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Zoning, a fundamental cornerstone of effective Marine Spatial Planning: lessons learnt from the Great Barrier Reef, Australia

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The Great Barrier Reef Marine Park was established to provide for conservation and ecologically sustainable multiple use of 344,400 km2 of a large marine ecosystem. Management is based on zoning as a fundamental component of marine spatial planning. The legislative framework including a specific ACT and Regulations addresses objectives of ecosystem-based, integrated management of human uses and impacts consistent with best contemporary understanding of biological diversity. Zoning is one of a suite of management measures that include other spatial and temporal management measures and non-spatial measures including public education, community engagement, codes of environmental best practice, industry partnerships and economic instruments.

The first section of the Great Barrier Reef Marine Park came into operation in 1980 and the most recent zoning came into operation in 2004. The paper discusses some common misunderstandings and identifies lessons that appear relevant for others addressing management and use of marine ecosystems and natural resources.

Conservation, ecologically sustainable use, large marine ecosystem, ecosystem-based management, integrated management, ocean zoning, marine park.

Introduction

The Great Barrier Reef Marine Park Act (1975) provides for a specific regime of conservation and reasonable multiple use of the Great Barrier Reef Region. This includes spatial management of a large marine ecosystem through zoning with powers to deny, or impose limiting conditions on, use of or entry to all or part of the marine commons. At the time it was enacted this was a novel concept and it was unclear how zoning might apply in the absence of private property rights and responsibilities.

The operational history of the Great Barrier Reef Marine Park (GBRMP) from initial establishment to recent legislative amendments (Lawrence et al 2002, COMLAW, 2008) reflects considerations of the role and potential of zoning and other measures in marine area management that are a continuing matter of global contention.

Introducing a system to integrate management of human uses and impacts within the resilience constraints of maintenance of ecosystem processes and biological diversity presents major challenges. An effective governance arrangement has to engage long standing human marine uses with histories of sectoral management, to provide for new uses, and to conserve biodiversity. Conservation has to be addressed in two ways, protecting or preserving biological diversity and management to sustain human uses and impacts within the constraints of healthy ecosystem processes. .

The challenges are reflected in the large number of approaches that have been developed to meet the operational constraints of social, economic and ecological systems. A World Bank (2006) report listed 28 acronyms for marine management areas and developed a typology based on geographic scale and extent of environmental protection. That list is not exhaustive but the range of terminologies reflects the social and political challenge of integrating competing sectoral approaches and interpretations for particular situations.

Doherty (2005) reported on a conference addressing the question of whether ocean zoning could work in the context of the Canadian Northwest Atlantic region. The question appeared to accept that zoning uses of marine space occurs in other areas. The discussion had three elements.

The first was a technical legal consideration of how zoning, in the sense of long-established land use spatial planning and regulatory governance methods, based on concepts of individual and group ownership and title, could be adapted to managing the marine commons.

The second concerned zoning as a process for pre-emptive identification of areas of high conservation value to be managed by conservation or environmental agencies for sectoral purposes of protecting and/or preserving biodiversity and ecosystem processes. This draws on terrestrial concepts of analysis to identify remnant areas of undisturbed or little disturbed habitat and biological diversity for preservation in national representative protected area networks (eg Possingham et al, 2000).

The third element concerned zoning as a system of spatial planning of marine areas within a legislative governance framework to address overarching goals of a healthy environment with maintenance of biological diversity and ecosystem processes while sustaining multiple uses that promote human well-being. This is the sense in which the term zoning is used in the Great Barrier Reef Marine Park. The term Marine Spatial Planning (MSP) has been used subsequently by the US Oceans Policy Task Force (2010) as an alternative to zoning in an attempt to separate the process from the political controversies discussed in a workshop on the management of the North West Atlantic (Doherty 2005). Effective MSP however, comprises a lot more than just zoning, but zoning is a fundamental cornerstone of effective MSP. The overall regime conforms to an interpretation of conservation within a framework of sustainable resource use in conjunction with the protection of biological diversity through viable representative highly protected areas.

The discussion of zoning and spatial management has broader relevance in the context of how nations may best address obligations under UNCLOS to conserve and manage use of fishery resources of their 200 nautical mile Exclusive Economic Zone, to protect the marine environment, to consider species associated with or dependent upon harvested resources and to take measures to prevent, reduce and control pollution.

