timely modifications to be made as conditions at the area change, these reviews often require investment of extensive resources as well as time, which may burden an area's management or take away from other important activities. Managers should carefully weigh the pros and cons of requiring these periodic reviews when setting the overarching time frame for the management plan, and should communicate these considerations to stakeholders and policy makers to manage expectations from the beginning. One option applied in the GBRMP was to legislate only a minimum time period during which the zoning plan needed to remain in force without any amendment. This provided certainty to all users without a deadline.

Hikianalia, a new-style double-hull long-distance voyaging canoe, sails past Nihoa Island in PMNM. @ Na'alehu Anthony

Zoning boundaries of the Great Barrier Reef Marine Park Authority

Early zoning plans within the Great Barrier Reef Marine Park emphasised the protection of coral reefs. Zone boundaries were usually described as a specified distance from a geographical feature (such as "500 m from the reef edge"). Depicting specific reefs or groups of reefs within such zones may have looked appropriate on a map, and including whole reefs may have seemed ecologically sound, but such zone shapes proved extremely difficult to interpret 'on the water.'

Consequently, coordinate-based zone boundaries were introduced when the 2003 Zoning Plan was being developed for the GBRMPA. All new zones were described by their coordinated longitude/latitude, specified in degrees and decimal minutes referenced to the Geocentric Datum of Australia 1994, and were orientated north, south, east and west for ease of navigation or demarked by a straight line.

Every zone was described in a detailed schedule to the statutory Zoning Plan, but not every zone coordinate was shown on the accompanying zoning maps. Nearly all coordinates for no-fishing zones and no-access zones were shown and all zoning coordinates were provided in an electronic form to commercial suppliers of electronic navigation aids, enabling them to load all zones into their Global Positioning Systems (GPS) or plotters. Additionally, all zone coordinates were freely available on the web or as a compact disc, allowing users to locate zones using their own electronic devices. Zoning information signs are located at major boat ramps along the coast.

Each zone was given a unique zone identifier (e.g. MNP–11–031), which provided the zone, line of latitude and zone specification, allowing zones to be easily identified on maps or cross-referenced to the schedule in the Zoning Plan.

4
Managing LSMPAs

Nihoa Island's 900-foot form a powerful silhouette at sunset in Papahānaumokuākea Marine National Monument. ©Robert Shallenberger

4.1 What does managing an LSMPA involve?

While the basic best-practice management standards for MPAs are similar at all scales, the guidance in this chapter has been collated from the experience and scientific insights gained from the on-the-ground management of 14 existing LSMPAs. The guidance has been tailored to help both new and experienced LSMPA professionals, and to outline the implementation process following the completion of a management plan.

Managing an LSMPA is usually a continuous, interactive, adaptive and participatory process, comprising a set of related tasks that all need to be undertaken to achieve a desired set of goals and objectives. These goals and objectives should be clearly established early in the life of an LSMPA so that they are known, understood and accepted, and can provide a benchmark against which to evaluate the effectiveness of management (*see* Section 3.7 and Day, et al., 2015).

In managing an LSMPA, rarely are marine ecosystems managed separately from its component parts; rather, the **human activities** occurring in and around an LSMPA are managed holistically. LSMPAs are not static – they are dynamic natural systems subject to a range of changes (technological, social, political, etc.), and a management system needs to be regularly reviewed and updated to respond to changes in the environment, the user's habits, and inadequacies within the management system itself as well as the wider socio-economic policies create and enforce a nation's natural resource management laws and regulations (Spoelder, et al., 2015).

4.2 Components of management

Management can be compartmentalised in many ways; for this chapter, management is discussed under the following broad groupings (based on UNESCO, et al., 2013):

- **Management elements:**
  - o Reassess the legal/governance framework
  - o Institutional framework (*see* Box 15)
  - o Resources – human, financial and intellectual inputs
- **Management processes:**
  - o Planning
  - o Implementation
  - o Monitoring
- **Key result areas:**
  - o Outputs
  - o Outcomes
  - o Improvements to the management system.

The term **'management system' can be explained as a set of processes** (e.g. cycles of planning, implementation and) which together deliver a set of results, some of which feed back into the system to achieve

HIGHLIGHT

It is important to note that this chapter does not attempt to cover every aspect of managing LSMPAs in detail, particularly as best practice standards in the field are still being developed. Managers can find many useful guidance documents cited throughout these Guidelines. Specific to management, another excellent resource, available free online, is the book *Protected Area Governance and Management*, available at https://press.anu.edu.au/publications/protected-area-governance-and-management/download

continuous improvement of the system, its actions and its achievements. The management system will be shaped by the resources available, by varying cultural perspectives, and by other factors (*see* Table 17).

As world's social, cultural and economic issues become more complex and the pace at which they change increases, so do the challenges for LSMPA managers to remain both adaptive and effective. Developing conservation and management strategies that produce the desired results and are sustainable over time is essential. As such, it is essential for managers to consistently improve upon their planning processes, whether they be focused on a reassesment of the areas legal framework or restoration of a particular habitat.

Despite the fact that LSMPA management is still in its developmental stage, professionals working at-scale can look to the advances being made in the field of conservation planning and utilise lessons learned from both the marine and terrestial realms. The key is to become better at identifying the real source of a problem and to improve upon how these problems are then framed. The bottom line is that resources are more effectivey used, and outcomes more easily achieved, when managers step beyond their biases, and combine what they think they know with formal planning processes that incorporate tools and methodologies being developed within the context of contemporary conservation and its wider links to society (Groves & Game, 2016). It is the LSMPA managers working to improve the field today, who will likely have the biggest impact on what is considered best practices for large-scale marine conservation in the decades to come.

Table 17. Top management successes and challenges from seven LSMPA areas at the time of this publication

LSMPA	Elements of Management at a Large-Scale MPA			
	Social/Cultural/Economic/Political		Ecological/Scientific	
	Top Challenges	**Top Successes**	**Top Challenges**	**Top Successes**
Parc Naturel de la Mer de Corail *Natural Park of the Coral Sea*	Compliance, surveillance and enforcement. Integrating multi-scale and multi-stakeholder management approach within a large EEZ park that includes World Heritage sites and is adjacent to territorial waters.	Regional integration (Pacific Oceanscape, Oceania 21, sister site agreement) Implemented highly successful management strategy with a focus on tourism management, long-term monitoring and action-oriented research to protect a World Heritage site (d'Entrecasteaux Reef) within the park.	Cooperation between public administration and NGOs for planning and enforcement of scientific measures. Sustainable funding and clear tools for decision makers.	Cooperation with other LSMPAs to enhance development of research planning and coordination methodologies. Oceanic fishery companies supporting research and surveillance.
Phoenix Islands Protected Area	Controling visitors to Kanton Island in PIPA and domestic vessels leaving the Gilbert Islands via PIPA to the Line Islands and vice versa. Point persons on cruise ships making sure biosecurity and disturbance plans are strictly adhered to.	Government support for establishing the PIPA Trust Act/PIPA (Amendment) Regulations 2014, closing off PIPA's entire area. Organised cruise ships' visits to PIPA, creating jobs and income.	Monitoring and evaluation are very costly due to remoteness. Need to standardise research data.	Work in partnership with key research institutions providing experts. Secured funding to support PIPA research expeditions.
Marianas Trench Marine National Monument	Limited resources available to support management planning and implementation spread across three areas. Working collaboratively, given funding limitations and the great distance from Hawai'i to CNMI.	Progress in drafting a multi-agency management plan. Public support for the MTMNM is growing, encouraged by public meetings and outreach and education initiatives.	Sustained funding to access the remote areas to conduct scientific monitoring. Funding to analyse and share the data acquired from the triennial monitoring cruises.	NOAA research vessels continue to monitor archipelago, including the three northernmost islands of the MTMNM, every three years. The area has also garnered the interest and support of other research partners to explore and monitor it. The NOAA Pacific Islands Fisheries Science Center published a comprehensive summary of the Marianas Archipelago coral reef ecosystem that includes the three northernmost islands of the MTMNM. A new GIS interface allowing access to research data is also in development.
Motu Motiro Hiva Marine Park	Developing a participatory management plan incorporating cultural aspects. Respecting local rhythms.	Participatory gathering of management measures with and by local communities. Local leaders empowered and ready to be involved in the management plan creation.	Generating scientific information useful for management purposes. Access to large scientific vessels for studying seamounts and other deep-sea ecosystems.	Multidisciplinary research to understand ecosystem dynamics. Collaborative research with scientists from Hawai'i.

Table 17 continued

LSMPA	Elements of Management at a Large-Scale MPA			
	Social/Cultural/Economic/Political		Ecological/Scientific	
	Top Challenges	Top Successes	Top Challenges	Top Successes
British Indian Ocean Territory Marine Protected Area	Halting illegal fishing.	Development of interim management plan with multi-stakeholder involvement. Political engagement with Sri Lanka to reduce arrivals of illegal, unreported and unregulated fishers.	Coral bleaching and effects on crown-of-thorn starfish. Access and cost of scientific research.	Regular scientific expeditions undertaking a broad array of research, and considerable public and private funding. Engagement of full-time Environment Officer to undertake and support research, aid with surveillance and engage with personnel on conservation and outreach.
Papahānau-mokuākea Marine National Monument	Budget limitations. Co-management structure.	World Heritage Site designation. UN Particularly Sensitive Sea Area designation.	Budget limitations. Size and scale of area.	Long-term partnerships with several universities and research institutes. Integration of traditional and cultural knowledge systems in scientific research.
Great Barrier Reef Marine Park	Addressing the multitude of challenges due to the high levels of connectivity between the adjacent land uses and the Great Barrier Reef. Maintaining a satisfactory level of enforcement and compliance, and operating with a decreasing budget while at the same time facing increasing usage.	Ongoing complementary management (including complementary zoning and integrated ecosystem-based management) involving a range of state and federal agencies. A comprehensive GBR Outlook Report every five years, including an independent assessment of management effectiveness.	Addressing cumulative impacts, particularly given the multitude of pressures. Current and future climate change-related threats, including increased sea temperatures, altered ocean currents, more extreme weather events, ocean acidification and sea level rise.	Effective long-term ecological monitoring programmes demonstrating the condition and trends for key habitat types. Establishment of a comprehensive socio-economic long-term monitoring programme.

4.3 Reassess the legal framework

In most countries, **some form of legal mandate or directive will define, identify, protect and/or conserve marine resources**. This may range from a formal body of law to unwritten traditions, customs or practices passed down from generation to generation. It may be a mixture of the guidance from international conventions combined with national legislation or with regional or provincial-level regulations, or local by-laws, or traditional customs.

Whether formalised or not, **the legal framework should provide sufficient regulatory tools and authorisation** to govern all aspects of the management system for the MPA and empower those within it to act.

Before implementing the management plan, it is advisable to **review the legal framework** for the area and to inform the management team accordingly. This kind of assessment should also be made periodically. Each review should take into account the following:

- **Maintain a legally published governance mechanism** along with an appropriate legal framework that will continue to protect the area from legal challenges.

- **Avoid legislative redundancy and wasted effort**. Use existing legal and policy language, rather than creating new language.

- **Maintain good relationships and clear communication channels** with decision makers and elected officials, who will provide political support and maintain the necessary political will required to sustain the management of the area beyond designation.

Legislation is not static and should evolve. To protect and strengthen the MPA's legal basis:

- **Identify and comply with international conventions and treaties,** especially those relating to the legality of the area or activities conducted within international waters (e.g. UN Convention on the Law of the Sea, World Heritage Convention, the Convention on Biological Diversity (*see* Salm, et al., 2000).

- **Keep long-term objectives in mind.** Political compromises and short-term losses may be necessary to avoid greater limitations or loss of long-term political will.

- If shortcomings in the legal framework are compromising the effectiveness of management, there may be a need to **reform laws** or consider other means. If reform is unrealistic, additional legislative controls at a local level may be feasible by using regional laws, development by-laws, local policies, partnerships between institutions or capacity-building measures.

- **Consider developing agreements** that support the area's legal foundation, especially with neighbouring jurisdictions or countries. Even with multinational agreements in place, managers should anticipate political issues and even conflicting claims against the LSMPA.

4.4   Resources

Resources are the basis for operational capacity and come in three main forms: **human, financial and intellectual**. Sometimes known as 'inputs', resources are how a management system conserves and manages an LSMPA.

Since resources for LSMPAs are often in short supply, it is important that they be used effectively. Resources are also more likely to be subject to frequent changes than the institutional or legal frameworks. A balance between the use of internal (within the institution) and external resources may be important in all three areas (human, financial and intellectual).

4.4.1   *Human resources*

The skills and commitment of staff (field staff and office staff), and effective leadership, are the most important elements for the success of an LSMPA. Managers need to ensure access to required skills and resources, including:

- An **appropriately sized and skilled workforce**,

- **Management infrastructure** that is operational and appropriately located,

- **Specialised equipment** (e.g. a vessel fleet) that is suitable for the task(s), well maintained and operational, and

- **Systems and technology** able to assist in the delivery of tasks in an informed, contemporary and timely way.

LSMPAs often demand a large investment in human resources, including full- and part-time staff and contractors. When determining the appropriate staffing levels and skills, **one focus should be on securing staff with skills that cannot be readily obtained elsewhere in the LSMPA** (for example, from other government agencies, industry or the

> "LSMPAs have higher visibility; take advantage of this fact and work with partners who are interested in helping to advance marine conservation globally."
>
> **– FOCUS GROUP PARTICIPANT**

HIGHLIGHT

- Invest in activities that strengthen the relationship between multiple areas of organisational and operational management.

- Prioritise activities that build strong interpersonal communication and supervisory skills in leadership.

- Create an intergenerational framework for management by investing in community and youth.

- Enhance gender equity, especially in areas where there are fewer qualified women to be staff, mentors and trainers.

- Ensure those that receive training in LSMPA management return their skills to benefit their community.

community). Partners can sometimes provide specialised human resources, especially if this staffing need is not ongoing or requiring a full-time position. Additional human resources for management can be contributed by those for whom the LSMPA is their home or livelihood, often as volunteers.

Many countries have shifted to **outsourcing expertise and works** (often associated with downsizing of public organisations and/or the desire to reduce risks assumed by the public bodies), leading to opportunities for a wider range of professionals and works contractors to engage in conservation and LSMPA management. However, particular care should be taken to avoid institutional memory loss when fixed in-house expertise is reduced in favour of periodic outsourcing.

Current experience suggests **managers should minimise staff turnover** and retain as many of the original staff through at least the first five years of the area's existence. This stability provides several substantial benefits, including a greater ability to delegate responsibility in a crisis, increased levels of stakeholder trust, greater institutional knowledge and a depth of leadership.

Leadership is often evaluated by the quality or benefit of the decisions made by the people who are driving an organisation, but that organisation is supported and moved forward by the entire staff. **Successful leadership is most often about effectively engaging and managing staff** who then produce beneficial outcomes. Senior management must lead by example and model the principles and values that are expected of staff. With the support of strong staff and organisational capacity, leadership can then focus on planning for the future.

A notable component of leadership is **one-to-one staff management**. This requires supervisory and people skills, not merely the ability to be responsible and delegate tasks. This role requires helping to manage workloads, being a liaison with senior leadership and staff, coordinating with outside colleagues and evaluating performance. The abilities of the people who hold these supervisory positions will significantly impact the quality of management. Additionally, as an LSMPA matures, a growing number of staff may end up spread over a larger geographic area. Being proactive in preparing top-level managers to oversee staff in geographically disparate locations is important. This also benefits partnerships, as they are often with organisations that are not in the same location as the LSMPA.

> "Care for and support your staff during good times, so they will do the same for you when your site faces challenging times."
>
> **– FOCUS GROUP PARTICIPANT**

Training and operating capacity need to be periodically reviewed and should be important parts of an organisation's annual business plan. The safety and well-being of those who deliver field management operations in an LSMPA and/or island environment are critical, particularly if the field-based tasks are undertaken in remote localities. This requires that safe workplaces, equipment and training be provided and that staff are competent to ensure all necessary tasks are performed safely.

4.4.2 _Financial resources_

Usually government budgets provide the financial resources for LSMPA management, but, as public funding declines, **funding is being sought from other sources**. Financial resources are either fixed (in terms of source, scope and timing) or variable with different sources (e.g. local, national or international sources, or from loans, private funding, international assistance, specific support for World Heritage properties, sustainable financing, etc.), or a mix of these. financial resources generated directly from such activities as tourism, sustainable fisheries, etc., are also becoming important for multiple-use LSMPAs in the pursuit of economic sustainability.

Effective accounting and budgeting is one of an MPA manager's most fundamental administrative responsibilities. Recruiting and keeping qualified professionals with skills, training and certification in financial management and accounting should be prioritised. An area's financial management team should develop an intimate understanding of the policies and regulations specific to the implementation of the budget and funding mechanisms. Doing so will not only attract and maintain sound financial investments, but will also limit exposure to legal liabilities, such as unexpected financial audits and budget reductions.

Creatively financing an LSMPA

- **Consolidate the suite of financial resources** available to the area into a portfolio of investments, managed by qualified financial managers, to be continually diversified and grown.

- **Develop financing partnerships with agencies and NGOs** to share costs of staff (shared between partner organisations), facilities (e.g. shared office space) and research platforms (e.g. marine laboratory, research vessel).

