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Canadian Science Advisory Secretariat (CSAS)

Research Document 2013/073

National Capital Region

Review and analysis of key international approaches to establish conservation objectives, identify indicators and develop monitoring protocols that evaluate the effectiveness of Marine Protected Area (MPA) networks

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April 2015

Canada

Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/
csas-sccs@dfo-mpo.gc.ca

ISSN 1919-5044

Correct citation for this publication:

Jamieson, G.S. 2015. Review and analysis of key international approaches to establish conservation objectives, identify indicators and develop monitoring protocols that evaluate the effectiveness of Marine Protected Area (MPA) networks. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/073. vi + 105 p.

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ABSTRACT

This report looks at the extent to which existing international Marine Protected Areas (MPAs) design, indicators and monitoring protocols can be applied to the Canadian context for MPA network development. A review of selected MPA networks from around the world was undertaken to address nine points relating to the development of MPA network objectives, design criteria, indicators and monitoring protocols, and management measures. These elements were summarized for the following overarching national MPA programmes and/or MPA networks: Australia's National Representative System of Marine Protected Areas, the Great Barrier Reef Marine Park, and Victoria's MPA network; California's *Marine Life Protection Act* South and Central Coast Regions and the Channel Islands National Marine Sanctuary MPA networks; the South African MPA network; the Phoenix Island Protected Area (PIPA) in Kiribati; Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), network, and UK's portion of the Natura 2000 MPA network. Networks that seemed the most functionally effective and documented were in Australia and California. In part this was because

1) only "single jurisdictions" and "ecosystems" were involved in each of these areas, which gave managers full authority to establish a comprehensive, functional network in a timely manner, and

2) because networks in these areas have been established for at least a decade, there has been more time for both refinement (adaptive management) and network evaluation.

Networks considered in other areas were either younger (PIPA), were developed in a more ad hoc and poorly funded manner (South Africa), or were the result of complex negotiations and compromises between numerous jurisdictions that shared common resources, resulting in a slower and more complex establishment process in their development of an effective MPA network (OSPAR and Natura 2000). The main conclusion is that MPA network experiences elsewhere have relevance to the development of a Canadian MPA network, and that they can indicate approaches which are effective, timely, and practical. Every situation is different and unique, but the approaches in MPA network development that are likely to be ultimately adopted in Canada's oceans have invariably been considered and evaluated at least in part elsewhere at some time.

Examen et analyse des approches internationales clés pour établir des objectifs de conservation, définir des indicateurs et élaborer des protocoles de suivi en vue d'évaluer l'efficacité des réseaux d'aires marines protégées (AMP)

RÉSUMÉ

Ce rapport examine la mesure dans laquelle la conception des aires marines protégées (AMP) existantes, les indicateurs et les protocoles de suivi peuvent être appliqués dans un contexte canadien pour l'établissement des réseaux d'AMP. Des réseaux d'AMP sélectionnés du monde entier ont été examinés afin d'aborder neuf aspects liés à l'établissement d'objectifs, de critères de conception, d'indicateurs, de protocoles de suivi et de mesures de gestion pour les réseaux d'AMP. Ces éléments ont été résumés pour les programmes globaux nationaux d'AMP ou réseaux d'AMP nationaux suivants : en Australie, le système représentatif national des aires marines protégées, l'aire protégée de la Grande Barrière de corail et le réseau d'AMP de Victoria; en Californie, les régions côtières du sud et du centre définies en vertu de la *Marine Life Protection Act* et les réseaux d'AMP du Channel Islands National Marine Sanctuary; le réseau d'AMP de l'Afrique du Sud; l'aire protégée des îles Phoenix (PIPA) aux Kiribati; le réseau de la Convention pour la protection du milieu marin de l'Atlantique du nord-est (OSPAR), et la partie du réseau d'AMP Natura 2000 en Royame-Uni. Les réseaux jugés les plus efficaces sur le plan fonctionnel et les mieux documentés sont ceux de l'Australie et de la Californie. Cela s'explique en partie par le fait que :

1) dans chacune de ces aires, il y a une seule « juridiction » ou un seul « écosystème », situation qui donne aux gestionnaires tous pouvoirs d'établir un réseau exhaustif et fonctionnel dans un délai raisonnable;
2) ces réseaux étant en place depuis au moins 10 ans, les gestionnaires ont eu plus de temps pour le perfectionnement (gestion adaptative) et l'évaluation des réseaux.