The Great Barrier Reef Marine Park (GBRMP) now has more than 30 years operational experience of the application of zoning as the core element of a suite

of management measures that has achieved an effective balance of coinservation and sustainable resource use within a large marine ecosystem (Lawrence et al 2002, Day 2002).

In this paper we present a brief account of the development of zoning and multiple use management of GBRMP, address some common misunderstandings and offer some lessons learned from the experience of establishing and adapting marine management of the Great Barrier Reef.

Brief account of GBRMP strategic management

The context of the Great Barrier Reef is extraordinary because it comprises the world's largest coral reef ecosystem, an iconic area proudly recognised as a key element of Australia's national identity. The Marine Park abuts the Queensland coastline at low water mark for some 2,300 km, but most of the Great Barrier Reef occurs offshore from the lightly populated coast of a wealthy nation. When compared globally with most tropical marine areas it is lightly used although there is increasing recognition of the extent and implications of the land-sourced pollutants reaching the waters of the Great Barrier Reef lagoon.

The GBRMP Act applies to an area of 344,400km^2 and the scale and nature of the marine management task envisaged was without precedent when legislated in 1975. The GBRMP Act was the the outcome of more than a decade of heated national debate over the need to address growing threats to a nationally and globally iconic environment from activities such as oil exploration and production, limestone mining, unsustainable tourism, unsustainable fishing and coastal development. (Lawrence et al 2002).

The original GBRMP Act provided for the establishment of the Great Barrier Reef Marine Park Authority (the Authority) with responsibilities for planning and oversight of management of the GBRMP. The Act included a specific section requiring the preparation of a zoning plan for any area declared to be part of the GBRMP; another section required the preparation of a zoning plan to have regard to five objectives:

(a) the conservation of the Great Barrier Reef;
(b) the regulation of the use of the Marine Park so as to protect the Great Barrier Reef while allowing the reasonable use of the Great Barrier Reef Region;
(c) the regulation of activities that exploit the resources of the Great Barrier Reef Region so as to minimize the effect of those activities on the Great Barrier Reef;
(d) the reservation of some areas of the Great Barrier Reef for its appreciation and enjoyment by the public; and
(e) the preservation of some areas of the Great Barrier Reef in its natural state undisturbed by man except for the purposes of scientific research.

This distinction between 'conservation' of the entire GBR and preservation in some small areas remains an important component of the overall management approach

Other sections outlined specific requirements for two periods of extensive public participation in the preparation of a zoning plan.

The GBRMP Act has been amended from time to time reflecting experience of operation and contemporary legislative drafting style. In the most recent amendments, the provisions of the original sections relating to zoning have been extended and revised, for example s 32 (1) (COMLAW, 2008). The revisions spell out clearly the primary objective of the *GBRMP Act* is "to provide for the long-term protection and conservation of the environment, biodiversity and heritage values of the Great Barrier Reef Region" and consistent with that primary objective, to "allow ecologically sustainable use….".

The *GBRMP Act* falls within the portfolio of the Federal Environment Minister but it provides an overarching framework for integration of multiple use management. The *GBRMP Act* provides precedence over inconsistent provisions of almost all other Federal laws and, under the Australian Constitution, Federal laws have precedence over inconsistent Queensland State laws within the Great Barrier Reef Region. Management of shipping and aircraft movements are not covered by this precedence because they are subject to international agreements but operations under the relevant Australian legislation are conducted in accordance with provisions of the *GBRMP Act.*

Zoning is a central premise of the GBRMP Act. Other spatial management tools can be applied provided they are not inconsistent with the relevant zone objectives in the statutory Zoning Plan; these include site or area related permits, statutory Plans of Management, site plans, specified military training areas, shipping areas or formal agreements with Traditional Owners. Non-spatial management measures include public education, community engagement, codes of Environmental Best Practice, industry partnerships and economic instruments. These management measures are described on the GBRMPA website http://www.gbrmpa.gov.au

Zoning plans and other statutory management measures are implemented through regulations prepared in accordance with s 66 which provides the powers to make regulations not inconsistent with the *GBRMP Act* or with a zoning plan.