- **Develop public-private partnerships to co-finance specific aspects of operations** (e.g. visitor centre). This may include wealthy individual donors and private-sector companies (sponsors).

- **Promote the large size, bold vision and wide legislative scope of the area** as an opportunity to attract private and non-traditional investment partners (e.g. crowdsource funding).

- **Use threat assessment and strategic planning exercises** as an opportunity to involve and invite partnerships with potential investors.

- **Develop an economic valuation of ecosystem services** provided by the area, and use this as leverage when applying for additional funding. The cost of managing an MPA will likely be much lower than the ecosystem benefits it provides.

LSMPA managers should **investigate the potential for the area's annual government funding to be matched by multiple sources of private revenue**. Potential sources of non-government funding may include licencing, permit or landing fees for extractive uses (e.g. fishing) and non-extractive uses (e.g. tourism revenues, diving fees). One example of this approach is the environmental management charge paid by tourists, collected by tourism operators and then forwarded to the managing agency to support operations in the Great Barrier Reef Marine Park (_see_ Case Study 15).

No-take zones within LSMPAs may also provide spillover of fisheries into extractive areas (Roberts, et al., 2001; Murawski, et al., 2005). **Funding from these extractive activities should also be considered** when developing a financing plan. For example, LSMPAs that support the conservation of high-value fisheries (e.g. tuna) should receive revenues from extractive industry operations that benefit from the area's management. The current use of this concept ranges from the initial discussion phase, as in the Cook Islands, to a fully developed model being implemented in the Phoenix Islands, where an endowment, established by partners, will help to finance marine management activities for the long term **(Case Studies 13 and 14)**.

Even in situations where managers are fortunate enough to secure the necessary financial resources required to sustain management efforts in the short- to medium-term (i.e. three to five years), it is important to **plan for the longer-term financial needs**. Be prepared for influential government decision makers or elected officials to claim there is no longer a need to finance an area because of past investments (i.e. 'Didn't we already fund that?'). Lastly, sustainable financing for an area may be challenged by an internal or external forces (e.g. special-interest groups representing specific users) with an interest in investing in several, smaller MPAs instead of a single LSMPA. Managers can address this fragmented approach by creating strong relationships with other MPAs or marine managed areas of varying scales nationally or regionally, and ensuring management efforts amongst these partner areas are complementary.

Case Study 13

Sustainable financing of the Phoenix Islands Protected Area

A unique sustainable finance model known as a 'reverse fishing licence' will enable the Kiribati government to be reimbursed for closing the waters within PIPA from extraction activities. Partners of the MPA will establish an endowment (the 'Financing Vehicle') where revenues once derived from financially and environmentally viable harvests in the closed area will be replaced by endowment income. Kiribati will then be able to pursue a historic marine biodiversity conservation achievement without losing the economic benefit that would otherwise have been obtained from exploitation of PIPA's natural resource base.

Core management activities for PIPA cost approximately US $400,000; the fishing revenue Kiribati will forgo is US $175,000, and Trust management requires US $300,000. The key component of the PIPA Trust Act (2010) is the Conservation Agreement obligating the Trust to provide financial support for the management of PIPA's primary activities and the prohibition of the exploitation of resources to the extent funds are available. The Trust board is comprised of representatives from the Kiribati Government, Conservation International, the New England Aquarium and, more recently, representatives from the Ted Waitt Foundation and Oceans 5.

The PIPA Trust requires a target of US $13.5 million capital to invest in an offshore bank that would attract an annual 5% interest in order to generate the US $675,000 needed to meet the Trust's annual primary costs. The Government of Kiribati and Conservation International have already contributed US $2.5 million each to the Trust, and other potential donors have shown interest. The PIPA Trust is a U.S. registered charitable organisation eligible to receive federal support, such as the non-taxable status of all income that the Trust generates from its investment in the U.S., along with tax-exempt revenue.

A school of Pacific chub in the waters of Papahānaumokuākea Marine National Monument. © Kaleomanuiwa Wong

Case Study 14

GEF financing partnership for the Phoenix Island Protected Area

The decision to support Small Island Developing States (SIDs) in the effort to confront challenges of biodiversity conservation on islands was made during the 8th Meeting of the Conference of the Parties to the CBD. As a result, Kiribati received Global Environment Facility (GEF) support to implement the PIPA Management Plan (2011–2014).

The Project Cooperation Agreement (PCA) using GEF funding, was signed in November 2011 between UNEP (GEF implementing agency for this project) and the Government of Kiribati (as executing agency) prior to GEF funding disbursement. The PCA implements cooperation conditions between the Parties for the execution of the PIPA project, including matched funding. The total project cost was US $2,663,100, of which US $870,200 was from GEF, with the balance co-financed in cash and in-kind contributions from the Government of Kiribati and its partners.

The initial PIPA Management Plan had three key components, including: (i) Core Operations (e.g. establishing need for infrastructure and personnel, (ii) Strategic Outcomes (e.g. World Heritage Site management and climate change adaptation), and (iii) Design and Operation of PIPA's sustainable financing system. The second PIPA Management Plan, for 2015 to 2020, adds a Kiribati translation to build greater public understanding and support for all planned activities and expected outcomes, and will be financed by PIPA Trust.

GEF funding was essential to allow Kiribati time to establish PIPA's sustainable financing system. The Tarawa PIPA office is responsible for implementing the PIPA Management Plan, with the Project Management Group (comprised of representatives of the Ministry of Environment representatives, Lands and Agricultural Development, Conservation International, the New England Aquarium and UNEP) responsible for the oversight and management of the PIPA project.

Case Study 15

The Great Barrier Reef Marine Park's Environmental Management Charge

In July 1993, an Environmental Management Charge (EMC) was introduced by GBRMPA management: a legislated fee was applied to some commercial activities, primarily tourism (e.g. vending and charter operations) in the GBRMP.

Most of the tourism-related charges require visitors to pay the permitted operator directly, but an operator can choose to advertise this fee separately from the ticket price as long as it is correctly and consistently represented on its website, brochure or receipt. Permittees must record the charge type and locations visited and remit the funds and data collected every quarter to GBRMPA. Late payments, failure to provide data or returns (i.e. number of passengers or the amount of nitrogen or other nutrients in discharge outfall pipes) or altering records may lead to revoked or suspended permits, on-the-spot fines and even criminal proceedings.

Formulas the amount charged are contained within the Great Barrier Reef Marine Park Regulations 1983. Increases in the Standard Tourism Programme charge, which represents the majority of funds remitted each year, take place on 1 April during years when the accumulated Consumer Price Index calculation reaches AU $0.40.

Funds received from the EMC are an important part of GBRMPA's annual budget. Payments are applied directly to management of the Great Barrier Reef Marine Park and used for education, research, ranger patrols and policy development. The data provided is crucial in assessing visitation trends and greatly assists the GBRMPA and the Queensland Parks in applying adaptive management arrangements to ensure sustainable use.

Box 23

Developing a business plan

Some LSMPA managers may find it useful (or may be required) to develop a business plan to support their comprehensive management plan. This is particularly true if the business plan addresses sustainable financing needs for certain objectives or strategies that may not be financed under the allocated budget. Even if the development of a business plan does not coincide with the development of a management plan, both should be closely linked. Examples of business activities helping to support management include: (a) collection of entry fees and concession revenues from an area visitor centre; (b) user access fees to enter the area; and (c) revenue generated from sustainable commercial fishing licences or landing fees.

Managers should also consider how components of the business plan can incorporate commercial revenues derived from sources adjacent to and outside of the area; for example, tourism revenues associated with the area and its benefits or commercial fishing income generated outside the boundaries of the LSMPA. This may also include retail revenues generated through the sale of products (e.g. books, clothing or consumer durables, coffee mugs, pins, tote bags, beach towels). This is especially important if the business plan's purpose is to finance or support funding for specific objectives under the management plan that would otherwise not be possible.

For most LSMPAs, business planning reflects a public-private financing partnership, one that is likely to include government funding and private and NGO investment (with NGO investment often provides matching funds through private foundation grants).

The following are recommended for matching business planning and management efforts:

- Develop a business plan in such a way that it attracts financing partners and revenue streams commensurate with large-scale management needs and growth.

- Take into account the allocation cycle of funders across the year to ensure activities have the necessary resources within the appropriate time frame. If large amounts of funding are involved, the allocation or payment schedule should be developed accordingly, if it is negotiable.

- Separate operating costs (which are usually ongoing) from capital costs (which may be one-offs). It is also useful to develop a replacement schedule for major items that are likely to degrade over time through sustained use, such as boats and motors.

- Consider how a business plan might help offset traditional costs, particularly relating to operations; for example, the costs of ships and fuel, additional staff, remote field stations or scientific research and exploration.

- Consider how a business plan can help offset non-traditional and/or capital and administrative costs (including additional labour requirements) and provide more flexible spending; for example, the financing of specialised staff training, customised software development or information technology infrastructure, purchasing of large equipment for remote sensing surveillance and enforcement, or leasing of office space.

- Utilise a business plan to creatively address increased travel budget needs or to overcome travel limitations that are inherent to managing LSMPAs, especially those that are remote.

- LSMPAs can generate a high level of public attention and awareness, which in turn may attract business partners to invest in an area's financing and business plan (e.g. start-up costs).

4.4.3 Intellectual resources and data management

The **success of LSMPA management depends on knowledge being generated, maintained, updated and exchanged** for day-to-day management actions, for improving the management systems and for communicating to existing and new audiences.

The human resources within an organisation can provide some of the intellectual resources, but they are not the only generator and host of intellectual know-how. **Traditional knowledge and local experience can be as important** as national research bodies or international experts.

Consider cross-site learning and collaboration with other LSMPAs as an effective capacity-building option. Although the costs may be greater, the benefits are often great as well.

Lasting change and significant professional growth can be achieved by providing immersive experiences in which staff are able to participate in the daily experiences of a peer colleague at an MPA facing similar challenges.

In the early stages of managing an area, **prioritising data management, storage and export** may be challenging. However, this frequently overlooked and undervalued

"Don't waste your time and money collecting data if you aren't going to properly manage and analyse it. Data kept in a box is just a fire hazard."

– DAVE GRAHAM, DATA MANAGER PMNM

administrative requirement is important for the long-term success of an LSMPA. Well-designed data management activities that collect, prepare, analyse and make data accessible can feed content into other management activities.

While administrative paperwork may be the most tedious aspect of managerial duties, **developing internal systems that expedite the processing of paperwork**, such as vendor contracts, employee reviews or monthly reports, will increase the ability of a management team to implement an LSMPA's management plan effectively and achieve its goals within the prescribed timelines.

4.4.4 *Specialised equipment*

The management and ongoing maintenance of specialised equipment, including vehicles and vessels, can pose significant challenges in an LSMPA. This is especially the case if an area does not have facilities or technical or mechanical support from an agency. Experience demonstrates that before allocating funds, a staff's ongoing capacity to handle specialised equipment should be assessed. If an area lacks the necessary technical capacity but requires the use of specialised equipment, managers should consider asking partners to share resources (e.g. sharing vessels across several agencies) and expertise.

Managing physical MPA assets (such as vessels or an operational base) should consider the whole life cycle of the asset, including design, construction, commissioning, operation, maintenance, repair, modification, replacement and decommissioning or disposal.

Depending on the scope and detail of a management plan, **an area may require multiple facilities**. For example, if the management headquarters is located separately from a visitor centre, vessel berth station or equipment warehouse, additional labour, time and resources will be required. Large distances between facilities may also complicate matters, particularly if facilities are distributed throughout the LSMPA.

4.5 Ongoing planning

Most of the key components of management planning in an LSMPA are addressed in Chapter 3.

Planning, implementation and monitoring are important processes that often overlap, forming a continuous cycle that enables the management system to deliver results efficiently and effectively. Planning (as with monitoring) is too often seen as an end in itself, an 'end product', rather than as one stage in a cycle of processes which ensure that results are delivered. The amount of time and level of resources invested at the planning stage can determine the success of implementation and the effectiveness of monitoring (Groves & Game, 2016).

The term 'plan' may suggest a lifeless, definitive document, but **a plan often needs to be a living document** that evolves as its proposed actions are implemented and then monitored. In fact, the planning process can be more important than the document itself, and a plan should not necessarily be regarded as a failure if not all of its actions are implemented.

Regular work plans (i.e. annual work plans, business plans) should be complemented by longer-term strategic plans. Planning must also set aside resources as contingencies specifically to anticipate the need (staff time and cost) for continuous revision of plans during their lifetime (*see* Box 23). Some management systems will mix 'active' planning (anticipating problems and opportunities) with 'reactive' planning (responding to problems after they arise); ideally, the former will predominate.

Experience shows that good planning, reinforced by feedback from within and outside the management system (*see* section 4.10, Improvements to management systems), will reduce the amount of reactive planning that has to take place since more and more needs will be anticipated. This optimises the use of resources. Even so, a capacity for reactive planning is necessary in order to deal with unforeseeable events, which will inevitably occur.

In some countries, **strategic planning might be the primary approach at the national level and a values-led planning approach might be the most relevant at the LSMPA level**. In some LSMPAs with diverse partners (planning authorities, communities, etc.), several overlapping plans may result and coexist, along with the need to plan both routine and one-off actions. Integrated approaches to planning at the LSMPA level are becoming more common.

Should the initial efforts and resources of management prove adequate in the first few months, **longer-term planning (two to five years) can be a helpful exercise**. It may seem illogical to think about year five when year one is barely over, but experience of LSMPA managers shows that the first few months of active management is precisely when critical errors and oversights can be identified early and losses kept to a minimum. If planning is done badly, the cost of taking remedial measures once implementation has begun increases. It is the planning stage that offers the potential to improve actions of the management system with minimum cost.

There are a variety of mechanisms for preparing and revising plans. Some institutions maintain the same planning procedures they started with but with the relatively new conservation planning methods and tools now available, managers need to remain open minded to new options (Groves & Game, 2016). Given the uniqueness of each LSMPA and each context, new planning approaches should only be introduced after careful consideration of the strengths and weaknesses of the existing planning approaches, both formal and informal.

Good planning principles:

- **Have aspirations that are realistic** (i.e. look to the future, learn from the past and then plan realistically given the available resources).

- **Utilise effective and engaging participation processes** (*see* Chapter 3, especially section 3.4 and Box 20).

- **Ensure good alignment with the values and culture** of the institution(s) and stakeholders.

- **Thoughtfully consider 'user' needs** (e.g. the local communities within or around the LSMPA; visitors and future generations).

- **Seek support across political parties** (multi-partisan), from local communities and the public rather than from just one elected official or government ministry.

- **Focus on decisions that will or need to be made by managers** (e.g. prioritise research but have management be the main driver).

Box 24

Process principles for real-time management of LSMPAs

- Keep a large-scale mindset when approaching management activities, and recognise that implementing and completing activities will take longer than anticipated. Realistic expectations must be built from timelines and work plans that take into account possible changes in political administration.

- Be prepared and willing to engage in international affairs and diplomacy, including building international political and management partnerships, as LSMPAs may include transboundary waters or international policy matters.

- Grow and strengthen partnerships that provide financial and technical capacity, as limitations in these areas may likely arise, particularly within developing countries where such limits on capacity may inherently constrain implementation.

- Remain open to change and willing to consider new ideas and ways of working; LSMPA management usually involves an increased number of competing priorities as a matter of scale, particularly given funding and human resource limitations.

4.6 Implementation

Assuming that an area's political and legal frameworks are reaffirmed and the managing agencies are resourced, implementation can begin in earnest. This will test the integrity of an LSMPA's foundation, the quality of its staff, the strength of its relationships with diverse stakeholders and the effectiveness of its initial communication strategies.

Mistakes made at the implementation stage are far more difficult to correct than those made during planning or monitoring. Box 24 lists a number of broad process principles for implementation:

This section does not aim to address every aspect of implementation for LSMPA management; the specific management topics addressed are:

- Communication and engagement
- A scientific research plan
- Compliance management
- Surveillance and enforcement
- Building innovative partnerships
- Organisational capacity
- Risk management and cumulative impacts.

For specific advice regarding other management tasks (such as visitor management, managing incidents, managing cultural uses and features, leadership, dealing with the media, etc.), refer to the relevant chapters in the book *Protected Area Governance and Management*, available at https://press.anu.edu.au/publications/protected-area-governance-and-management/download

HIGHLIGHT

Always go for quality over quantity and make sure all material and messaging is relevant to a diverse set of stakeholders and affected parties.

4.6.1 Communication and engagement

LSMPAs often attract more attention than smaller areas, partly because of their vast size but also because they currently represent the newest genre of marine conservation (Toonen, et al., 2013, Wilhelm, et al., 2014). The scientific community and public are fascinated by the enormous geographic scale of LSMPAs and they draw international media attention (both desired and unwanted), particularly just before and after declaration and when the potential political gains and losses are significant (*see* Case Studies 16 and 17).

Managers need to adopt a communication strategy or plan that suits their stakeholders, and consider important elements such as cultural protocols, staff presentation skills and language fluency. Communications strategies should be considered living documents, consistently modified to reflect an area's growing needs (Jacobson, 2009).