Les réseaux examinés dans les autres régions étaient soit plus récents (PIPA), établis de manière ad hoc et mal financés (Afrique du Sud), ou étaient issus de négociations complexes et de compromis entre plusieurs autorités partageant des ressources communes, occasionnant ainsi un processus d'établissement plus lent et plus complexe en vue d'élaborer un réseau d'AMP efficace (OSPAR et Natura 2000). La principale conclusion est que les expériences des réseaux d'AMP ailleurs dans le monde sont pertinents pour l'établissement d'un réseau d'AMP canadien en permettant de dégager des approches efficaces, opportunes et pratiques. Chaque situation est différente et unique, mais les approches adoptées pour la création de réseaux d'AMP, qui sont susceptibles d'être appliquées dans les océans du Canada, ont invariablement été prises en considération et évaluées, du moins en partie, ailleurs dans le monde à un moment donné.

INTRODUCTION

An important component of bioregional marine protected area (MPA) network planning and implementation is the setting of appropriate conservation objectives and then testing and evaluating the network's effectiveness in achieving those objectives. Network-level indicators and monitoring protocols are needed, as opposed to site-specific ones. Identification of indicators and development of protocols to test MPA network effectiveness is a commitment under the Canada's *Health of the Oceans Initiative*, which was launched in 2007 (DFO 2014), Component 14:

"*14. The national network of MPAs will build upon multiple regional networks of MPAs. At the level of resolution of the major biogeographic units [see DFO 2009], each complete network should have all of the CBD properties and components. An MPA network designed for specific objectives (see Section #5) may be established having only a subset of these properties and components, as long as these networks make it likely to achieve outcomes associated with the objectives for which the network was established. This would not be achieved with only the individual MPAs functioning independently. Such objective-specific networks could be at a variety of spatial scales*" (DFO 2010).

Science advice has been requested on the extent to which existing international MPA monitoring protocols and indicators could be applied to the Canadian context (given the goals, design properties, etc., outlined within the *National Framework for Canada's Network of Marine Protected Areas* (GoC 2011). To ensure the best available information is used as the basis for this advice, this report has been developed to provide a review and analysis of key international experiences as of 2011 with these aspects of MPA networks.

For the key examples, this paper provides an in-depth review of the types of MPA network objectives, design criteria, indicators and monitoring protocols, and management measures used by these international MPA networks (as opposed to those used for their component individual MPAs). The most relevant objectives and indicators are deemed the ones that relate to a goal similar to goal #1 in the *National Framework for Canada's Network of Marine Protected Areas* (GoC 2011), i.e., "*to provide long-term protection of marine biodiversity, ecosystem function and special natural features*". For each international example of an MPA network the following nine elements were considered:

A. MPA NETWORK OBJECTIVES

A1. The network goal(s), objectives and the process used to identify the objectives.

A2. An analysis of how network-level objectives differed from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?).

B. DESIGN CRITERIA

B1. The extent to which the network design criteria/properties and steps recommended in Annexes II and III of Decision IX/20 of the ninth meeting of the Conference of the Parties (COP 9) to the Convention on Biological Diversity (CBD) (CBD 2008) (Appendix 1) have been part of the planning process are discussed, along with other design criteria if they were factored in.

C. INDICATORS AND MONITORING PROTOCOLS

C1. The specific indicators developed for the network design criteria/properties (e.g.,representativity, connectivity, replication, adequacy) to evaluate the effectiveness of the network design itself;

C2. The monitoring protocols or other methods used to evaluate progress towards meeting network objectives, including the process used in their selection, and how adequate the indicators are in

measuring the effectiveness of an MPA network in achieving its objective(s) and whether and how baseline values were established;

C3. The extent to which “citizen science” (community-level participation) is utilised as part of the monitoring;

C4. The extent to which network-level monitoring protocols and other evaluation methods differed from those used to evaluate the progress of the individual components of the network; and

C5. Efforts to evaluate the degree to which individual network components (individual MPAs) and their objectives contributed to achieving the network level objectives, and if there were any, the types of analyses used to measure this.

D. MANAGEMENT MEASURES

D1. In addition to MPAs, other tools or management measures being used to achieve the various types of network objectives, if any.

A "goal" is defined as a broad statement about a long-term desired outcome for MPAs, while an "objective" is a measurable outcome of MPAs that will be achieved in a specific timeframe to help accomplish a desired goal. "Strategic objectives" are more general whereas "operational objectives" are more specific, measurable and are needed to guide monitoring of overall MPA network effectiveness. However, while these terminology definitions are used in this analysis, the terminology used in each of the case studies reflects the terminology used in the acknowledged references, which was not always consistent with the above definitions. This needs to be recognized when reading this document to minimize confusion.