From the time the Authority was established in 1976, it has taken an adaptive science-based approach to management. This continuing adaptive process can be described in terms of six key phases in the development of Great Barrier Reef management.

The GBRMP Act provides precedence, but subject to this. the management of most activities occurring in the Great Barrier Reef Region is undertaken by sectoral agencies under their own legislation. Under intra and inter-government agreements, implementation of GBRMP Act and Regulations is undertaken by other agencies. This reduces some potential inter-sectoral tensions and provides an operational basis for the planning and management oversight roles of the Authority with a degree of separation from typical operational management agency tasks.

The first phase of operational establishment included a zoning strategy study to explore the practical constraints and opportunities of applying terrestrially derived zoning approaches in the marine context. The study explored the management options for the Capricorn Bunker Ridge, a discrete area of 12,000km^2 in the south of the Great Barrier Reef Region. (Lawrence et al 2002). It demonstrated that zoning principles and practices could be applied effectively to marine areas.

The major difference flowed from the legal public property status of marine space and resources under which anything not specifically allowed is prohibited, with the consequent requirement in the *GBRMP Act* to specify the purposes for which an area could be used or entered. This contrasts with the usual terrestrial situation, flowing from concepts of private or group title and consequent common law, that anything not specifically prohibited is allowed. The immediate practical need identified by the study was for a permitting mechanism to consider potential impacts and consistency of proposals for new, greatly changed or unanticipated purposes of use or entry and to decide whether and under what condition they should be allowed.

In 1979 the results of the study were used in the creation and zoning of the area of the Capricorn Bunker Ridge as the first section of the Marine Park – the Capricornia Section. The Zoning Plan and regulations that were developed specified the purposes and conditions for uses and entry to each zone. They also created a permit system to provide for environmental and social impact assessment of uses that might affect biodiversity or amenity and for the establishment of conditions for permitted uses.

The second phase involved the progressive declaration and zoning of subsequent sections of the overall Marine Park. The Authority had a policy of reviewing zoning plans after they had been in place for 5 years and the reviews of the first two sections, Capricornia and Cormorant Pass, were incorporated into the declaration and zoning of surrounding sections. The development of each zoning plan drew on earlier experience of planning and implementation. By 1988, the Great Barrier Reef Marine Park consisted of four sections that comprised 98.5% of the Region identified in the GBRMP Act.

The third phase involved consolidation to address changing patterns of human use and impact, and deficiencies in management-related information that had become apparent through planning and management. In a tactical sense an immediate and major pressure at this point was the rapid growth of the Great Barrier Reef tourism industry in the late 1980s and early 1990s (Kenchington, 1991). This generated a large, urgent and unpredictable demand for permits along with pressure for timely consideration of permit applications. It became apparent that the spatial scale and regulatory detail of zoning were not the most appropriate approach for managing tourism. There was a consequent need for finer scale management of local usage and environmental impact in areas used intensively for tourism. Consequent outcomes included the development of regulations and finer-scale Plans of Management for the four more intensively used areas in the Marine Park; these complement the underlying zoning by addressing issues of site access and local conditions of

tourism and recreational use for specific local areas subject to high use and/or of high conservation value.

The third phase also involved consideration of new management arrangements to meet the requirements arising from World Heritage listing. The Great Barrier Reef was accepted for the World Heritage List in 1981 on the basis of a 37 page nomination document that established that it met all four natural criteria under article 2 of the World Heritage Convention (GBRMPA, 1981). Since that time obligations under the World Heritage Convention had become more clearly defined with changes in management and reporting requirements. This issue was partly addressed by a comprehensive consultative process involving 60 government and non- government organisations in the development of a 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area (GBRMPA 1994).

The 25 Year Strategic Plan provided the basis for the fourth phase with an issues-based focus for review of the Marine Park. The primary strategic issues were conservation and World Heritage matters; recognition of Aboriginal and Torres Strait Islander interests, fishing; tourism; recreation; water quality and coastal development.