Critical considerations for communication:

- **Develop key messages** by bringing together a diverse, targeted group of public and stakeholder representatives, including resource users (boaters, divers, fishers, etc.); elected officials; cultural and spiritual leaders; Indigenous leaders; educators; and youth (i.e. the next generation of managers, scientists and users).

- **Key messages need to be simple, short and in**

"When you go big you get noticed. Publicise your accomplishments early and often – create global relevance, so the world keeps watching."

– FOCUS GROUP PARTICIPANT

a language that resonates with the majority of the audiences. Always address the fundamentals (i.e. who, what, where, why and how), and make sure the messages are relevant and foster interest and understanding. Note that the way the messages are delivered may need to be different for each group. For instance, communicating with fishers will require a different approach than communicating with the media.

- It is useful to **test key messages on people outside the area** to check whether the messages make sense and are relevant to different audiences. But be aware of potential disconnects that may occur between audiences – research scientists and conservation professionals may speak very differently about the area than local residents and cultural leaders. Start with conversations based upon basic, shared values.

- **Translate key messages**, as well as the management plan itself, into local languages and dialects to avoid marginalising important stakeholders. Management should also translate local knowledge and values, and provide briefings to ensure that outsider scientists and conservation professionals understand them.

- The most important aspect of early, key messaging is **clarifying how people will benefit** through the protection of the area. Be realistic. Promise only what can be delivered. Failing to meet publicly stated promises, even when outcomes are positive will almost always be seen in a negative light and work against an LSMPA and its management team.

- **High-impact visuals**, such as spectacular or provocative imagery or informational graphics (*see* Case Study 18), can communicate messages more effectively than words. Some communications formats, like quality underwater film footage, require specialised equipment and skilled staff, but advances in photography and video equipment, which now includes mobile smartphones, should allow most areas to acquire high-impact visuals.

- **Develop a clear internal approval system** for the review, communication and endorsement of key messages, so that they are finalised and agreed upon by all relevant parties before they go public.

- **Provide communication training** to all staff and partners, so that messages are understood and expressed clearly and consistently. Provide appropriate training to those people most likely to engage with the media. Key messages require the right spokespeople. These include people who are well grounded in the background of the area, and ideally are also articulate, comfortable with public speaking, politically savvy and respected.

- **Do not forget about internal communication.** Have regular updates and meetings to ensure staff are kept aware of the latest issues, priorities and communications goals. Clear and effective communication with outside audiences is only possible if everyone internally knows the same information.

- **Develop a basic information kit** that includes a fact sheet, key messages, brochures, and video clips that can be used to easily for multiple purposes (e.g. community meeting or school groups, etc.). The kit should be made available in various digital formats for ease of distribution across multiple platforms – sent by email, downloadable from a website or on a flash drive.
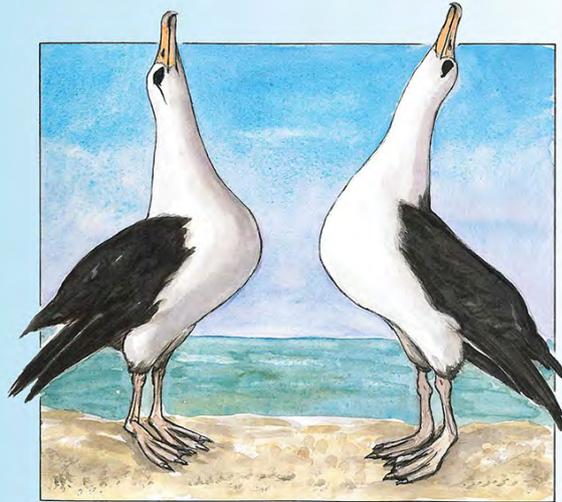
Case Study 16

Accurate messaging and management of media is critical from the outset

The media scrutinised PIPA in 2013. News stories accused the Government of Kiribati and Conservation International (key PIPA partners), of deceiving the public by claiming the LSMPA was fully closed to fishing in 2010, causing substantial damage to the reputation of PIPA and its involved partners.

The criticism was fueled by small mistakes in communication and possible language translation issues in the early development of the MPA, all of which could have been avoided with clear and consistent communications planning. One story erroneously reported the MPA to be fully protected – making it off limits to fishing and other extractive uses"; this story was replicated across hundreds of websites. Other media coverage incorrectly used the term 'reserve', further complicating PIPA's status. A mistake also appeared on Conservation International's website in a story describing the LSMPA as closed to all fishing. Mistakes were corrected but the damage was done.

Marine management at a large scale is a complex process with a complex language. Words such as sanctuary, reserve, preserve and no-take have different meanings to stakeholders and can have differing legal definitions between nations, making misinterpretations easy when translating between languages. When creating management and communication plans, it is critical to define what the MPA is, what it is not, what it does, what it will do and how it will get there. Having a media crisis plan can also help address potential issues effectively if they do arise.

If a response to media is necessary, an organisational statement, media release or letter to the editor can help explain the issue to the public. Adequate forecasting of what might draw public criticism – whether it be displacement of people, or difficulties of enforcement or funding – can help avoid a crisis.

Educational materials like "Makani: The albatross that cares for the land." produced by PMNM, can include interactive materials and information on natural and cultural heritage. © Papahānaumokuākea Marine National Monument

- **Be aware of situations** where engaging politicians and policy makers directly will occur; some nations have legal constraints about such approaches. Understand the laws and policies regarding this type of communication and outreach from the start.

Some key concepts for developing promotional material and educational products:

- A substantial portion of resources should **focus on developing activities that effect change in the next generation** of scientists, managers and resource users.

Case Study 17

Garnering support for LSMPAs through imagery

One of the biggest challenges in protecting marine areas, particularly large and remote ones, is that they can often be difficult to experience personally, making it hard to build a connection to the area. High-quality imagery can play an important role in creating a connection between people and the place, thereby instilling the desire to protect it.

Leading up to the formation of Papahānaumokuākea Marine National Monument, professional images of the region's seascapes, coral reefs and wildlife were essential to making that connection. Some of those images became iconic of the Northwestern Hawaiian Islands and helped facilitate a bond between constituencies and the place, ultimately building support for long-term protection. Images illustrating threats to the Monument, such as animals entangled in marine debris, also helped raise awareness of the vulnerability of even the most

remote areas. Combining powerful imagery with scientific research creates a potent tool for justifying protection.

Projects should invest time and resources to build a strong imagery library, particularly imagery that is licenced to the area to use for promotional purposes. Protection likely would not have come to Papahānaumokuākea as swiftly or definitively without video and photographic depictions of the majesty of the place. It is also important to refresh imagery annually. The PMNM permit process considers imagery collected during any activity as data, and permittees are required to submit their images for organisational use. While these images are often not of a professional calibre, many are quite good and are regularly used in PMNM reports, posters, videos and other materials at no cost.

HIGHLIGHT

A new generation of well-designed, interactive websites can provide access to the latest research and trends and also showcase success stores and lessons learned from real people and communities working to strengthen the relationship between people and nature. Consider using platforms like these to learn and also to share with colleagues around the world. As a starting point, visit IUCN's #NatureForAll website at http://www.natureforall.global/welcome.

- **Get to know the LSMPA's audience** before developing any education and outreach materials, as a classroom activity that resonates with elementary school children in an urban setting may not appeal to this same age group in a remote village.

- It is important to **successfully translate data and images into specific messages** for education and outreach. The ability to advance even the most basic understanding of an LSMPA can only happen if the most relevant scientific data is translated in ways that can be understood more broadly.

- **Strengthening and perpetuating cultural knowledge and practice is equally vital**, particularly if the area has strong ties to Indigenous communities. If the communities speak a different language, every effort should be made to develop versions of key education and outreach materials in the local language. Stories, songs and drama are often used to communicate and pass on knowledge, so managers should be open to developing approaches that utilise a multitude of written, oral and visual formats.

- Once effective engagement and delivery methods have been identified, **train all staff and partners** in their purpose, objectives and how to use them. Everyone who works for the area should be seen as an ambassador for the area and marine conservation as a whole; anyone who speaks on behalf of the area needs to be well versed in the materials and key messages being delivered internally and externally.

4.6.2 *Developing a research plan*

As discussed in Chapter 3 (*see* section 3.3), LSMPA managers should **consider developing secondary plans** within the overall framework of the management plan, and developing a separate research plan directly tied to the management plan should be a priority. Planning for any management activity requires understanding an area's natural resources, a profoundly different undertaking when conducted at a large scale (Big Ocean, 2013).

The research plan should provide long-term guidance on research priorities and how to approach them. LSMPAs have a particular need to prioritise research activities because there is a much more diverse and extensive list of potential research questions for a large area, as well as the potential for new questions to arise as more is understood about the

area (Christensen, et al., 1996; Sutherland, et al., 2006; Big Ocean, 2013).

Science and research can often operate separately from management, with the exchange of data being the primary mechanism for communication with management. However, it is critical that scientific inquiry directly address LSMPA management needs and questions (*see* Case Study 20). Without a clear long-term research plan, management could unknowingly be supporting research that is either not relevant or not immediately essential, wasting precious and limited resources.

A research plan:

- **Clarifies and documents** the research agenda.

- **Can provide a framework** to more effectively support research-specific partnerships.

- **Allows for frequent reassessment** and amendment of research strategies and activities without having to address an area's comprehensive management plan.

- **Sets the stage for other research plans** to be developed, namely a cultural or Indigenous knowledge-based research plan.

- Is usually more **effective in incorporating multiple knowledge systems** and related approaches than a general, overarching management plan.

To aid in the development of a scientific research plan, managers should **consider hiring the most critical scientific or research coordination positions early** in the implementation phase. For example, PMNM (then known as NWHI Coral Reef Ecosystem Reserve) has employed a research coordinator since 2002. The coordinator builds relationships between the area and research institutions, and coordinates relevant scientific symposia. In 2003, PMNM refined its scientific research priorities by hosting a three-day research planning workshop to assess the information needs for conservation science and management of the area. As well, PMNM has three research/science representatives on its 15-member Reserve Advisory Council (RAC), which has provided substantive advice for more than a decade.

A scientific research plan for LSMPAs should **take advantage of the many unique scientific opportunities that arise from working at a large scale**. These include studying processes that are global in nature (e.g. biogeochemical cycles, movement of migratory species) and cannot be studied at a smaller scale. Furthermore, the relatively pristine nature of most current LSMPAs allows for the study of processes that cannot be studied anywhere else on Earth. While direct human impacts, such as coastal runoff, habitat degradation and overfishing, are

"Research is critical. A scientific understanding of the system allows for much better management and protection."

– DANIEL WAGNER, FORMER RESEARCH SCIENTIST FOR PMNM AND LEAD AUTHOR OF BIG OCEAN'S SHARED RESEARCH AGENDA

Case Study 18

Communications – crossing the Blue Highway

Some complex concepts like cross-shelf connectivity or resilience may be hard to explain to non-scientists or the wider community; consequently, a diagram or a graphic may convey a concept more effectively. One excellent example of such a graphic is the poster 'Crossing the Blue Highway', shown below, which depicts red emperor snapper (*Lutjanus sebae*) in the Great Barrier Reef. The image shows that this recreationally and commercially important reef fish utilises a much wider range of interconnected habitats during various life cycle stages than was initially believed, ranging from inshore estuaries, and inshore seagrasses, to coral and deep-

water sea grass communities. (The poster is based on a concept developed by Russell Kelley and illustrated by Gavin Ryan.

During the rezoning of the GBR, this poster was an immensely valuable tool to explain the concept and importance of marine connectivity, and to validate the need for large MPAs. Even today, many years after the rezoning, the poster is still used to explain connectivity and the importance of protecting a range of habitats.
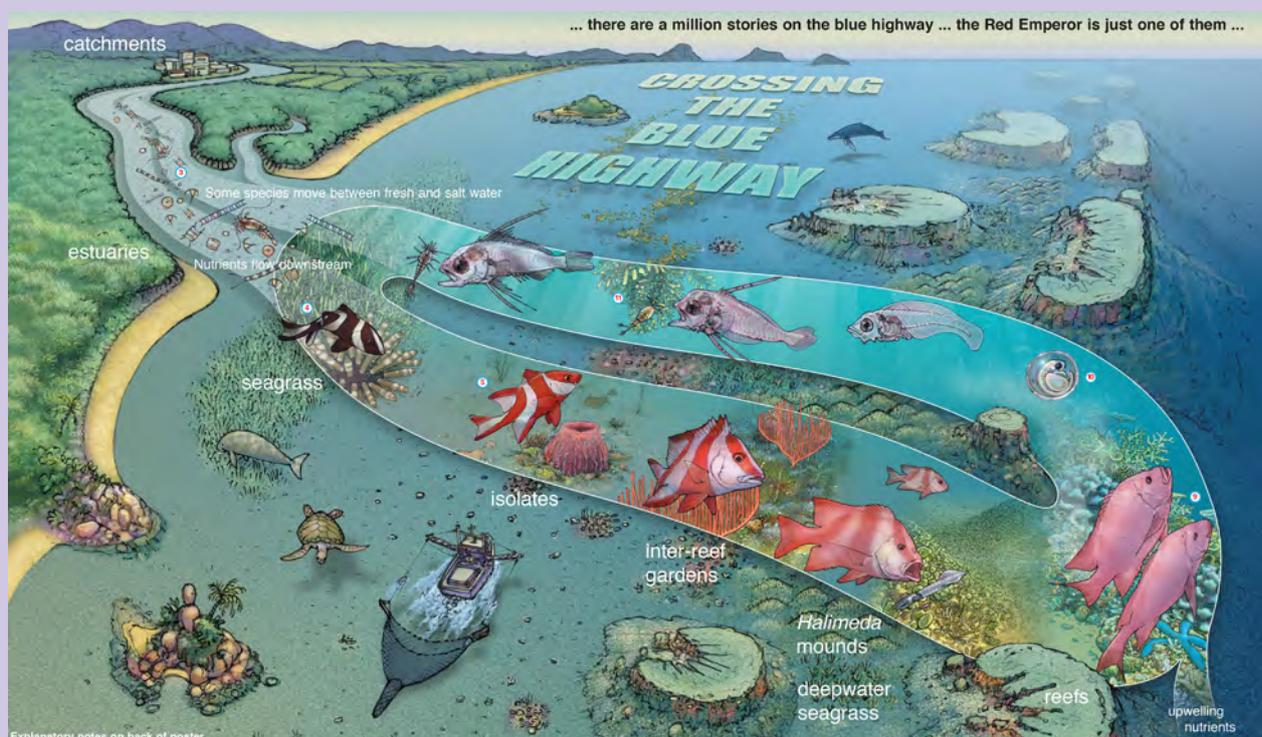
Example of ecosystem connectivity showing habitats utilised during the life cycle of the red emperor snapper *(Lutjanus sebae)*. Concept developed by Russell Kelley and illustrated by Gavin Ryan © R Kelley. www.russellkelley.info

evident in most of the world's coastal areas, they are much less common in LSMPAs. Therefore, large-scale marine protected areas provide unique opportunities to study intact ecosystems in the absence of local stressors (Big Ocean, 2013; Toonen, et al., 2013; Edgar, et al., 2014; Wilhelm, et al., 2014).

Managers can also consider action plans that are nested within an overarching management plan that **allow for singular focus on a priority issue or threat**. One example is PMNM's Climate Change Action Plan (*see* Box 25). The action plan includes:

1) An **introduction,** which provides the purpose, enhances the understanding of how the area will respond to climate change, and outlines how the action plan is related to the management plan and step-down plans.

2) A **situation analysis**, which outlines the variables from critical ecosystems to cultural and natural resources.

3) **Priority climate change strategies**, which are the goals managers will set out to achieve (*see* section 3.6).

4) **References and appendices**.

Box 25

Goals of the PMNM Climate Change Action Plan

Goal 1: Implement interdisciplinary research and monitoring efforts to understand variation in resilience and climate change impacts across the Hawaiian Archipelago under differing climate change scenarios.

Goal 2: Implement appropriate adaptive actions before ecosystem integrity and social values are compromised.

Goal 3: Contribute toward regional and national efforts to raise awareness about climate change and change behaviour through strategic partnering and engagement in policy, education and outreach.

Goal 4: Serve as an international example in the context of climate change for collaborative management of natural, cultural and historic resources that hold universal and Indigenous significance.