In addition, the profiled MPA networks will be classified according to the 6 categories in the IUCN Protected Areas Categories System based on their management objectives (Dudley 2008).

BACKGROUND

“The CBD requires that Party states establish, by 2012, comprehensive, effectively managed, and ecologically representative national and regional systems of protected areas” (UNEP World Conservation Monitoring Centre 2008). Canada has adopted the following International Union for the Conservation of Nature / World Commission on Protected Areas (IUCN/WCPA) 2008 definition of a protected area for its national network of MPAs:

“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” (GoC 2011).

MPAs have been mostly designated in a piecemeal fashion, one site at a time. A special area is identified and protected in an MPA, thereafter another special area is identified and protected, and so on. Over time, and with enough diligence, a country or region can build a representative network system of MPAs. However, this gradual method takes a long time to implement and the ad hoc planning style can lead to gaps in coverage as focus is often mostly on protecting individual sites rather than several sites that are ecologically linked. Most early MPA networks are of this type and are still evolving, with MPAs periodically being added to the network. In contrast, some jurisdictions have applied a more structured strategy for building their MPA systems and are designing networks of MPAs across broad regions, where the individual MPAs that are part of the network are being designated all at once. The Great Barrier Reef Marine Park (GBRMP) was one of the first examples of the latter strategy, and in 2004, the multiple-use park was rezoned, with one-third of its area set aside in a comprehensive network of no-take areas (NTAs) (these NTAs previously constituted 4.7% of its area). Recommended MPA networks for consideration in this report are of all the above types, i.e.,

1) a collection of individual MPAs established site by site in an ad hoc manner;
2) an MPA network designed at least partially according to the design criteria/properties identified by the CBD but which is not yet complete (gaps to be filled over time); and
3) an MPA network established as a complete package (rare).

MPA networks generally have stated objectives, whereas individual MPAs often do not, although there may be general objectives stated for their legislated reserve type, such as national park or ecological reserve. This is particularly true in a Canadian context, where most individual MPAs have been established through provincial legislation without unique site-specific conservation objectives (Jamieson and Levings 2001); this is particularly the case in British Columbia. In 2003, 125 (61%) of the 204 legislated MPAs in Canada were located in British Columbia, with 94 % of the MPAs in this province being nearshore and relatively small (Jamieson and Lessard 2000). Most of those had no site-specific MPA objectives. In many regional networks around the world, while degree of representativity may be considered, relevant biological connections between reserves are seldom clearly defined, and so in the relatively few network assessments completed, it has generally proven difficult to evaluate how overall biodiversity is being conserved. In the UK, for example, the marine Natura 2000 site regulations specify that a single scheme of management may be established for any Natura 2000 site, but there is no requirement for every Natura 2000 site to have a management scheme. In England, in 2005, management schemes had been published for eleven sites, were under development for eight sites, and for twenty sites there were no schemes (WWF-UK 2005).

In this review of MPA networks, another way to characterize MPA networks is apparent. The networks can be composed of either a very large legislated protected area, which may largely include the entire ecosystem and is zoned to include both NTAs (the “MPA network”) and areas that permit various activities (e.g., as in the GBRMP); or a very large area that is conceptually fully “managed,” and has many separate, typically relatively small legislated MPAs (e.g., as in California’s marine regions) which together comprise the MPA network. Monitoring efforts in either case may be confined simply to the legislated MPAs or to the greater region that includes or at least may influence the “network”.

Previous studies, notably by the United Nations (UNEP World Conservation Monitoring Centre 2008), have summarized efforts around the world to establish MPA networks (Table 1).

Table 1. Examples of regional MPA networks (involving two or more countries) (UNEP World Conservation Monitoring Centre 2008).

Region / Name of network	Countries	Progress
Mesoamerican Barrier Reef	Mexico, Belize, Guatemala, Honduras	No-take areas (NTAs) and multiple use; several initiatives underway to develop the network with support of the Nature Conservancy (TNC) and the World Wildlife Fund (WWF)
Gulf of Mexico 'Islands in the Stream'	USA, Mexico, Belize	Early proposal
North-east Pacific	Countries from Mexico south to Colombia	Proposal developed
South-east Pacific	Countries from Panama south to Peru	Recommendation; to include Marine Protected Areas (MPAs) and Marine and Coastal Protected Areas (MCPAs)
Tropical Eastern Pacific Marine Corridor Network (CMAR - or Corredor Marino)	Colombia, Costa Rica, Panama, Ecuador - San Jose Declaration	Implementation of network of five existing MPAs underway