The Authority subsequently transformed its operational structure from one based primarily on functions - planning; field management; research and monitoring; and information and education - to one based on four groups of critical issues:

- Conservation, Heritage and Indigenous Partnerships;
- Fisheries Issues;
- Tourism and Recreation;
- Water Quality and Coastal Development

The changes in recommended practice and reporting requirements under the World Heritage Convention created a clear need to achieve a more precise understanding of contemporary international obligations with respect to management of the Great Barrier Reef World Heritage Area. The Authority commissioned an expert study to review available information on relevant World Heritage values and management criteria. The report (Lucas et al 1997) found that the biological diversity values of a large proportion of coral reef bioregions were represented in the most highly protected zones but same was not true for most non-reef and deep water areas.

The major activity of phase five was comprehensive and systematic rezoning of the entire GBRMP. The rezoning was aimed primarily at increasing the protection of biodiversity but also provided an opportunity to zone some coastal areas not included in the initial declarations, to address inconsistencies between provisions of the initial sectional zoning and to address matters arising from operational experience (Dat et al, 2004). It also addressed issues identified through strategic review of management of the critical issues (GBRMPA 2005).

The rezoning was known as the Representative Areas Program (RAP) because the principal strategic approach was the protection of representative examples of the entire range of biodiversity. Key products included a bio-regionalisation that identified 70 bioregions and a set of operational principles developed by the Authority agency assisted by committees of external scientific, socio-economic, and cultural advisers (Fernandes et al 2005). The resulting 11 biophysical operational principles and four socio-economic operational principles were endorsed by the Minister and informed the zoning process and clarified the planning 'guidelines' up-front as they were presented for public information before any new zones were proposed. They included the operational principle of ensuring that a minimum of 20% of each of the 70 bioregions within the Marine Park was represented in highly protected zones (Day et al, 2004).

The RAP developed a draft zoning plan considering all the operational planning principles. This provided a robust basis for public consultation as required by the *GBRMP Act*. More than 31,500 written representations were provided in two formal phases of public participation (Day et al 2000; Day et al 2005; GBRMPA 2005; Fernandes et al 2005). The revised zoning was markedly different from the draft plan due to the public comments and came into effect in July 2004.

The transition to a sixth phase flowed from legislative amendments arising from a review of the GBRMP Act (1975) (Commonwealth of Australia, 2006) which occurred partly in response to the 2004 zoning.. A key feature of these amendments was a clearer formal framework for review and adaptive management. S 54 of the amended Act requires the Authority every five years to prepare and submit to the Minister a comprehensive Great Barrier Reef Outlook report assessing the biophysical and socio-economic condition, the effectiveness of management and the longer term outlook for the Great Barrier Reef Region . ecosystem (Dobbs et al 2011).

The amendments also incorporated a process of Ministerial approval and public availability of operational principles for future zoning plan preparation, along with provisions for Ministerial alteration subject to a requirement for a report on such alterations to be tabled in the Parliament.

Community engagement in the Great Barrier Reef Marine Park

Marine ecosystem-based management is achieved primarily through influencing the ways in which people behave. There are as yet few means to influence or control biophysical processes such as tides, currents, oceanographic phenomena or the relative breeding success of plants and animals. But it is possible to address human behaviours to prevent, or contain within apparently sustainable limits, those which have damaging impacts and to encourage those which maintain biological diversity, ecosystem processes and other values. Community engagement is critical in managing the values of the marine commons.

The extent of the precedence of the *GBRMP Act* over other legislation had significant implications for many users, other agencies and the managers of various sectoral-based industries and expectations. The *GBRMP Act* addressed this by providing for close involvement of the Queensland State government, a broadly-based consultative committee, and a clear process for broader public consultation in preparing zoning plans for the Marine Park.

From the start the GBRMPA developed processes that went beyond the minimum requirements of the *GBRMP Act* in order to ensure that there were adequate opportunities and time to engage stakeholders in the development of zoning plans (Lawrence et al 2002). As the initial zoning plans came into effect, ongoing consultative groups were established. This process has evolved today into a system of intersecting consultative arrangements with 11 multi-interest Local Marine Advisory Committees (LMACs) in major centres along the GBR coast and four expertise-based Reef Advisory Committees (RACs) that focus on key issues.