Bleached (white) and unbleached (lavender) Montipora coral at Lisianski Island during the 2014 mass-bleaching event.
© Courtney Couch
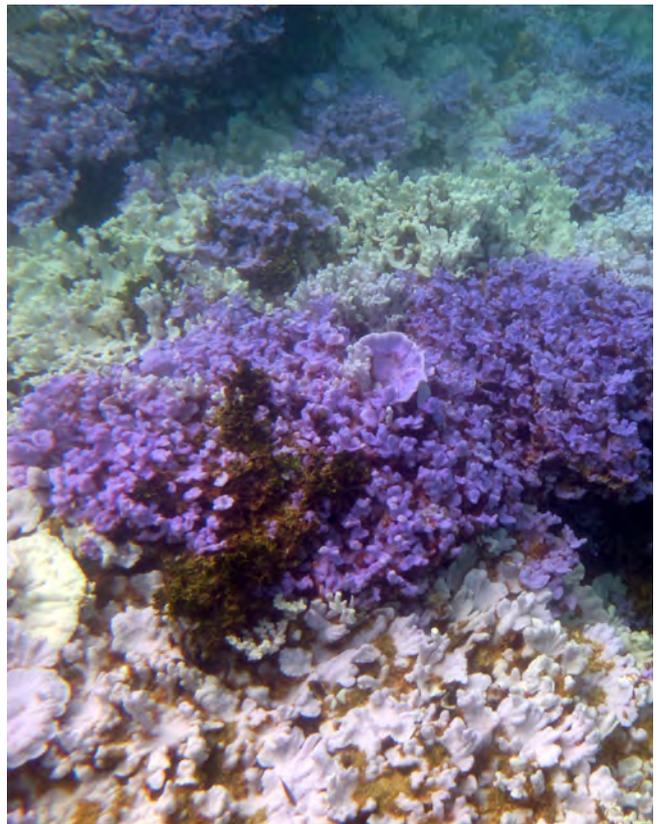
Case Study 19

Engaging local researchers in science planning

A programme to assess and promote Monument-related scientific research and exploration within the MTMNM was proposed by Presidential Proclamation 8335 in order to characterise and better understand its diverse environments – from subtropical coastal waters, numerous hydrothermal vents, underwater volcanoes and lakes of liquid sulfur to bubbling vents of liquid CO_2 and diverse coral communities – many of which are considered unstudied due to technical difficulties in accessing them.

In 2011, Monument managers held a workshop discussing scientific exploration and research within the MTMNM. It was held in Hawai'i to include the presence of international scientists; however, this limited the ability of local participants in CNMI and Guam to attend. Therefore, in 2012, staff from NOAA Fisheries Pacific Islands Fisheries Science Center conducted 21 meetings with a range of stakeholders and partners in the CNMI (Saipan, Tinian and Rota) and in Guam to solicit input and ensure local participation in the development of a MTMNM Ecosystem Science Plan.

Subsequently, NOAA Fisheries held a Mariana Archipelago Marine Ecosystem Science Implementation workshop in Saipan, which focused on identifying research needs in three areas: 1) maximising the sustainability of fisheries and fishing communities; 2) recovering and conserving protected species; and 3) habitat processes. Representatives from research institutions, resource management agencies and other interested stakeholders were invited to attend. In addition to reviewing research gaps in the theme areas, workshop participants proposed specific projects targeted at obtaining needed information. In 2014, NOAA Fisheries provided space aboard its research vessels for these projects.

NOAA Fisheries plans to continue to incorporate regional research priorities into its science planning by holding additional subject-specific workshops. Because of the diversity of resources in the Monument, these workshops will incorporate scientific experts, as well as local stakeholders, in the planning process. Advance communications technologies, including forums, webinars and Google hangouts, are being explored to bring together researchers and stakeholders located all over the world.

Case Study 20

The significance of science in large marine reserves: an example from the British Indian Ocean Territory MPA

The decision to establish the BIOT Marine Reserve was based on a significant compilation of scientific knowledge, which began with a series of papers from the 1970s. Additional scientific data was added after permission to access the area was again granted in 1996. Now more than 100 scientists from numerous institutions around the world have visited the marine reserve, some providing material and samples for many others to work on.

The coral, fish and island ecology initially featured in these studies led to an increased appreciation of the pristine marine condition and enormous bird populations. Despite the decline of reef systems and coastal habitats in most of the Indian Ocean, the Chagos Archipelago remained relatively healthy. Though the 1998 El Niño warming destroyed more than 90% of the Indian Ocean's shallow corals, the Chagos' reefs rebounded rapidly, while many other areas did not recover. This resilience was attributed to the almost total lack of other human impacts. Recent work has embraced the study of biogeographic patterns as it

becomes clear that the area is a reservoir for many species and could be used in geochemical work focusing on past climate change.

More than 250 scientific publications have emerged about this remarkable place. The area supplies key scientific and practical benefits, which enable scientists to examine effects of climate change without the compounding effects of local impacts, such as fishing and pollution, which are crucial to the management of human-impacted locations elsewhere. BIOT also provides target recovery aspirations, which are increasingly being developed, along with a reservoir, refuge and stepping stone for species in an increasingly exploited ocean.

Science is critical to ongoing management in the BIOT. The interim management plan prioritises certain areas of research, with practical science to support programmes for restoration to increase understanding of future threats, and assess the benefits of protection.

The science plan should also **incorporate economic, social and cultural sciences** that address how LSMPAs affect and are affected by human activities. Managers can also consider developing a cultural research plan (*see* Case Study 21). Articulating how LSMPAs contribute to people's welfare is as important as the protection of biodiversity. Conducting social research may require including the perspectives of cultural practitioners and traditional managers (e.g. on historical abundances, spawning patterns and other traditional ecological knowledge). As such, managers may also consider developing a separate secondary research plan that specifically addresses cultural knowledge systems and their related research methodologies. Indigenous peoples and community members must be credited; discussions of intellectual property rights and similar issues must be considered and protocolsmust be agreed to prior to the development of a plan and the implementation of research.

Developing a detailed economic valuation of the ecosystem services provided by the area will greatly strengthen support from partners, the public, key stakeholders and policy makers. Economic valuation should be robust enough to withstand critique, validated by outside sources, designed to communicate to government officials and decision makers, and yet still relevant to the academic community (Worm, et al., 2006; Costanza, et al., 1997). If necessary, managers should create separate (or multiple) versions of plans specifically for external communication that are simpler and more concise.

While there are likely abundant research opportunities to pursue at any LSMPA, an area's scientific research plan should **address a small set of specific, management-related**

needs, with the acknowledgement that this scope will likely expand or change over time. The primary research goal should be to establish a baseline of an area's resources and and system characteristics that will inform management decisions.

The complexity of large-scale areas requires engagement and collaboration with a multitude of scientific advisory groups and international research institutions to boost scientific exploration and research efforts.

Building a common understanding between the management team and research partners will take time. However, the co-production of knowledge and the development of "actionable science" is important when considering who may help develop the area's research questions. For example, tourism operators may be on site for over 300 days per year, while researchers may only get there two or three times per year. Involving citizen science for the purposes of broadening research is a valuable and cost-effective strategy (*see* Case Study 22), and has been found to be a relatively robust way to develop trained researchers (Danielsen, et al., 2014). Work to build common understanding and, if possible, invite research partners into the process of formulating research questions. Clear communication between management and research partners will also assist in a better understanding of the area's data needs and requirements.

HIGHLIGHT

- Seek out research partners who are committed to addressing key management questions.

Case Study 21

Native Hawaiian community engagement on cultural research for Papahānaumokuākea Marine National Monument

Knowing community engagement is crucial to the development of any management plan, managers of PMNM prioritised this measure when developing the step-down plan for Native Hawaiian cultural resources. Two Monument co-managing agencies – OHA and the Office of National Marine Sanctuaries (ONMS) – visited 10 communities on five islands for two rounds of focus-group meetings to gather input on future research and management priorities and to identify items of importance to Native Hawaiians specific to research in the Northwestern Hawaiian Islands (NWHI). PMNM staff sought out participants with previous experience in the NWHI or knowledge relevant to the management of cultural resources. They also utilised several contact networks to announce their intent to visit communities to conduct meetings with community members including:

1. Members of the Cultural Working Group of PMNM, who also helped to develop the content, logistics and invitation list for the focus-group meeting;

2. Community members who have accessed PMNM for cultural purposes or conducted cultural research in PMNM;

3. Community members who have attended other PMNM management meetings.

The meetings were well attended and collectively produced varied but positive outcomes. At one meeting, the discussions shifted temporarily towards concerns about legal and jurisdictional issues. Community members expressed their misgivings about other government resource management efforts, and requested further clarity on the purpose of developing a management step-down plan for Native Hawaiian cultural resources in PMNM. However, by the end of the meeting, most participants felt that greater mutual understanding was achieved, which kept the plan on track.

Working with communities is a complex process requiring significant commitment, but when time and resources are used effectively to build strong relationships and trust, the experience can be rewarding for everyone involved.

Citizen science can be challenging for areas that are remote, or those like Marae Moana that include a significant portion (or all) of the country's EEZ. Traditional leaders in the Cook Islands have discussed amongst themselves their citizen science goals, but currently not all partners are involved in the discussion.

Partnerships can benefit LSMPAs in several ways, the most obvious being sharing research costs (Friedlander, et al., 2016) to achieve shared goals and objectives (*see* Box 26). Multiple partners can **leverage and pool human and financial resources by identifying key common questions** to more efficiently address such goals. Partnerships may also increase the logistical feasibility and political support required for scientific research expeditions. In some cases, a wider group of donors may be more likely to underwrite the costs of research expeditions if the outcomes benefit a broader constituency and wider scope of areas. The fact that LSMPAs encompass larger-scale processes (e.g. ocean gyres, nutrient cycles, atmospheric circulation cells, genetic connectivity, etc.) may make them of greater interest to the global research community. Blending the objectives of multiple areas can also bring resources that are inaccessible to some areas. The key is to ensure complementary objectives and consistent methodologies.

Box 26

Developing scientific research partnerships

Building partnerships between management and scientific partners working at an area is essential, but doing so with other LSMPAs can leverage a single area's efforts to benefit marine conservation and ocean governance globally (Friedlander, et al., 2016). As one example, Big Ocean's Shared Scientific Research Agenda (Big Ocean, 2013) aims to (1) capitalise on collaborative and comparative research opportunities based on the scientific needs common to LSMPAs, and (2) identify a set of shared research priorities to be addressed by Big Ocean member areas. Although obvious differences exist among large-scale areas, highlighting the commonalities can have synergistic effects that accelerate the advance of LSMPA science. Furthermore, the unique characteristics shared by LSMPAs can be used to answer global science questions (Big Ocean, 2013).

Case Study 22

Eye on the Reef Programme

Citizen science programmes encouraging the collection of management-relevant information are strongly supported by GBRMPA. The initiatives are run by a wide variety of stakeholders, from traditional owners, regional natural resource management bodies and tourism operators, to researchers, diving enthusiasts and members of the general public. They build strong links with local communities and provide volunteers with hands-on opportunities to collect information that contributes to protecting GBR ecosystems.

Eye on the Reef is one of the most successful citizen science programmes run by GBRMPA. It enables reef users to provide scientific information to reef managers and researchers in a user-friendly way by matching participants with a level of monitoring suited to their available time and inclination. For those who'd like to learn more, a comprehensive online training course provides all the information required to transition participants from basic to professional-level monitoring skills.

A single data management and reporting system stores all the integrated programme data. The protocols and methodology were developed in consultation with reef users, managers, scientists and experts in the field. A

smartphone app is also available for Great Barrier Reef visitors to record and share their observations while out on the reef.

The programme also provides reef-wide early warnings to threats like coral bleaching, disease and crown-of-thorns starfish outbreaks. Data collected is also used to:

- Understand impacts of incidents such as cyclones and flood plumes.

- Report status and trends.

- Evaluate the effectiveness of management actions;

- Build capacity and stewardship.

- Deliver accurate, timely and valuable information for management actions and policy.

This stewardship-based reef health assessment and monitoring programme is a compelling example of how managers, industry and the community can work together in a mutually beneficial approach to help protect an iconic ecosystem.

4.6.3 *Compliance management*

Compliance management is a planned approach to ensuring that individuals and users interacting with the LSMPA (e.g. recreation, tourism, commercial fishing, extractive industries or shipping), do so in accordance with legislation, regulations, permit conditions or lawful instructions.

The foundation of **compliance management is grounded in a number of disciplines including the legal framework, law enforcement, human behaviour, risk management, stakeholder engagement, data management, intelligence analysis and public relations.**

Compliance management in an LSMPA therefore involves a much wider consideration than just enforcement. A structured approach begins with a detailed demographic analysis of the key users, analysing and categorising their behaviours, assessing the impacts of those behaviours, identifying and assessing the threats and risks, and determining appropriate treatments to mitigate those risks.

Compliance management can also involve a wide range of interests, including other regulatory and law enforcement agencies, whose primary responsibility may be shipping, fishing or tourism, and which may assist the LSMPA compliance team to deliver outcomes relevant to their specialised areas.

Failure to effectively manage compliance is likely to compromise the key objectives of the LSMPA. Ideally,

compliance is a key performance indicator and an important part of any external assessment of the LSMPA. When properly integrated into the management cycle, compliance management supports the achievement of a range of outcomes including conservation, use management, sustainability, industry/business and public involvement and Indigenous engagement.

> "The effective management of compliance is key to achieving many of the strategic goals of managing a large-scale MPA, balancing resource protection with sustainable use."
>
> **– JOHN KNOTT,**
> **INTERNATIONAL COMPLIANCE EXPERT**

Enforcement and prosecution may be matters of last resort, and other treatments, such as information, education, surveillance/monitoring, audit, warning letters or infringement notices may be more appropriate given the threat, human behaviour or environmental impact. The objective is to achieve informed self-regulation by the majority of users, focusing limited resources on high-impact non-compliant behaviours.

Experience in the GBRMP demonstrates that an effective and strategic approach to **compliance management begins with a compliance plan that typically has a three-year outlook**. The first year of the rolling three-year plan is prepared in greater detail, identifying the operational and resource requirements for the coming 12 months. This facilitates a thorough approach to targeting resources and the delivery and reporting of compliance outcomes.

A successful education and outreach programme can raise public awareness, build stakeholder engagement and encourage voluntary compliance with an area's rules and regulations.

Achieving voluntary compliance in an LSMPA requires additional effort compared to smaller MPAs, because some users may:

- Be operating out of range of management presence or awareness.

- Have the intention of deliberately violating area rules and regulations and have no interest in voluntary compliance (e.g. illegal commercial fishing operations).

- Simply be transiting through the area (e.g. international shipping vessels and other commercial maritime operators) and may not prioritise the need to be compliant. Encouraging compliance in such situations is not a one-time endeavour; it is a continual challenge (Edgar, et al., 2014).

Work proactively and constructively with stakeholders and user groups whose compliance is critical to the LSMPA in order to:

- Find out how to **clearly and effectively communicate** the rules and regulations.

- **Raise the stakeholders' awareness** of why these rules and regulations exist and how compliance benefits users and resources.

- **Create opportunities** for interested individuals to champion voluntary compliance within their own stakeholder group, including representatives from local and Indigenous communities to help promote the area in their native language.

- **Encourage suggestions and advice** on how best to engage users and encourage voluntary compliance through time, including with new or future stakeholders.

Increase public awareness by demonstrating and publicising law enforcement capacity through a clear show of strength (e.g. periodic media releases of successful prosecutions); this will help encourage voluntary compliance with users who otherwise may be disinclined to obey management rules and regulations.

Work with key groups, such as tour operators, who can help disseminate information on the rules of the LSMPA, and with youth groups and schools to encourage voluntary compliance from a young age and help transmit compliance messages to family members.

Area managers should also **view a permit programme as an opportunity** to encourage voluntary compliance during the application and review process. To do this:

- All permitted users should be required to undertake pre-access training, including information about the area's goals and objectives, natural and cultural resource protection and the associated rules and regulations. This will provide the opportunity to communicate the consequences of non-compliance.

- Personnel and vessels regularly operating within the area should also be trained in the protocols of the area (e.g. navigation; hull inspection; ballast water discharge; quarantine procedures to prevent the spread of invasive species; cleaning, maintenance and storage of on-board equipment; solid waste disposal; and grey water discharge).

4.6.4 *Surveillance and enforcement*

Surveillance and enforcement are essential parts of compliance management. Surveillance refers to the way activities are monitored and conducted inside the LSMPA to ensure compliance with rules and regulations, whereas enforcement consists of the actions taken against those who violate the rules and regulations. It is critically important to have a sound legal framework in place to prosecute individuals and companies who violate the regulations; without this framework, surveillance and enforcement efforts are superfluous.

If an LSMPA is remote, it may be more difficult to employ surveillance and enforcement strategies and to document illicit activities. In some cases, the remoteness of an LSMPA may seem to provide an additional level of protection because the area is far away from population centres, but this will probably only lessen the frequency of in-situ enforcement efforts rather than eliminate them. Identification of available tools for surveillance (*see* Box 27) and enforcement linked to programme needs can offer managers the most effective approaches to get the job done. This information should be documented in the Compliance Plan.

> "Enforcement must not only be scaled up but actually requires different technologies and methods due to the site's large size, particularly when the site is remote."
>
> **– 2012 IUCN WORLD CONSERVATION CONGRESS PARTICIPANT**

An effective surveillance programme may include real-time monitoring of potential violators, including routine patrols by dedicated law enforcement or military vessels (*see* Case Study 23) and aircraft (including unmanned vehicles), as well as on-board observers on permitted vessels.

Experience from MMHMP, PIPA, PMNM and MTMNM suggests the high expense and technology required to conduct surveillance and enforcement efforts in remote waters may inadvertently enable poaching by illegal fishers if they are able to track and predict enforcement patterns. Since illegal, unreported and unregulated (IUU) fishing is a common occurrence, LSMPAs may be tempting targets in an increasingly depleted global ocean.

Prioritise surveillance and enforcement efforts by focusing resources on monitoring and controlling illicit activities that pose the greatest threat to the LSMPA. Costs associated with surveillance and enforcement may be lessened by sharing equipment and resources with other areas or agencies. Keep in mind, however, that some information, such as that collected by military operations, may be sensitive and not available to be shared.