Region / Name of network	Countries	Progress
Baja California to the Bering Sea (B2B)	USA, Canada, Mexico	28 sites identified
Scotian Shelf/Gulf of Maine	Canada, USA	
Eastern African Marine Ecoregion (EAME) Programme	Somalia, Kenya, Tanzania, Mozambique, South Africa	Priority 'seascapes' identified and ranked by WWF and support provided to protect some of these
MPA network for the countries of the Indian Ocean Commission	Madagascar, Mauritius, France (Reunion), Comores, Seychelles	Data-gathering underway
Western Africa regional network	Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, and Cape Verde	Initial steps underway
Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) MPA network	Djibouti, Egypt, Jordan, Saudi Arabia, Somalia, Sudan and Yemen	Master Plan for the network prepared and some sites established
Caspian regional MPA network	Azerbaijan, Islamic Republic of Iran, Kazakhstan, the Russia Federation and Turkmenistan	Initial discussions underway
Southeast Asia MPA network	Association of Southeast Asian Nations (ASEAN) and other countries	Action Plan prepared
Sulu-Sulawesi Marine Ecoregion (SSME)	Indonesia, Malaysia, Philippines	Framework for network developed with criteria for site selection
Natura 2000	Member countries of the European Union (EU)	Under development and many sites established
Mediterranean	All countries bordering Mediterranean	Under development; to be comprised of several sub-regional networks
Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) network	Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK	Criteria and guidelines developed and process well underway; sites currently being nominated
Baltic Marine Environment Protection Commission - Helsinki Commission (HELCOM)	Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russian Federation, Sweden	Criteria and guidelines developed and process well underway; sites currently being nominated
Antarctic	25 members of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR	Planning underway for a regional MPA system
Arctic	Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, USA	Discussions underway for an MPA network

MPA networks that have been considered in this report are listed in Table 2. One newly established MPA “network” that primarily supports subsistence living, the Phoenix Islands Protected Area (PIPA), has been included, as this may be relevant to the Canadian Arctic. Finally, for those MPA networks recommended (table 2), it is noted that none individually have information on all the nine elements considered in this evaluation, but collectively they provide a consideration of approaches and challenges relevant to Canada. There is no good single example of a network that fully addresses all the aspects listed in the evaluation framework, as most networks with the potential to be “functional

networks[1]" have been established in the last decade and few of these have been monitored to assess performance.

Table 2: MPA networks considered for this report, their locations, whether their individual MPA or network objectives have been defined, and whether monitoring and network assessments have been conducted. The MPA networks examined in this report are in bold. These MPAs networks were examined depending on how advanced studies assessing them are, the availability of those assessments and the network's relevance for inclusion/exclusion.

Country/Region	MPA network	Objectives defined		Monitoring Conducted (time period)	Assessment Undertaken
		Indiv. MPA	Network		
Australia	**National Representative System of Marine Protected Areas (NRSMPA)**		**Yes**		
Queensland, Australia (NRSMPA)	**Great Barrier Reef Region (GBRR)**	**For GBRR as a whole**	**Yes**	**Yes (2004-2009)**	**Yes**
Victoria, Australia	**Victoria Marine Reserve Network (part of the NRSMPA)**	**No**	**Yes**	**No**	**Audit (2011)**
New South Wales, Australia	South-east Commonwealth Marine Reserve Network (part of the NRSMPA)	No	Yes	No	
New Zealand	New Zealand Marine Reserves		Yes	Some indiv. MPAs	Some indiv. MPAs
California	***Marine Life Protection Act* (MLPA) Regions**		**Yes**		
California (federal)	**Channel Islands (now part of South Coast MLPA Region)**	**Some**	**Yes**	**Yes (2003-2008)**	**Yes**
California (state)	**Central Coast MLPA Region**	**Yes**	**Yes**	**No**	**Monitoring concepts developed**
California (state)	North Central Coast MLPA Region	Yes	Yes	No	
Kenya, Tanzania and Mozambique, Africa	Eastern African Marine Region	No	Yes	No	
South Africa	**South Africa**	**Some**	**Yes**	**2004-2009**	**Yes**

[1] For a *functional network* of MPAs to exist, the network should deliver pre-identified outcomes beyond those which would be expected if there were only a collection of MPAs, each sited optimally and functioning for some individual specific purpose (DFO 2010).