The composition of each LMAC varies depending on local interests and industries. The aim is to have a balanced representation of the spread of interests of local people who are affected by and involved in the management or use of the Marine Park. The members may be independent, or represent a community or industry group and all are voluntary. LMACs provide a way to coordinate feedback through local forums discussing sometimes conflicting views on issues such as habitat conservation and resource sharing.

The RACs are competency-based committees comprising a cross-section of stakeholder interests with expertise and experience in relevant areas. Each RAC works closely with GBRMPA staff addressing critical issues. Current priorities correspond to those identified in the Outlook Report (GBRMPA, 2009) and include an ecosystem-approach to management, managing for climate change, addressing water quality and coastal issues, and improving partnerships with Indigenous Traditional Owners.

Misunderstandings about the GBRMP

The GBRMP uses a planning regime based on an adaptation of land use planning methods. It has legislative precedence through which sectoral management of all reasonable human uses occurs within an overarching framework of long term protection and conservation. It also addresses the protection and/or preservation of biodiversity and ecosystem processes by providing high levels of protection to representative examples of bioregions throughout a large marine ecosystem..

It provides a multiple objective layered management framework within which the broad range of human uses and impacts continues to be sectorally managed provided that their management is not inconsistent with the provisions of the GBRMP Act. This is particularly important for addressing the many reasonable uses that can occur consistently with each other and GBRMP regulation on the surface, in the water column and on or beneath the seabed of an area of marine space.

In contemporary terminology, the GBRMP regime may be described as providing for conservation and multiple use of a coastal and ocean area using marine spatial planning and regulation to address objectives of integrated, ecosystem-based management of human uses and impacts consistent with best contemporary understanding of biological diversity.

The use of the word "Park" in the title of the Great Barrier Reef Marine Park Act (1975) reflects the Australian political climate of 1975 but in the context of subsequent global developments in theory and practice of marine ecosystem management it has contributed to some significant misunderstandings about the GBRMP. Other misunderstandings have arisen in the course of development, implementation and adaptation of management and in the context of international use of terminologies changing over time.

Misunderstanding 1: The Great Barrier Reef Marine Park excludes fishing and many other uses.

The GBRMP is not a National Park. It is a very large zoned multiple-use marine protected area with components conforming to 4 of the 6 IUCN categories of protected areas:

IUCN Category	Area ($km^{2)}$ of GBRMP	% of GBRMP
Ia - Strict nature reserve	865	0.2
II - National park	114,530	33.3
IV - Habitat/species management area	15,040	4.4
VI - Protected area with sustainable use of natural resources	213,780	62.1
Total	344,400	100

The basis of management is to provide for conservation while allowing reasonable use. This is done by determining the purposes for which areas may be used and entered and establishing conditions under which uses may occur.

Today one third of the GBRMP is managed for the protection and/or preservation of biological diversity by the exclusion of fishing, collecting and activities likely to have significant impacts on biodiversity or habitat. The remainder is managed for conservation where ecologically sustainable multiple use is consistent with maintaining the integrity of ecosystem processes. Various types of fishing are therefore allowed to occur in 66% of the GBRMP. Half of this area excludes trawling and related activities that damage seabed habitat and communities are excluded but where other types of fishing are allowed.

Misunderstanding 2: The zoning scheme is the only management measure used in the Marine Park.

Zoning is a key underpinning instrument for the conservation and management over the entire area of the Great Barrier Reef Region as defined in the *GBRMP Act* (344,400 km2). Zoning provides a spatial planning basis for determining where many activities can or cannot occur, but as outlined

above, zoning is only one of many spatial and non-spatial management tools used in the GBR by the Authority and, subject to consistency with the GBRMP Zoning Plan and Regulations, by other agencies with management responsibilities for activities within the GBRMP. Important non-spatial management tools are also used in the GBRMP; these include community engagement, public education, advisory committees, industry partnership and best practice models, equipment, method or skill-based licensing, permitting, and economic instruments such as the Environmental Management Charge.

Misunderstanding 3: Permits are automatically granted for activities that are specified as requiring permits

The permit system is an important element of determining and managing conditions for use and entry within appropriate zones. Permits are not granted automatically; rather the application and assessment process is designed to ensure that activities are only permitted subject to conditions that are consistent with the objects of the Act and the objectives of the zones in which they are to occur.