Not all surveillance and enforcement will be undertaken on-site. For large-scale commercial fisheries (notably pelagic tuna), engagement with regional fisheries management organisations and other bilateral or multilateral partnerships can lead to the threat of blacklisting, while the use of an automatic identification system (AIS) on many larger vessels can enhance remote monitoring.

Another key component of enforcement lies in diplomacy. The BIOT MPA has been affected by IUU fishing from multiple sectors coming from other nations, and the BIOT Administration has had some successful engagement with national governments and local communities from which opportunistic IUU vessels originated.

When building an LSMPA enforcement programme, managers should be aware of:

- **Vulnerabilities within an area's core zones** (e.g. no-take areas; no-travel zones) where incursions by user vessels may occur, particularly if such zones are remotely located.

Box 27

Enforcement technology

Technology is also playing an increasingly critical role in the management actions of LSMPAs, and some of the current systems managers can investigate are:

- On-board vessel monitoring systems (VMS).
- Unmanned aerial vehicles (UAVs), such as drones and gliders.
- Autonomous Underwater Vehicles (AUVs), such as wave gliders and mobile listening stations.
- Sensor buoys and data loggers, such as acoustic monitoring devices.
- Remote sensing by satellites, drones or other equipment.
- Pioneering initiatives that bring high end technology within reach of managers – as examples, Pew Charitable Trust's **Eyes on the Seas** and Google's **Global Fishwatch**.

Case Study 23

Forging partnerships with the military

Papahānaumokuākea Marine National Monument is a large, remote area; by ship it takes almost a full day to arrive at the nearest boundary from the Monument's management office in Honolulu, Hawai'i, and an additional four days to traverse to the northernmost end. Establishing and maintaining a healthy relationship with an agency that has vessels and aircraft is critical in managing a large and remote area. For many nations, this means partnering with the military or coast guard. While PMNM has no formal agreement with the U.S. Coast Guard (USCG), the two agencies work closely on a variety of management activities. The USCG conducts regularly scheduled surveillance and monitoring overflights, has responded to numerous medical, grounding and storm/tsunami-related emergencies, and has provided scheduled and unplanned logistics support when asked. While some of these missions are part of the service's mandated operations portfolio, by assisting the USCG in carrying out their core missions, the Monument has established a proactive relationship resulting in USCG support for other missions as well.

PMNM often provides observers on law enforcement flights, and NOAA has worked closely with the USCG to pursue criminal and civil prosecution of suspected illegal fishers. The FWS allows the USCG to keep an aviation fuel storage tank at Midway Atoll, increasing aircraft on-scene time, and providing berthing and meals for air crew during mandatory crew rest periods. The USCG has transported hundreds of tons of marine debris (mostly derelict fishing gear) out of the Monument, and has assisted with spotting debris as a result of the 2011 tsunami in Japan in the course of regularly conducted operations. A USCG representative participates in the Monument's Inter-agency Coordinating Committee as a non-voting government representative on the citizens' advisory council.

Developing partnerships and coordinating activities with operationally focused agencies can help leverage resources when they are scarce. Managers can strategically use these partnerships to strengthen enforcement efforts, work more effectively with users to identify areas important to perpetuating traditional practices, establish clear and legally enforceable boundaries and provide a buffer for no-take areas.

- **Vulnerabilities associated along the area's boundaries,** where deliberate or accidental violations may occur, such as commercial fishing vessels attempting to fish along the LSMPA's boundaries.

- **Lack of knowledge and awareness** of the area's existence, boundaries, rules and regulations by foreign vessels transiting through the area.

- **Challenges of obtaining advance notice from foreign vessels** transiting through the area, particularly with international commercial shipping and fishing operators.

- **Logistical challenges,** such as inclement weather, storms or rough wave conditions, particularly in deep and remote waters.

- **Possible corruption among staff** involved in monitoring and enforcing the area.

- The need to **develop formal and innovative enforcement partnerships** between the LSMPA management authority (e.g. government agencies) and other organisations, e.g. fisheries, marine transportation and national security agencies (*see* Case Study 23).

- The need to **utilise joint agency agreements to cross-deputise staff** and encourage partnerships between law enforcement agencies and park warden programmes.

- The need to **provide training in foreign languages** (relevant to the country or area) to staff and law enforcement partners to effectively raise foreign user awareness and compliance.

- The need to **develop mutually beneficial surveillance and enforcement partnerships** between neighbouring nations, with NGO support. For example, the ship-rider agreement between Kiribati and the U.S. and between Australia and New Zealand provide for collaboration on aerial surveillance.

- The need to **work with tourism and shipping industries** to provide at-sea surveillance input, including the establishment of **consistent observation and reporting protocols** between law enforcement and civilian vessels or commercial airlines.

- The need to **have the area recognised by internationally-supported regulations**, such as being designated as a Particularly Sensitive Sea Area (PSSA) that restricts access under the UN's International Maritime Organization (IMO).

- The need to **carefully monitor all permitted activities** to ensure protection of biologically and culturally sensitive areas and **use of scientific data to help target enforcement** (e.g. known spawning times when fish aggregate).

- The need to **engage diverse stakeholders in the development of community surveillance programmes**, if the area is accessible or has coastal areas. For remote areas, engage diverse stakeholders in the planning of surveillance programmes so they understand both desired outcomes and challenges to achieving them.

4.6.5 *Building innovative partnerships*

In most LSMPAs there is strong recognition of the **importance of engaging local communities** to help protect natural and cultural values. This commitment extends to maintaining effective and meaningful partnerships with innovative university programs, Indigenous people, local communities and users (*see* Case Study 27 on page 96) in order to conserve the values of an LSMPA as well as to enhance the resilience of the marine environment to cope with inevitable pressures.

Chapter 2 refers to early investments in partnerships where the vision and mission of all parties are complementary. Later in the implementation phase, however, more attention must be paid to making new partnerships while maintaing existing ones. Concentrate on partners who provide support to high-priority activities and who understand the unique challenges of LSMPAs (*see* Table 18).

Key partnership matters to consider are:

- **Develop cross-sector or interdisciplinary partnerships**, which can lead to innovative strategies to utilise global resources (e.g. engaging with organisations like regional fisheries management organisations, Google Ocean, international aerospace agencies [for remote sensing] and IUCN/WCPA). While this may require large investments of time and resources, there is great potential to produce outcomes and benefits for vast areas of ocean.

- **Scientific research and marine conservation science partnerships can provide access** to advanced technologies and the specialised equipment that is often needed to support LSMPA science.

- **Partnerships with non-governmental organisations** can assist managers in **communicating messages more broadly and effectively** in situations where managers cannot or should not advocate with government officials.

- For some LSMPAs, **sheer size or bordering a neighbouring foreign jurisdiction may necessitate multi-agency or multi-jurisdictional partnerships**. Although these kinds of partnerships require considerable effort to develop and maintain, they can provide novel opportunities to finance and administer management efforts across vast ocean spaces, e.g. the Pacific Oceanscape (http://www.conservation.org/where/Pages/Pacific-Oceanscape.aspx).

- **Site-to-site partnerships can foster opportunities to build management capacity**. For example, the sister-site agreement between PIPA and PMNM has generated greater results and value than anticipated (*see* Case Study 25). This agreement also inspired former President Anote Tong of Kiribati to use the Pacific Oceanscape Framework to invite the United States to cooperatively manage the Phoenix Ocean Arc, which includes the PRIMNM and PIPA.

HIGHLIGHT

- The mission and vision of the area and of prospective partners should be complementary.

Table 18. Benefits and disadvantages of collaborative approaches inLSMPAs

Type of collaboration	Benefits	Disadvantages
Bilateral arrangements	• Long-lasting • Formalised statement of governmental intent • Greater engagement • Increased awareness of relationship	• Time-consuming to establish • Obstacles presented by differences in governance structure • Non-binding • Often no funding attached
Research and monitoring	• Research projects may be more cost-effective when shared • Builds relationships between scientists • Opportunity to build capacity in developing programmes • Supports comparison between areas • Documents ecosystem trends • Can lead to the development of shared monitoring and data storage protocols	• Time-consuming to plan and expensive to conduct • Limited expertise in conducting this type of project • May require additional permitting or governmental approvals • Potential for disagreement on research objectives and priorities
Enforcement	• Preserves integrity of area • Broadens the reach of individual enforcement programmes • Opportunity to build relationships and capacity	• Costly • Technological, legal and regulatory limitations
Learning exchanges and workshops	• Relatively easy to conduct • Flexible format • Increased cultural exchange • Engage wide range of people • Foster peer learning	• No force of state • Not institutionalised • Infrequent meetings do not lead to sustained collaborations

• As discussed in sections 3.5 and 4.4.2 it is advisable to **build sustainable funding relationships** if they are not already in place. As LSMPAs require significantly more funding than smaller areas, austere economic times can have greater negative impacts on the ability of managers and governing entities alike to implement core activities. It is essential to investigate the potential to develop these kinds of partnerships.

4.6.6 *Organisational capacity*

Strong organisational capacity is critical to achieving a management plan's vision, mission and goals over time. Make the quality of the area's organisational management one of the highest priorities, including effective communication, consistently producing high-performance outcomes and maintaining high staff morale.

Another issue to keep in mind is the **logistical complexity** encountered when conducting field operations. Not only is additional planning required to move people and supplies to field sites, remote facilities create greater difficulties. Consistent access to the area is challenged by seasonal or other factors beyond anyone's control.

Initiating human resources and staffing programmes during the implementation phase is a worthwhile investment. Administrative burdens tend to increase over time, due in part to paperwork and time-intensive processes, but also to an ever-increasing scope of work for all staff. Efforts to build a well-trained and motivated team can be wasted if overall staffing needs are not tracked effectively. Consider consistent, ongoing cross-training of staff so that everyone on the team is able to help if there is a loss of staff temporarily or permanently.

To cultivate a well-balanced staff and work environment, **the capacity to manage inter-agency relationships is also essential**. As organisational cultures can vary widely, it is important to develop clear channels of communication to better understand the values and perspectives of key colleagues in other organisations. Placing all of the responsibility of maintaining inter-agency relations on just one or two people is not wise, given that they may not be always available.

Creating a connection to the area among non-operational staff is important. Having office staff travel to the area, even a remote area, gives them the chance to see and appreciate field activities. These kinds of experiences can increase the efficacy of administration and operations (*see* Case Study 26).

"As we move forward to care for larger and larger areas, we need to thoughtfully analyse and objectively consider our progress each step of the way. We must remain cautious."

– 2012 IUCN WORLD CONSERVATION CONGRESS PARTICIPANT

Case Study 24

# Research partnerships to aid in long-term monitoring

GBRMPA diver videotaping transect and recording results of coral bleaching event at Fitzroy Reef. Photographer P. Marshall.
© Copyright Commonwealth of Australia (GBRMPA)

The Great Barrier Reef Marine Park Authority always uses the best available science to inform its management decisions. It achieves this by engaging and partnering with research providers, such as the Australian Institute of Marine Science (AIMS), the Commonwealth Scientific and Industrial Research Organisation (CSIRO), universities and government agencies in order to influence, contribute to and access the best available science.

An example of this kind of partnership is the collaboration between GBRMPA and AIMS on the long-term monitoring programme (LTMP). This programme started in 1985 using broad-scale surveys (manta tow), and in 1993 intensive survey techniques (permanent transects) were added. AIMS conducts the programme and surveys the health of 47 reefs dispersed throughout the MPA. Following the rezoning of the park in 2004, GBRMPA was interested in getting data on the effectiveness of zoning by monitoring no-take versus take reefs. Due to lack of funding, GBRMPA and AIMS conducted surveys biennially, and efforts in odd years were redirected to surveying a number of paired reefs, using the same monitoring techniques. As a result, GBRMPA has obtained additional management-relevant information that is crucial in promoting the success story of the rezoning and enhances community and stakeholders' confidence in policy decisions.

GBRMPA also maintains an open dialogue with the scientific community by periodically publishing its research

information needs. An Outlook Report is published every five years, these assessing the current conditions and the future issues the GBRMPA is likely to face. Together with consistent engagement of funders and participation in the development and execution of major research programmes, ongoing dialogue can help consistently direct science efforts towards critical management issues.
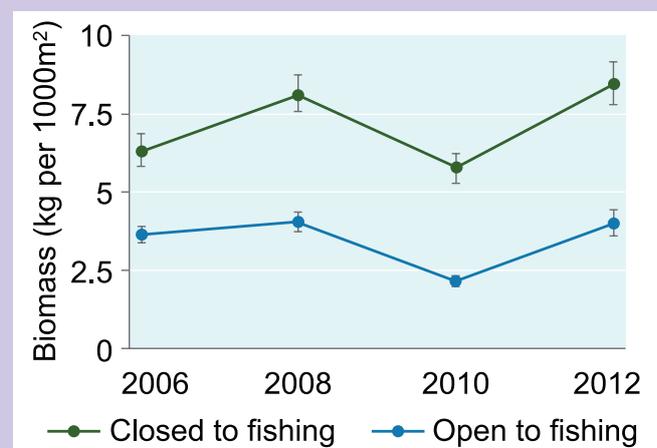
Biomass of coral trout in zones open and closed to fishing, 2006–2012. This graph shows the results of recent monitoring conducted by AIMS as part of the LTMP. It indicates that the biomass of coral trout is higher in protected reefs. Data were collected from surveys of 28 pairs of reefs in five areas of the GBRMP. © Great Barrier Reef Outlook Report 2014

Case Study 25

Sister-site agreements: tangible benefits from the relationship between PMNM and PIPA

At a meeting of marine managers and World Heritage experts from Oceania in 2007, a simple comment regarding the potential for setting up protected area sister sites became the start for what is now a very fruitful partnership, and one that has been a catalyst for the emerging field of large-scale marine conservation (Toonen, et al., 2013, Wilhelm, et al., 2014, Friedlander, et al., 2016)

As the U.S. and Kiribati have shared a Treaty of Friendship since 1979, a sister-site relationship between PMNM and PIPA furthers the treaty's goal of encouraging and facilitating cooperative agreements to protect the natural and cultural resources of Kiribati. Despite being uncertain of the process or the benefits, three staff from Hawai'i met in Maui in 2009 to script a draft concept. Five months later, a final agreement was signed in New York.

Technically called a 'proposal for cooperative exchange', the non-binding agreement recognised the areas as 'sister marine protected areas' and set forth language aimed at

fostering cooperation and peer learning, sharing data and research findings, and reducing the duplication of effort. A three-year work plan was developed to provide initial direction. The agreement expires 22 September 2019 and may well be renewed.

In the case of PMNM and PIPA, the sister-site relationship has enjoyed several tangible benefits and outcomes, including achieving a World Heritage inscription within a year (in 2010); the co-founding and launch of Big Ocean: A Network of the World's Large-Scale Marine Managed Areas; shared outreach at international meetings; direct engagement in site research plans including cooperation and participation in scientific research missions; and peer review of research methodologies and results.

The key to keeping sister-site relationships effective is for both areas to have equal commitment and intent, or the arrangement can easily dwindle in meaning and value over time into 'feel-good' photo ops.

Case Study 26

Building management capacity (PIPA)

As a national conservation strategy, PIPA's management approach adopts a 'whole of government' principle wherein all agencies and many partners assist PIPA's core staff to implement key activities, including:

- Training and workshops, such as surveillance by the Kiribati Police Maritime Unit.
- Biosecurity by the Agricultural Department.
- Fisheries studies assisted by the Fisheries Department.
- PIPA lessons by the Ministry of Education, to be incorporated into national curriculum.

PIPA's outreach programmes for youth and I-Kiribati, or the people of Kiribati, has helped garner public support for the PIPA project. PIPA's resources and information have also been included in the curriculum for primary and secondary schools.

To help manage the only inhabited island in PIPA, Kanton Island, the newly recruited coordinator attended the SEA semester training course at Woods Hole Oceanology Institute, organised by New England Aquarium. The PIPA Kanton assistant will also undergo biosecurity training. In addition, the Kanton community is observing biosecurity

Residents of Kanton Island wait to meet with government officials during an invasive species pest mammal eradication mission to the Phoenix Islands Protected Area. © Ray Pierce.

protocols and other measures on the protection and preservation of PIPA resources and values. PIPA's website also provides consistently updated information to potential tourists and researchers.

The Kanton office will be operational before the end of 2017 and will be managed by the PIPA Kanton Coordinator, who will be responsible for the oversight, direction and efficiency of the physical and technical functions of the PIPA site. Meanwhile, the Kanton Community Welfare agreement provides for safety, food security and other measures to protect I-Kiribati, and preserve marine and terrestrial resources, including the birds on Kanton Island.

4.6.7 *Risk management*

Risk management involves undertaking a risk assessment of the **likelihood and consequences of impacts**, such as human-caused pollution, on key species or habitats and/ or localities such as bays, islands or reefs. An effective risk assessment should also consider the social, cultural, economic and reputational risks to the MPA.

There will always be some danger and risk associated with operating in remote locations, where it can take days for staff to receive adequate medical care. Managers should strive to minimise risk in all field operations and make the safety of staff the highest priority.

> **HIGHLIGHT**
>
> - When preparing emergency response actions, make the safety of staff and visitors the highest priority.

Emergency response is logistically more complex at LSMPAs, particularly when the area is remote, but this aspect of management must be prioritised because human lives may be at risk.

An emergency response plan and regular staff training increases staff capability and efficiency to respond to emergencies in a decisive and swift manner. If an area is remote, there may be a need for additional plans to address the increased time it will take to handle problems. Always take the necessary precautions.

The response to some emergencies (e.g. ship groundings) will require managers to address activities that violate the rules and regulations of an MPA. In such instances, managers should strategically make use of media to deter other potential violators from committing similar offences in the future.

4.6.8 *Cumulative impacts*

Different impacts may combine or exacerbate each other so that the **cumulative impacts may be far greater than any individual impact**. This has important consequences for LSMPA management, including the need to manage as many impacts as possible so as to reduce cumulative effects (NOAA 2012). Reductions in one impact may reduce the effects of other impacts, thus increasing the resilience of the ecosystem to cope with less manageable impacts, such as those caused by climate change.

It is important to **consider the scale at which cumulative effects are occurring,** (Halpern, et al., 2008) considered cumulative effects at the global scale, but depending on the size of an area or the source of a pressure, the effects may be more readily addressed at the scale of an individual LSMPA.

Cumulative effects may arise from multiple pressures, such as a bay receiving nutrient enrichment from both direct point-source discharges (for example, sewage) and agricultural run-off. Alternatively, it may be the same pressure that is repeatedly affecting a feature over time, such as seabed features exposed to episodic fishing (e.g., trawling with bottom-towed gear), or different pressures arising from the same development acting cumulatively on the one feature – for example, development of infrastructure on intertidal mudflats leading to habitat loss (footprint) and disturbance (through increased use of vessels).

While there is widespread recognition of the need to manage cumulative effects, and there are a number of guidance documents on methodologies, practical progress is difficult, even in well-established and well-researched MPAs (NOAA, 2012).

4.7 Monitoring

4.7.1 *Effective monitoring*

Monitoring is a fundamental management tool involving the collection and analysis of data for specific purposes. Figure 2, originally featured in the introduction, underscores the importance of monitoring to the adaptive management process. The evaluation process helps to:

- Check whether the management system is operating effectively (i.e. management effectiveness, requiring monitoring of the processes);

- Check whether the management system is delivering the right results (outputs and outcomes), requiring, amongst other things, monitoring of the property itself and documenting environmental impacts, both natural and anthropogenic; and

- Establish what remedial measures or new initiatives to take in the event of shortcomings or opportunities being identified.
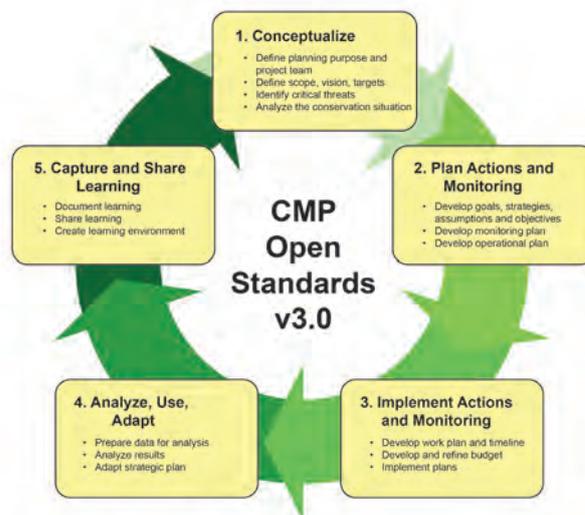
Figure 2. Conservation Measures Partnership Open Standards Process

These forms of **monitoring can have multiple benefits**, for example:

- Better allocation of resources.

- Improving documentation and reporting to avoid burdensome, time- and resource-consuming activities and facilitate compliance with reporting processes.

- Allowing management to change, to promote a proactive rather than reactive attitude towards conservation and management.

- Gaining new support from potential donors or partnerships by showing a coherent and credible approach.

Monitoring delivers the evidence with which managers can substantiate their policies, needs and decisions. **Monitoring processes essentially observe trends** whether the management system is working, whether the values in the area are getting better or worse and whether ecosystem benefits are being harnessed for society. Monitoring techniques can range from elaborate procedures using technology and interdisciplinary support, to simpler, regular, visual checks by MPA staff or by a member of the local community (*see* Case Study 24).

Monitoring must not be simply the collection of raw data but a process that involves data analysis to provide insights into, for example, the condition of the area or the effectiveness of management. The data measured and collected during monitoring must be analysed so that they become information (not merely data), allowing actual results to be compared against expected ones (targets or goals from the 'planning' process). This information, when combined with an analysis of similar actions in the past, will make trends meaningful.

4.7.2 *Measuring performance*

Amongst the LSMPAs currently in operation, most are still in the design or management planning phase and have yet to attempt performance measurement (e.g. BIOT MPA, MTMNM, MMHMP, CIMP) using an internationally recognised methodology (e.g. Hockings, et al., 2006).

Currently, only two LSMPAs (GBRMP, PMNM) have sufficient management experience and longevity to allow for iterative attempts at measuring management effectiveness. These two areas are very different from one another and offer distinct lessons.

Some of the more recently established LSMPAs are not only diverse in their purpose, management structure and socio-economic, cultural and political contexts, but are generally far larger than GBRMPA and PMNM. As these areas mature, they will be able to add lessons learned to this emerging body of knowledge.

Below are some **guiding questions to consider** when sorting out how to best measure management performance at scale:

- **How long has the area been in operation?** What is a reasonable amount of time to measure the area's performance initially (baseline) and iteratively?

- Is there **sufficient time and resources** to confidently conduct an effectiveness evaluation of the management team's efforts? At what scale can a performance evaluation realistically be undertaken based on the current level of resources?

- **Have sufficient internal systems been in place long enough** to have collected and analysed enough data to make a comprehensive evaluation of the area?

- **How do performance measures relate to the goals and o bjectives** of the area? How can an area's performance measurement be useful in the context of assessing management's progress against its stated objectives?

- **Is a performance measurement required** for the area by a specific audience or group of decision makers? Who are the primary stakeholders with an interest in the results? Who will be impacted by the implementation of management decisions based on the evaluation?

- **Do key stakeholders and decision makers hold realistic expectations** about the area's performance results? Has it been clearly communicated that an LSMPA management's performance is different from that of smaller scale MPAs?

4.7.3 *A large-scale approach for measuring performance*

All managers will face pressure from decision makers and influential stakeholders to demonstrate immediate improvements because of newly implemented management efforts. Reporting of evaluation results must always be clear and frequent, but more importantly, the strategies to manage internal and external expectations must be reassessed as they may have changed significantly since the design phase.

Two practices that can help are:

1. **Referring back to the management plan** to identify what activities have been completed and which remain to be done; and

2. **Being flexible** about how the complexity that a larger scale adds to defining and communicating management success is handled. Each area has its own benefits and challenges and managers must know both.

When designing a performance measurement approach, be aware that **this phase can be dynamic and require full engagement by staff**. Not only will the outcomes (or data collected) need to be analysed and compared against stated objectives, performance will need to be measured accordingly and previous decisions may need to be revisited. Stakeholders may need to be engaged around a focused set of issues (*see* Case Study 28) or needs to ensure their support if changes are required. Changes made from the evaluation process will require adaptive management planning and implementation.

For LSMPAs, this process will probably be more logistically challenging and resource-intensive than at smaller MPAs (including the challenge of assessing overall ecosystem health across the full scale of the area and meaningfully reporting on its status). Managers will need to consider the scale and intervals at which assessments or measurements are made. Managers working at all scales often underestimate the time required for evaluation and collection of the required data. It may be beneficial to create a tiered approach, whereby individual strategies and activities (possibly those identified as the highest priority) are assessed more frequently. Thus, when the cumulative assessment of the management plan is made (e.g. every five years), the impact on management, staff and resources is not overwhelming (*see* Box 28).

Assessing the social aspects of protected areas is an important task for managers and a critical part of performance evaluation. A number of methods and frameworks exist for this (Schreckenberg, et al., 2010), though none have yet been applied in the context of LSMPAs. A key question is whether or not management efforts are changing the attitudes and behaviours of area users and the full range of diverse stakeholders. Consider external mechanisms and/or technical assistance throughout the evaluation process.

Case Study 27

Integrating Western and Indigenous sciences to understand environment

As the scientific community becomes more inclusive of gender and diverse ethnicities, increasing options are available for both non-dominant and Indigenous cultures to contribute multiple knowledge systems. The University of Hawaiʻi at Hilo (UHH) is a Native Hawaiian-serving institution that established the Uluākea Program to incorporate Native Hawaiian ways in the curricula. A course named Kūʻula: Integrated Science was developed in 2008 and is open to students from all majors as long as they have prior experience in conducting systematic research. Most Kūʻula students study natural sciences, have experience-based or academic understanding of Native Hawaiian knowledge and are usually Native Hawaiians.

Kūʻula students come to understand the similarities and differences between Western and Indigenous sciences from readings, from attending field trips that showcase achievements of Indigenous science, and from their familial ties to place and practice. Students also conduct their own research on the environment of Hawaiʻi, integrating

Western and Indigenous sciences in content, context and methodology. This research takes place on Hawaiʻi Island, where UHH is located, as well as remote locations within the Hawaiian Archipelago, including Papahānaumokuākea. The Monument has partnered with Kūʻula, alongside FWS, to help build place-based management capacity and develop an archipelagic mindset in students, nurturing them as emerging professionals and potential future leaders.

Kūʻula provides an experience of the natural world that combines ancestral and Western sciences, which in turn inspires powerful outcomes, including a realisation by most students that multiple knowledge systems already exist within themselves – they simply have to integrate these systems while developing and implementing their research.

Many former students are now working in natural resource management positions, applying their abilities to integrate Native Hawaiian as well as Western scientific approaches in research, management practices and public communication.

Case Study 28

Measuring performance and communicating results

The Outlook Report, published by GBRMPA every five years, is an important component in assessing management effectiveness of key activities/issues occurring within the Great Barrier Reef. Globally regarded as best practice, the framework for management effectiveness, developed by the IUCN-World Commission on Protected Areas (Hockings, et al., 2006), was adapted for the GBR, requiring an assessment of six components of management:

1. Context
2. Planning
3. Inputs (including staff, money and equipment)
4. Processes
5. Outputs
6. Outcomes.

Comprehensively assessing all six components helps provide a full understanding of the effectiveness of management; assessing only outcomes may indicate the objectives have been achieved but leaves it uncertain whether it was it due to good luck or good management. Conversely, if an outcome is not achieved, then unless all six components are assessed, it is difficult to know whether it was due to insufficient resources (inputs), poor planning or a problem with the management process.

A major challenge of this process is the development of a framework that is logical and systematic but rigorous enough to effectively assess the complexity of the differing activities or issues, while being simple enough to be easily understood, with succinctly depicted evaluations based on real evidence. The methodology also must be repeatable to form a baseline.

Lessons learned in the process include:

- The final assessment was not just about the individual elements but the links between them; it was this overall picture that gave the best summary of management effectiveness.

- Understanding that no one is an expert in all areas – the assessment needs to rely on information provided rather than requiring expertise in all areas.

The overall assessment of management effectiveness was well received by stakeholders and decision makers, setting a high standard in terms of impartiality, thoroughness, scientific rigor and credibility. It was widely considered to be readable and well designed. Using the same assessment method in future reports will inspire comparable results while providing demonstrable trends, and the impact of the report's findings will be greater.

Box 28

Large-scale performance indicators

Choosing performance measurement indicators is not necessarily different for LSMPAs, but far more data will need to be collected in order to say something meaningful. Determining how much data is enough is something that all scientists deal with on a regular basis, and as such, the general rule is "more data is always better." However, management eventually hits a point of diminishing returns (i.e. new data tells the same story as existing data).

Indicators may be quantitative or qualitative. The following general considerations in selecting them are particularly pertinent to monitoring the state of an area, its surroundings and the relationship with stakeholders, and identifying any changes. Indicators should ideally:

- Be limited in number.

- Have a clear and measurable relationship to the trend being monitored (e.g. if the environmental status of an MPA is being measured, indicators should include the condition and trend of some relevant environmental values).

- Be sensitive to change and thus able to illustrate whether management actions are having effect.

- Reflect long-term changes rather than short-term or local variations (e.g. if monitoring one particular impact, choose indicators that are likely to show long-term changes and not just seasonal changes). At the same time, avoid mapping trends that have such a long cycle (e.g. mentality shifts from one generation to another) that it is improbable that they will feed in information useful to the management system in a realistic time frame.

- Aim to use monitoring procedures that are as simple and cost-effective as possible in terms of approaches to information collection, information analysis, interpretation and management, as well as ease of access for data collection, and as far as possible use data that are already being collected. If the process requires elaborate equipment, custom-made software, expertise or authorisations, it is more vulnerable to being curtailed when resources are scarce or to knowledge being lost through staff changes.

- Detect new pressures. For instance, evidence of the longer-term impact of climate change may not yet be discernible, but monitoring may ensure that it is identified as soon as it is.

Ultimately, how much is enough is a function of the heterogeneity or the quality or states of an area or of various areas within the LSMPA. If an area is completely homogenous (the same throughout), then one data point is enough to create a full characterisation. However, as the diversity within the area increases, more data is needed to characterise it.

Given that LSMPAs are much larger and encompass diverse ecosystems, or have far more heterogeneity than smaller MPAs, management teams will need to plan on putting far more resources into data collection, analysis and translation for various audiences. Depending upon the existing data or level of characterisation of a given LSMPA, the need to collect substantive biophysical data may be long lasting (Krebs, 1999; Wisz, 2008).

4.7.4 *Adaptive management and sharing lessons learned*

LSMPA managers need to be flexible, adaptive and responsive, given that patterns of use and technological approaches are constantly changing. The marine environment itself is dynamic and subject to both natural changes and differing uses. Such changes will continually test the abilities of managers to effectively utilise staff strengths and capabilities in the face of these multiple factors most of which are beyond the manager's control.

Experience from existing LSMPAs shows that **managers must remain committed to an adaptive approach** and not be discouraged if even the best-made plans do not work out as anticipated. Consequently, an adaptive management approach is essential for effective LSMPA management; this is best achieved through regular interaction between agencies across all levels of government and with local communities and interest groups.

Continuous improvement is central to good management, and can lead to changes in the management system and achieve greater effectiveness and efficiency.

LSMPA managers should investigate findings from other areas and scales of marine protection. This practice not only increases the resources from which guidance and relevant examples can be derived, it supports management to keep current – to stay informed about important research findings, new knowledge and innovations in the field.

As evaluations from LSMPAs are compiled, managers and stakeholders will have easy access to a growing body of guidance (all of which is available online) that can support management teams to remain adaptive, learn from shared experience and grow the capacity to consistently implement core evaluation processes efficiently and effectively at varying scales and for a wide range of management needs.

The following actions are essential to creating an adaptive learning environment:

- **Create ongoing opportunities for feedback** to be shared formally and informally.

- **Document the rationale behind all changes** so that others will understand what was learned and the reasoning behind the change. This is especially important for staff that join a project after important and significant transitions have been made.

- Internally, **provide a work environment that encourages experimentation and questioning**.

- Externally, help LSMPA management improve by being willing to **share lessons learned** (both positive and negative) with practitioners around the world.

- Regularly **revisit and adjust project parameters** and core assumptions for all action plans, monitoring plans, operational plans, work plans and budgets.

- When elements of strategic plans or activities are changed, **ensure modifications are communicated to all staff** and are reflected in all relevant and related materials.

- **Decide which lessons are most important to communicate** and which audiences are of highest priority. These decisions help determine the best approach to reaching key audiences.

- Adapted from the Conservation Measures Partnership, 3.0 (2013)

As an area's management team completes each cycle of evaluation, there will likely be the need to make hard decisions such as reallocating limited resources. Management should commit to repeatedly implementing the systematic, adaptive processes that have been identified as being most appropriate for the area and the team. Facilitating LSMPAs to move from 'ordinary' management into successful adaptive management is one of the core goals of these Guidelines.

4.7.5 *Operational considerations*

When an activity is found to be successful at one MPA but fails at another despite the overall conditions being similar, **managers might consider whether there is an issue** with operational processes or the professional capacity of staff. The issue could be due to an individual team member or to the management team as a whole not operating efficiently. Additional administrative training or financial support could be needed.

Questions to help further explore these aspects of the evaluation process:

- Are the priority strategies showing insufficient or less than effective outcomes? If so, could staff perceptions of their importance be an issue?

- Have resources been both consistent and sufficient (e.g. financial, human, administrative, political) to implement priority management actions? Has there been a recent decrease in funding?

HIGHLIGHT

- Document all discussions and decisions.
- Make formal management plan revisions quickly after the appropriate amendments have been outlined.
- Ensure the full scope of the changes to strategies and activities are reflected in all corresponding areas of management and related documents (e.g. action plan, monitoring plan, operational plan, work plans and budgets).

- Are the relevant staff positions held by people with the right skills to implement the strategy or activity or to lead the project effectively? Has management provided the necessary training?

- Are limitations in physical infrastructure or a lack of the necessary equipment (e.g. office space, vehicles, computers) impeding staff from doing their jobs?

- Is the management team, or the discrete teams leading specific activities (e.g. a field research team), operating smoothly? Are there areas where improvements could be made? Are there interpersonal issues or a lack of leadership in communication or the delegation of responsibilities?