Misunderstanding 4: Scientific research can only take place in Scientific Research Zones

Scientific research can theoretically be conducted throughout the Marine Park but it is subject to a detailed policy that establishes conditions and areas to minimise the impacts of research (GBRMPA 2004). The strictest permit requirements for scientific research applies to the most highly protected areas (Preservation Zones) where a permit for scientific research will not be granted unless it can be demonstrated that the research cannot reasonably be conducted elsewhere and the research will be of benefit to management. Limited impact research (extractive and non extractive) is defined and generally does not require a permit especially if undertaken by an accredited educational or research institution. All other scientific research requires a permit irrespective of the zone.

Misunderstanding 5: The current zoning that came into effect in 2004 is fixed forever and biodiversity is now adequately protected.

The RAP was a process of adaptive management, applying the experience of management, the results of research and monitoring, along with the application of the above-mentioned operational principles. The adaptive management process, including a more prescriptive planning process, is now more clearly defined through amendments to the legislation that require the Authority to present a five-yearly 'Outlook Report' to the Minister that is subsequently tabled in the national Parliament. These reports do not contain recommendations but it is not unreasonable to assume that a Minister would seek separate advice on options to address elements of the outlook that might threaten the biodiversity or other outstanding values of Great Barrier Reef. The Act stipulates that a Zoning Plan cannot be reviewed within a period of seven years from the time it comes into effect but this does not mean that the Plan must be reviewed immediately seven years have passed.

Misunderstanding 6: It takes many years to see clear results of management.

In the early years of the Marine Park there was concern that the results of zoning could take many years to become apparent. The Authority was careful not to generate unrealistic expectations. It established a long term monitoring program conducted by the Australian Institute of Marine Science and commissioned other specialist monitoring studies. In the event some benefits have become apparent relatively quickly. Thus, following the 2004 rezoning, significant increases in populations and size of fish on closed reefs were recorded in monitoring programs and recreational fishers identified areas surrounding closed reefs as attractive (Russ et al., 2008). Sweatman (2008) has reported a marked reduction in outbreaks of the predatory starfish *Acanthaster planci* on coral reefs within the no-take areas closed to fishing. This has implications for the health of the entire GBR, not just the highly protected zones.

Conclusions

The GBRMP was designed and has evolved through addressing socially economically and ecologically sensitive issues in the management of an iconic large marine ecosystem. It should not be simply transposed to another governance and political context but it does provide some lessons that have broad relevance to the design and implementation of management of other marine ecosystems.

We derive 10 primary lessons from the Great Barrier Reef experience:

1. Zoning and supporting regulations are key management measures which, with other spatial, temporal and community engagement measures, collectively can provide an effective basis for management of a marine area.
2. A clear legislative framework with an overarching goal of conservation, and ecologically sustainable use consistent with the overarching goal, can provide a robust foundation for the management of all reasonable marine uses. All operational agencies must be bound to conduct their activities in ways consistent with the overarching goal
3. Management should be based on the best currently available biophysical and socio-economic information and this should be made accessible to stakeholders in a comprehensible and culturally appropriate form.
4. The management regime should be based on effective community, sectoral and managing agency engagement in planning and management.
5. The planning and management process should be based on clear objectives and operational planning principles addressing biophysical, socio-economic, and cultural considerations as well as management feasibility.
6. Significant areas, representative of all the bioregions within a large marine area, managed with a high degree of protection from human use and impacts, should be a mandatory component to ensure effective marine ecosystem-based management.
7. Effective management of a marine ecosystem cannot be regarded simply as the sectoral responsibility of a single government agency, ministry or jurisdiction.

8. Subject to the overarching goal, all forms of resource use should be managed through publicly developed plans and regulations that specify verifiable sustainability and cautious limits of their impacts.
9. Managers of neighbouring areas should be involved in planning and management as far as practicable. Whatever the boundaries of a marine managed area, or of a zoned subset, cross-boundary impacts are significant influences. Many such impacts arise through activities within the responsibility of a jurisdiction or agency other than that responsible for the marine area.
10. The management context changes with time, management experience, monitoring of outcomes, new biophysical, socio-economic and community information and community attitudes so management should be based on an adaptive cycle of planning, implementation, evaluation and review.

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