- Adapted from the Conservation Measures Partnership, Open Standards version 3.0

4.8 Outputs

The aim of management is to deliver results. Outputs include those tangible products and/or services that are produced during the management cycle as a result of a planned work programme and those which can be shared with the local community and other stakeholders.

Different types of outputs can be expected from the planning, implementation and monitoring processes of the management cycle; they include actions that have been accomplished or services delivered:

- The plans themselves (e.g. a finalised management plan).

- The tangible results achieved 'in the field' (e.g. moorings installed, signs erected).

- The data that those results, and the process of achieving them, can deliver to inform future actions (e.g. visitor numbers doubled over three years).

- Services such as maintenance of an effective permit system.

Outputs are a necessary prerequisite to achieve outcomes. However, the relationship between processes, outputs and outcomes can be confusing; usually several outputs will help contribute to the achievement of one or more outcomes.

Effective management will produce numerous outputs on a long- and short-term basis. If stakeholders can see the tangible results of their contribution, they will be more prepared to contribute further in the event of a gap between targets and results.

The results of planning and monitoring can themselves be outputs but should not be viewed as an 'end product' but rather as a means to another process and another output that will work together towards making the management system operational and effective.

Indicators chosen to assess outputs should be the fewest necessary to determine success and should be measurable in a consistent way. As outlined in Chapter 3 (*see* section 3.7), it helps to choose indicators that support management to remain practical, considerate of existing resources (e.g. money, staff time), time-boun, and tied to specific outputs.

4.9 Outcomes

Outcomes are the effects of management that aim to achieve certain objectives defined during the planning; outcomes may be a mixture of processes, outputs and behavioural change, and may not be obvious for years. They may also be intangible achievements that relate to environmental values or have repercussions for society (known as 'ecosystem benefits').

Outcomes are the most important but also the most difficult things to measure accurately. They usually emerge through the effect of outputs, the specific actions accomplished and products and services delivered by management processes. There are many objectives in MPA management, but how they are achieved will depend on the nature of the area and its social, environmental and economic setting.

Outcomes can relate directly to MPA management; for instance, whether or not the area is maintaining its core environmental or cultural values and, in the case of a World Heritage Site, its 'Outstanding Universal Value' (the core concept behind World Heritage). But outcomes often relate to broader issues beyond the confines of the LSMPA.

Outcomes may be less tangible and more difficult to measure than outputs. Usually they can be expressed as a trend on a graph that shows how performance has changed over time. Using trend graphs to show target performance levels and relevant comparisons allows information from monitoring outputs to be used to review and, if necessary, improve the management system.

Since outcomes are less tangible, effective communication policies should promote positive outcomes as a catalyst for support from outside the primary management system. Support can deliver precious feedback to reinforce the management system and its actions.

4.10 Improvements to management systems

Previous sections on the three elements of LSMPA administration (Legal and Governance Framework, Institutional Framework, Resources) and the three processes (Planning, Implementation and Monitoring) have explained how management systems help managers to achieve the desired outcomes and outputs. **Developing potential improvements depends on identifying where elements and processes are falling short and then taking corrective measures.**

Shortcomings may be due to gaps in the legal and institutional frameworks, to insufficient or poor deployment of resources, or to inadequacies in the processes themselves. Outputs will then be unsatisfactory and outcomes will be achieved partially or not at all. The solution may be quite simple (for example, better deployment of resources). But if direct remedies are not possible in the short term (for example, by resolving inadequacies in the legal frameworks), solutions might be found in other areas of the management system. Changes to the management system may require days, months or years. Distinguishing the time frames that are necessary and ensuring sufficient tenacity to deliver long-term improvements can represent a challenge.

If planning, implementation and monitoring processes do not lead to the desired outputs and outcomes, this may at first appear to be due to external factors. But the real cause may be shortcomings in the existing management system. A good management system should have contingency mechanisms for handling even the least foreseeable risks.

The information can be the basis for making substantial improvements to some or all of the components of the management system. Importantly, this needs to be part of the cyclic approach to adaptive management outlined in Figure 2 and section 4.1.

A dwarf minke whale in the protected waters around Australia, which are home to a wide variety of whales. © Matt Curnock

Closing summary

The rapid emergence of LSMPAs over the last decade has been transformative to the field of marine conservation, in both policy and practice. While protecting only 1 million km^2 in 2006, established LSMPAs now account for more than 11 million km^2 of ocean and collectively MPAs across scales now protect more than 23 million km^2 or just over 6% of the world's oceans.

The establishment of very large MPAs has not been without controversy. The establishment of very large MPAs has not been without controversy and differing perspectives (e.g. Devillers, et al., 2015; Jones and De Santo 2016; Dulvy 2013; Singleton and Roberts 2014). Many of the primary purposes for which these sites were created (i.e. intrinsic value, cultural value, food security) pushed up against the conventional drivers of marine protected areas (i.e. spillover effect, user conflicts, threatened and endangered species) creating uncertainty even for advocates of LSMPAs about the value and long–term viability of such a concept.

Despite the uncertainty, the initial success of current LSMPAs has shown that many of the widespread threats to our oceans can be greatly alleviated by marine protection at scale. The vast size of LSMPAs has enabled sites to protect entire ecosystems and serve as refuges by preventing habitat loss and conserving biodiversity.

LSMPAs have also been responsible for a growing record of research on healthy marine ecosystems, the role of fisheries management as a tool for protection of marine biodiversity, and the impacts of climate change. Investment in such research has been essential for deepening our understanding of the stressors leading to ocean degradation and ways to buffer against ecological impacts that may result from these changes.

Although many of the early LSMPAs were designated as no–take areas, a diversity of models now exists, ranging from fully protected areas encompassing large portions of national EEZs to mixed–use designations across entire national EEZ boundaries. This diversity is critical to enabling countries to build the necessary social and political support, as well as capacity, to effectively manage these areas into perpetuity. It is also important to recognise that design and establishment of LSMPAs is a journey, often with early designations evolving over time as support, scientific knowledge, and management capacity has increased.

For example, when the Great Barrier Reef legislation was initially proclaimed in 1975, it comprised only the outer boundary of the area and had no internal zoning. Over the years, different sections of the Marine Park were declared and zoned, but it took 13 years (until 1988) before the majority of the Marine Park was sequentially zoned. For the first 29 years, the extent of no–take zones was less than 5% of the total area, and it was only following the comprehensive Representative Areas Program rezoning in 2004 that 33.3% of the Marine Park was declared a no–take zone. Similarly, Papahānaumokuākea was first established as a Coral Reef Ecosystem Reserve in 2000, then as a Marine National Monument inclusive of land areas in 2006 and finally quadrupled in size in 2016. Understanding these long–range dynamics and the underlying social, cultural, political, institutional and economic factors will be increasingly important as additional areas are considered for designation in the future.

A better understanding of the human dimension of LSMPAs is growing. Early social science research is beginning to document the role and importance of building capacity in the human dimensions of LSMPA management and increasing awareness of the differences in managing very large MPAs versus smaller ones.

More research is needed to comprehensively understand how to best engage Indigenous peoples and local communities, perpetuate cultural practices, support sustainable livelihoods, increase community health and wellness, ensure food security and uphold human rights. However, this research is beginning to highlight the ways in which LSMPAs have begun to and will continue to address wider social issues; contributions from this research will help strengthen ocean conservation and governance globally.

Although only a handful of LSMPAs have existed long enough to provide active, ongoing management experience, we have an opportunity for learning and synergy between and among the full range of MPA communities. Building the skills necessary to transform real–world experience into improved judgement and an increased ability to calculate and manage risk is essential to sound ocean governance. These Guidelines can help achieve this, adding expertise to the field and allowing subsequent Guidelines and additional tools and resources to be developed.

Given the rapid growth and diversification of marine management at scale, these global Guidelines will undoubtedly require updating. However, the core considerations and management requirements will endure. Technology will open up new possibilities, while increasing pressures on the ocean will challenge even the most robust of management regimes, but the shared learning and support for communities of practice through these Guidelines will provide a foundation from which to build for the next decade. Existing sites can strengthen their management efforts and maintain long–term support and investment of resources, while new sites can benefit from the expertise of older sites to accelerate their success and avoid pitfalls. As for proposed sites, they bring the promise that new and better approaches and designs can be forged to ensure that both humans and the natural world are considered in the development of national policies and commitments aimed at enhancing governance of the world's oceans.

Most important may be the role of best practice LSMPA management, as this body of knowledge and expertise can help address threats and resource management needs in the high seas, creating confidence in the ability of nations to collectively design management tools for the 64% of the global oceans that lie beyond national jurisdictions.

A subtidal reef anemone (*Anemonia mutabilis*) at Pearl and Hermes Atoll in the Northwestern Hawaiian Islands. © Greg McFall

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Glossary

Adapted from IUCN–WCPA (2008) and Pomeroy, et al., (2004).

Abundance (of species): The number of individuals of a particular species occurring within a defined area.

Adaptive management: The cyclical process of systematically testing assumptions, generating learning by evaluating the results of such testing, and further revising and improving management practices. The goal of adaptive management in a protected area context is improved effectiveness and increased progress towards the achievement of goals and objectives.

Anthropogenic: Caused or produced by humans. Used in relation to environmental pollution and pollutants originating from human activity.

Audience (or target audience): From a communication perspective, audience or target audience is a grouping of people from a specific, identified group that can be based on any number of factors, including age, gender, marital status, income level, etc. As examples: teenagers, females, single people, corporate executives, etc. Combining factors allows for an even more targeted group, e.g. women ages 40–50. In terms of the MPA, an audience differs from a stakeholder in that it does not necessarily have to be vested or affected by the management activities within the LSMPA.

Autonomous underwater vehicles (AUVs): An unmanned, self–propelled submersible launched from a platform that uses pre–defined mission protocols versus being connected via a cable. AUVs constitute part of a larger group of undersea systems known as unmanned underwater vehicles that includes non–autonomous remotely operated underwater vehicles (ROVs), which are controlled and powered from the surface by an operator or pilot via a cable and/or remote control.

Baseline: Information collected about a specific target (e.g. condition of a resource, knowledge, population of a particular species, etc.) at the initial stages of a project, thereby providing a basis for measuring progress or change over time.

Benthic: Relating to or occurring at the bottom of the ocean or seafloor.

Biodiversity: The variability among living organisms and the living complexes of which they are a part. It is expressed in the genetic variability within a species, the number of different species, and the variety of different ecosystems and habitats.

Biomass: The total mass of all organisms of a given type or in a given area.

Boundary: A limiting or bounding line; a geographic area with a discrete perimeter (e.g. the boundaries of a piece of real estate or a country). In terms of an MPA a boundary delineates the area that has been designated to enhance the conservation of marine resources.

Commercial fishery: One where fish are harvested under the authority of a license for the purpose of sale, trade or barter.

Community (biological definition): A collection of different and interacting populations of organisms found living together in a defined area.

Community (human/social definition): A group of people living in the same place or with common characteristics or interests.

Connectivity (biological): The degree to which local production results in recruitment to other populations. For any local population, connectivity could be characterised by: (1) the proportion of recruitment into the local population that is self–sustaining; (2) the proportional contributions of other populations to recruitment into the local population, in a spatially explicit manner; and (3) the spatial distribution and proportional representation of the contributions of local production to externally–based recruitment of other populations. (Warner & Cowen 2002)

Conservation: The maintenance or sustainable use of the Earth's resources in order to maintain ecosystem, species and genetic diversity and the evolutionary and other processes which shape them. In the context of the IUCN definition of an MPA, conservation refers to the in situ maintenance of ecosystems and natural and semi–natural habitats and of viable populations of species in their natural surroundings.

Conservation target: Specific desired outcome of management (e.g. number of species protected/maintained, area protected, reduced human impact, etc.). It is generally paired with human actions to be taken to achieve the target.

Core zone, or Integral zone: Within a single MPA there can be multiple zones where the regulations about what is permitted within any given zone differ. Specific to core zones, these are areas of heightened protection – no commercial activities and no fishing. Core zones have very specific boundaries and cover 10–20% of the total MPA.

Climate change: A long–term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. It is a change in the average weather conditions or a change in the distribution of weather events with respect to an average; for example, greater or fewer extreme weather events. Climate change may be limited to a specific region, or may occur across the whole Earth.

Citizen science: Projects or initiatives in which members of the public partner with scientists to answer real–world questions. The objective is usually to expand opportunities for scientific data collection and to provide access to scientific information by community.

Cultural landscape: Cultural sites that represent the combined works of nature and humans. These landscapes can range in the extent to which they have been shaped by people.

Cultural resources: Any resource, whether tangible or intangible, that identifies a certain Indigenous People's culture inherent in the way they live and practice their traditions, such as stories, art, songs or chants, dances, structures or artifacts.

Cultural value: The value attributed to a human work or place that holds spiritual or historic meaning for a group of people.

Data management: The act, process, or means by which data is managed. This may include the compilation, storage, safeguarding, listing, organisation, extraction, retrieval, manipulation and dissemination of data.

Declaration: The act of making an official statement of the intent to create an MPA; a potential first step in a longer process to legally establish an MPA through formal legislative action.

Deterrence: The act of making someone decide not to do something; the act of preventing a particular act or behavior from happening.

Ecologically important: A community, process, area or species that provides a biological or ecological function, which contributes relatively more value to the greater system.

Economic valuation: A measure of the benefit provided by a good or service to an economic agent. In an environmental context the full economic value of an ecosystem expressed in an absolute dollar is likely impossible or at least impractical to measure. As such, an alternative perspective is the economic value expressed in relative terms using indicators of willingness to pay or an estimated value of the benefit derived from the service nature is providing (see ecosystem services).

Ecosystem: A geographically specified system of organisms (including humans), the environment and the processes that control its dynamics.

Ecosystem–based management: A process that integrates biological, social and economic factors into a comprehensive strategy aimed at protecting and enhancing sustainability, diversity and productivity of natural resources. EBM emphasises the protection of ecosystem structure, functioning and key processes; is place–based in focusing on a specific ecosystem and the range of activities affecting it; explicitly accounts for the interconnectedness among systems, such as between air, land and sea; and integrates ecological, social, economic and institutional perspectives, recognising their strong interdependences. (Mills, et al., 1993)

Ecosystem services: The natural processes by which the environment produces resources that contribute to making human life possible and enhance the quality of life. Common examples include products and processes such as water, timber, habitat for fisheries, pollination of native and agricultural plants, control of soil erosion and disease outbreaks, and non–material benefits such as recreational, perpetuation of culture, and spiritual well–being. What is critical to understand about this term is that an ecosystem 'service' is defined in terms of its benefit to people and therefore is context–dependent, that is, the same feature of an ecosystem can be considered an ecosystem service by one group of people but not valued by another group. (Ash, et al., 2010)

Edge effect: Ecological changes in population or community structure that occur at the boundary of two or more areas with distinctive characteristics.

Enabling legislation: A measure of formal legislation that provides the MPA with a sound legal foundation so that the goals and objectives of the site can be recognised, explained, respected, accomplished and enforced. In some cases, traditional law may also serve as a foundation for the MPA. (Pomeroy, et al., 2004)

Endangered species: A species at risk of extinction due to any number of factors, including human activity, changes in climate, changes in predator–prey ratios, etc.

Enforcement: The act of compelling observance of or compliance with a law, rule or obligation. Enforcement can occur in situ by catching those who may be breaking the regulations or laws of an MPA or by taking civil or criminal enforcement action.

Emergency response: Activities characterised as necessary to respond to situations threatening life, property, or the environment. The objective of emergency response in the context of managing a large–scale MPA is to minimise damage to natural and cultural resources while maintaining human safety through coordinated emergency actions and assessment. This includes an immediate response but can also include a series of plans and systems (e.g. a national response plan) that may require management actions that extend beyond the initial response.

Evaluation: The judgment or assessment of achievement against some predetermined criteria; herein, the objectives for which the protected areas were established.

Exclusive economic zone (EEZ): Sea area in which a nation has special rights over the exploration and use of all marine resources, including energy production, fishing and mining, as prescribed by the United Nations Convention on the Law of the Sea. It usually stretches from the baseline out to 200 nautical miles from a nation's coast but can include offshore islands.

Food security: Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Goal: A broad statement of what the MPA is ultimately trying to achieve.

Habitat: The living space of an organism, population or community, as characterised by both its biological and physical properties. Habitat types are distinguished from one another by their distinct composition and structure that forms the living space.

Horizontal datum: Set of parameters and control points used to accurately define positions on the three–dimensional model of the Earth.

High seas [international waters]: All parts of the sea not included in the EEZ, in the territorial sea or in the internal waters of a state.

Intertidal: Area located between the elevations of the lowest and highest yearly tides.

Invasive species: An introduced organism (plant, animal, fungus or bacterium) that out–competes native species for space and resources, causing ecological and/or economic harm. Not all introduced species are invasive, and when used more broadly the definition can include native species that heavily colonise and degrade a particular habitat.

Illegal, unreported and unregulated (IUU) fishing: Fishing that occurs in violation of the law of a fishery. It can apply to fisheries that are under the jurisdiction of a state or high seas fisheries regulated by regional organisations.

Indigenous: Originating and living or occurring naturally in an area or environment.

Indigenous [peoples, communities, and nations]: As no official definition of Indigenous has been adopted by any UN–system body at the time of publication, a current working definition from the Study of the Problem of Discrimination

Against Indigenous Populations (Martinez–Cobo, 1986) is being used: "Groups of people having a historical continuity with pre–invasion and pre–colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them. They form, at present, non–dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system."

Note: Article 33 of the United Nations Declaration on the Rights of Indigenous Peoples underlines the importance of self–identification; i.e., that Indigenous peoples themselves define their own identity as Indigenous.

Keystone species: A species that has a disproportionately large effect on its environment relative to its abundance. Such species are described as playing a critical role in maintaining the structure of an ecological community affecting many other organisms in an ecosystem and helping to determine the types and numbers of various other species in the community. Loss of keystone species would often precipitate the loss of many ecologically–linked species. As such, keystone species often warrant special conservation attention. (Mills, et al., 1993)

Large–scale MPA (LSMPA): Currently, there is no official definition for what constitutes a large–scale MPA but some NGOs, and the managers of Big Ocean member sites, have chosen to use a working definition that defines these sites as marine conservation areas larger than 150,000 km^2.

Livelihoods: The means of securing the basic necessities of life – food, water, shelter and clothing, etc. – and the capacity to acquire these necessities by working either individually or as a group.

Locally–Managed Marine Areas (LMMA): An area of near–shore waters and its associated coastal and marine resources that is largely or wholly managed at a local level by the coastal communities, land–owning groups, partner organisations and/or collaborative government representatives who reside or are based in the immediate area (LMMA Network, 2014).

Management effectiveness: The degree to which management actions achieve the goals and objectives of a protected area.

Marine protected area (MPA): Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna and historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment (Kelleher, 1999). MPA is used as a generic term to cover all sites that meet the IUCN definition, regardless of purpose, design, management approach or name (e.g. marine reserve, sanctuary, marine park). As well, MPAs are but one of the more general category of protected area which, under the current official IUCN definition, is "A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long–term conservation of nature with associated ecosystem services and cultural values."

Monitoring: The process of observing and checking the progress or quality of something (a resource) through an intermittent (regular or irregular) series of observations in time to show the extent of

compliance with a formulated standard or degree of deviation from an expected norm.

MPA Network: A collection of individual MPAs or reserves operating cooperatively and synergistically, at various spatial scales and with a range of protection levels that are designed to meet objectives that a single reserve cannot achieve.

NGO, non–governmental organisation: Any non–profit or voluntary citizens' group that is organized on a local, national or international level. These groups are formed to provide services or advocate for specific public policies, often bringing citizen concerns to government, and advocating, monitoring and encouraging political participation by providing critical information. Most are organised around specific issues, such as human rights, the environment or public health. They also provide analysis and expertise, serve as early–warning mechanisms and help monitor and aid in the implementation of international agreements.

No–take zone: An area that is completely (or seasonally) free of all extractive or non–extractive uses that have an impact on the area.

Objective: A specific statement of what must be accomplished to attain a related goal.

Outcomes: The consequences, effects or real impacts of management actions. Similar to outputs, outcomes help assess the extent to which management objectives are achieved.

Outputs: Resulting products, services or achievements of a planned work programme that arise from a management activity.

Participatory: A process providing the opportunity for individuals and relevant stakeholders to participate in how management is developed and implemented.

Pelagic: Living in the water column of the open oceans or seas.

Performance indicator: A unit of information measured over time that allows managers to document changes in specific attributes of the LSMPA. It helps to understand where management is, where it's going and how far it is from achieving its stated goals.

Permanence: The state or quality of being perpetual; existing or remaining unchanged indefinitely.

Permanence of protection: In order for sites to be considered for inclusion in the Marine Managed Areas Inventory database they must provide year–round (12–month) protection. They must be established with an expectation of, or at least the potential for, permanence. Areas with a sunset clause must provide a minimum of four years of continuous protection and must have a specific mechanism to renew protection at the expiration of the sunset period.

Political will: The force brought to an issue or need when a sufficient set of political actors with a common understanding of a particular problem on the public agenda genuinely intends to support an initiative or to find an effective policy solution.

Population: A particular section, group or type of people or animals living in an area or country.

Practitioner: Someone experienced in the technical skills and practice of a particular field (e.g. cultural).

Precautionary principle: When there is a lack of full scientific certainty to aid in the decision–making process, one should not use this situation to postpone taking action where the threat is serious or irreversible environmental damage may occur. Additionally, when consequences are uncertain, managers err on the side of caution, thereby giving the benefit of the doubt to nature, public health and community well–being.

Protected species: A species (animal or plant) which is forbidden by law to harm or destroy.

Protection: Any regulatory or other provision to reduce the risk of negative human impacts on an area or species.

Quality control: A system for verifying and maintaining a desired level of quality in an existing product or service by careful planning, use of proper equipment, continued inspection, and corrective action as required.

Recruitment (biological): The addition of a new cohort to a population. The magnitude of recruitment depends on the time and life history stage at which it occurred.

Remote sensing: The science of gathering data on an object or area from a considerable distance. Standard technologies often include satellites, radar and infrared photography. For the marine environment, additional technologies can also include visual identification, echo–sounders and sonar, as well as lidar and similar laser technologies mounted to UAVs (unmanned aircraft or drones).

Replication: The process of duplicating or replicating a process, procedure or outcome, such as in scientific experiments.

Representative (sample): A selected subset of a group whose characteristics reflect those of the population from which it is drawn.

Resilience: The ability of a system to maintain key functions and processes in the face of stresses or pressures by either resisting or adapting to change. Resilience can be applied to both ecological systems and social systems.

Seascape: Seascapes are the equivalents of landscapes in the terrestrial biosphere; namely, the physical, chemical and biological elements that collectively define a particular marine area (Karl & Letelier, 2009).

Sentinel sites: A site or network of sites that possess the attributes necessary to help address a given threat or issue. In terms of large–scale MPAs, especially remote sites, they can act as sentinel sites specific to enhancing an ecosystem's resilience in the context of threats, such as climate change, as they are removed from anthropogenic stressors.

Shifting baselines: Refers to the fact that people measure ocean health against the best they have experienced in their own lifetimes – even if those measures fall far short of historical ones. One generation sets a baseline for what is healthy and natural, based on its own experience. Successive generations see even more degraded ecosystems as healthy and therefore set their standards for ecosystem health even lower. (Pauly, 1995)

Special interest group: Faction with an interest in advancing a specific area of knowledge, learning or technology. Members of special interest groups cooperate with one another to affect or produce solutions within their particular field of interest by communicating, meeting or organising conferences.

Species: A group of organisms differing from other groups of organisms and that can breed and produce fertile offspring.

Species richness: The number of different species that exist within a given area or community.

Stakeholder (and diverse stakeholder): An individual, group or organisation that has a vested interest in, can influence or may be directly affected by the establishment of an MPA or a particular management strategy. Within these Guidelines the term is also presented as "diverse stakeholders" to underscore the need to ensure that compositions of diversity (age, ability, gender equality, economic status, ethnicity) are included.

Strategy: A method, thoughtful plan of action or policy designed to achieve the goal(s) or aim(s) stated to be accomplished over time.

Subtidal: Area below the low–tide level.

Surveillance: Within a research context, surveillance is repeated surveys using a standard methodology undertaken to provide a series of observations over time, unlike monitoring, which can be intermittent. Within an enforcement context, the term means the degree and types of activities or observations required to detect non–compliance with the regulatory controls imposed on fishing or other illegal activities. Surveillance must then be paired with enforcement (e.g., self–regulation, observers or law enforcement) to maintain compliance.

Threat: A factor with immediate negative impacts on the natural or cultural resources of an LSMPA, such as biodiversity, food security or livelihoods.

Threatened species: A species likely to become endangered if limiting factors are not reversed.

Vessel monitoring systems (VMS): A mobile transceiver, including its hardware and software, used by vessels to track and transmit their positions to a receiver in a remote location.

Viability: The ability to live, especially under certain conditions; the capacity to operate or be sustained; the capability of becoming actual, useful or practicable, etc.

Vulnerable: Particularly sensitive to impacts from human activities or natural events.

Unmanned aerial vehicles (UAVs): An aircraft, such as a drone or glider, with no pilot on board. UAVs can be remote–controlled (e.g. controlled by a pilot at a control station) or can fly autonomously based on pre–programmed flight plans or via more complex dynamic automation systems.

Voluntary compliance: The action of an individual or group to adhere to or comply with the laws and regulations of an MPA; it is the alternative to state–imposed enforcement. Achieving high rates of voluntary compliance usually requires robust education and outreach efforts that educate users about potential violations, regulations and how to comply (Davis & Moretti, 2005, available at http://marineprotectedareas.noaa. gov/pdf/publications/enforcement.pdf, p.11).

World Heritage Convention: The Convention defines the kind of natural or cultural sites which can be considered for inscription on the World Heritage List. The Convention sets out the duties of States and Parties in identifying potential sites and their role in protecting and preserving them.

Zoning: A process in which a marine protected area is divided into discrete zones, each permitting and regulating specific human activities through conditions such as gear limitations in fishing and waste discharge prohibitions in tourism.

Management tools

The following is a more detailed version of Table 3 (page xxvi) and is meant to connect the needs of managers across the design and management process with specific sections of the Guidelines. Whereas, Table 3 shows five distinct process phases the following table shows three. This is because the history of LSMPAs is so new that lessons learned from existing management teams are the most robust for the earliest phases of LSMPA design and management.

Table 3a. Important tools and management topics that compliment the initial phases of LSMPA design and management

	1: DESIGN Create a site with a clear purpose and mission	**2: PLAN** Develop management strategies & activities	**3: IMPLEMENT** On–the–ground operations
Management Tools			
Administration and operations	1.4.2 2.4.1, 2.4.3 Case Study 3	3.2 Box 23, 24 Case Study 14	4.4.1, 4.4.2, 4.6.4, 4.6.6 Case Study 23
Communication / community awareness	1.1, 1.4.2, 1.4.3 2.1, 2.3.2, 2.3.3, 2.4.1 Boxes 9, 11, 12, 13 Case Studies 1, 2, 7 Tables 10, 11	3.2, 3.3 Boxes 20, 23 Tables 13, 14	4.6.1, 4.6.3, 4.6.6, 4.7.5, 4.9 Case Studies 16, 17, 18, 22, 23 Table 18
Compliance	1.4.2 2.3.1, 2.4.1 Case Study 3	3.10	4.6.3, 4.6.4, 4.6.7 Box 27 Table 17
Economic instruments and valuation	1.1, 1.2, 1.3.6 2.4.3 Table 4	Box 18	4.4.2, 4.6.5, 4.6.6 Case Study 13
Enabling legislation	1.1, 1.3.6 2.0, 2.3.2, 2.4.1, 2.4.3 Box 15 Case Study 3 Table 11	3.2 Case Study 8 Tables 13, 15	4.3, 4.6.3
Impact assessment	Box 13	Case Study 8	
Partnerships	1.0, 1.4.2, 1.4.4, 2.3, 2.3.3, 2.3.4, 2.4.1 Case Study 1 Table 5	3.2, 3.3, 3.5	4.3, 4.4.1, 4.4.2, 4.6.2, 4.6.4, 4.6.5 Boxes 24, 26 Case Studies 23–25 Table 17
Permits and licenses	1.4.2 2.4.1 Case study 8, 15		Box 23
Policy	1.2, 1.4.2, 1.4.5, 2.3.3, 2.4.3 Box 7, 13, 16	3.2, 3.10 Tables 13, 14	4.3, 4.6.1, 4.6.6 Box 24, 25 Case Study 22, 24
Public engagement	1.4.1 2.3.4 Figure 3 Tables 10, 11	3.3, 3.4, 3.6 Box 20 Figure 4	
Scientific research	1.4.4 2.3.1, 2.4.3 Tables 5, 10, 12	3.3, 3.8	4.6.2, 4.6.5 Boxes 21, 23, 26 Case Studies 17, 19, 20, 24, 25, 27 Table 17
Miscellaneous			
Adaptive management	2.0, 2.2 Box 7 Figure 2	3.2 Case Study 9 Table 16	4.7.3, 4.7.4, 4.9 Case Study 15

Table 3a. continued

	1: DESIGN Create a site with a clear purpose and mission	**2: PLAN** Develop management strategies & activities	**3: IMPLEMENT** On–the–ground operations
Assessing performance/ performance indicators			4.4.1, 4.6.3, 4.6.6, 4.7.2, 4.7.3, 4.9 Case Study 28 Box 28
Budgets	1.4.2, 1.4.3, 1.4.5	4.4.2, 4.7.4 Box 19	
Climate change	1.2, 1.3.1, 1.3.2, 1.3.7, 2.4.2 Boxes 2, 6, 17 Case Study 3	3.1, 3.9 Case Studies 5, 14 Table 17 (GBR)	4.6.2, 4.6.8 Boxes 25, 28 Case Study 20
Components of management		3.3, 3.7 Case Study 8 Table 13	4.1, 4.2, 4.5 Table 17 Case Study 28
Cultural awareness	1.2, 1.3.4, 14.1, 1.4.2, 1.4.3, 1.4.4, 2.1, 2.3.1, 2.3.3, 2.4.1, 2.4.3 Box 9, 10, 12, 13 Case Studies 1, 2, 6 Tables 5, 11	3.1, 3.3, 3.9, 3.10 Box 21 Tables 14, 16	4.3, 4.4.3, 4.6.1, 4.6.2, 4.6.5 Case Studies 11, 21, 27
Cumulative impacts	1.3.1, 1.3.2	Case Study 11	4.6.7 Table 17
Design considerations	1.3.4, 1.3.5, 1.4.3, 1.4.5, 2.1, 2.2, 2.3, 2.3.1, 2.3.3, 2.3.4, 2.4.2, 2.5 Boxes 2, 8, 13, 16, 17 Case Study 6 Tables 10, 11, 12	3.2, 3.9 Case Study 8 Table 13	4.4.4, 4.7.3, 4.7.4
Financing	1.4.2, 1.4.5	3.3, 3.5	4.4.2 Box 23 Case Studies 13, 14, 15
Fisheries	1.2, 1.3.1, 1.3.6, 1.4.3, 2.4.2, 2.4.3 Box 2 Case Study 4		4.4.2, 4.6.4 Case Studies 19, 26
Funding	1.4.2, 1.4.3, 1.4.5, 2.4.1 Table 11	3.5 Table 14	4.4.2, 4.6.5 Box 23 Case Studies 13, 14 Table 17
'Going Big'	1.2, 1.3, 1.4 Box 4 Table 4	Table 15	
Governance	1.1, 1.3.2, 1.4, 1.4.11.4.3 2.4.1 Box 3, 5, 12–15 Case Studies 1, 2, 3 Tables 5, 6, 7	3.1	4.2, 4.3, 4.4 Table 17

Large–Scale MPAs	1.0, 1.2 Box 1 Table 1		
Leadership	2.3.1 Case Studies 1, 7	3.4 Box 18 Table 18	Case Studies 25, 26
Management systems	Using the Guidelines (p. xxiv)	Boxes 8,19	4.5, 4.6, 4.10 Box 24
Monitoring	1.4, 1.4.4 Box 7 Table 5 2.4.1–2.4.3	Table 17 Case Study 11	4.6.4, 4.7 Box 25, 27,28 Case Studies 22–24 Tables 17–19
Objectives	1.1, 1.3, 1.4 2.1, 2.3.2 2.3.4, 2.4.1, 2.4.2, 2.4.3 Boxes 3, 7, 8, 10	3.2, 3.4, 3.6 Boxes 10, 19 Table 16	
Outputs and outcomes	1.0 2.2 Box 18 Tables 10,11	3.2, 3.7 Boxes 19, 20 Case Study 9 Tables 13–15	4.5, 4.7.2, 4.7.4, 4.8–4.10 Box 28 Case Studies 14, 21, 25–28
Resources (human)	1.3.4, 1.4.3	2.3.1, 2.3.3 Boxes 11–13 Case Study 7	4.4.1, 4.4.3, 4.6.6, 4.7.5 Box 18 Case Studies 21, 26
Resources (data)			4.5.3
Risk management		Case Study 9	4.6.7
Staffing	1.4.2 2.3, 2.3.1	4.4.1, 4.6.6, 4.7.5	
Social considerations	1.1, 1.2, 1.3.2, 1.3.4, 1.3.6, 1.3.7, 1.4.3, 1.4.4 2.3.1, 2.3.3, 2.3.4, 2.4.1–2.4.3 Boxes 5, 10–12, 18 Case Studies 1, 4–6 Tables 6, 7		
Socio–economic issues	1.2, 1.3.4, 1.4.3 2.3.3, 2.4, 2.4.3 Boxes 7, 9, 12 Case Studies 5 Table 4	3.9 Case Studies 10, 13	4.6.2
Specialised equipment	1.4.2, 1.4.4	4.4.4, 4.6.4 Box 23, 27, 28	
Timing considerations	1.4.2, 2.3.1	3.2, 3.7, 3.10 Box 19, 22 Tables 10,11, 13–15	4.5
Zoning	2.4.1–2.4.3 Tables 9, 12	3.1, 3.9 Case Studies 8, 11–12 Table 15	Case Study 24 Table 17