Country/Region	MPA network	Objectives defined		Monitoring Conducted (time period)	Assessment Undertaken
		Indiv. MPA	Network		
Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, and Cape Verde	Western Africa Marine Region	No	Yes	No	
Fiji, South Pacific	Kubulau MPA Network	No	Yes	Yes (2005-2009)	Yes
Melanesia and Polynesia, South Pacific	Community Conserved Areas	No	Yes	No	Yes (2009)
Kiribiti, South Pacific	**Phoenix Islands Protected Area (PIPA)**	**No**	**Yes**	**Limited**	**No**
North-east Atlantic, Northern Europe	**Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Network**	**Some**	**Yes**	**Annual**	**Yes**
UK	**Portion of the Natura 2000 Network**	**Some**	**Yes**	**Yes (2010)**	**UK seas overall assessed**
Baltic Countries (HELCOM)	Baltic Sea Protected Area (BSPA) Network		Yes	No	Yes

Note: in many networks, different types of reserves (e.g., national parks vs. reserves vs. sanctuaries) may have general objectives, but individual reserves often do not.

MPA NETWORKS

AUSTRALIA

Background

Australia has been committed to realizing its international commitments as a signatory to the CBD through the significant expansion of its existing MPA network throughout Australia's Exclusive Economic Zone (EEZ) by 2012, thereby meeting its commitment made at the World Summit on Sustainable Development in 2002. The Australian Government has established 40 new Commonwealth marine reserves around Australia building on existing marine reserves that have been gradually established since the first Commonwealth marine reserve was declared in 1982. The new Commonwealth marine reserves add more than 2.3 million km^2 to Australia's marine reserve estate, resulting in a total area of 3.1 million km^2 of ocean being managed primarily for biodiversity conservation.

1) National Representative System of Marine Protected Areas (NRSMPA)

What is the NRSMPA?

In 1991 the Australian Government initiated a long-term marine conservation program to ensure the conservation and sustainable use of Australia's marine and estuarine environments. A key component

of this initiative was a commitment to expand Australia's existing marine reserve system through the establishment of a National Representative System of Marine Protected Areas (NRSMPA). The Australian Government and the governments of the individual states and the Northern Territory are working together to implement the NRSMPA. The aim of the NRSMPA is to protect areas which represent all the major ecological regions and the communities of plants and animals they contain to help conserve important habitats and representative samples of marine life for present and future generations.

It should be noted that State and federal MPAs (e.g., Great Barrier Reef Region (GBRR)/Great Barrier Reef Marine Park (GBRMP)) are all included in the NRSMPA (as indicated in table 2), and that this discussion is an overview of the NRSMPA. The GBRR/GBRMP and Victoria's MPA system are discussed in more detail below.

Objectives of the NRSMPA

The primary goal of the NRSMPA is to establish and manage a comprehensive, adequate and representative system of MPAs to contribute to the long-term ecological viability of marine and estuarine systems, to maintain ecological processes and systems, and to protect Australia's biological diversity at all levels.

The goals of the NRSMPA relate primarily to the conservation of biodiversity and sustainable and equitable management of human usage. However, the MPAs that make up the NRSMPA may also protect and manage many other important geological, archaeological, historical and cultural attributes. The following secondary goals are designed to be compatible with the primary goal:

1. To promote the development of MPAs within the framework of integrated ecosystem management;
2. To provide a formal management framework for a broad spectrum of human activities, including recreation, tourism, shipping and the use or extraction of resources, the impacts of which are compatible with the primary goal;
3. To provide scientific reference sites;
4. To provide for the special needs of rare, threatened or depleted species and threatened ecological communities;
5. To provide for the conservation of special groups of organisms, e.g., species with complex habitat requirements or mobile or migratory species, or species vulnerable to disturbance which may depend on reservation for their conservation;
6. To protect areas of high conservation value including those containing high species diversity, natural refuges for flora and fauna and centres of endemism; and
7. To provide for the recreational, aesthetic and cultural needs of indigenous and non-indigenous people.

Australia's Oceans Policy (Commonwealth of Australia 1998a and b) outlines commitments and actions to the ongoing establishment of the NRSMPA for conservation purposes and to give regional security for industry access to ocean resources and their sustainable use. The integration of environmental, economic, social and cultural ocean uses is fundamental to the broad principles established in Australia's Oceans Policy.

Principles used to establish the NRSMPA

The following key characteristics define the MPAs that form the NRSMPA. The individual MPA:

- has been established especially for the conservation of biodiversity (consistent with the primary goal of the NRSMPA),

- can be classified into one or more of the six IUCN Protected Area Management Categories reflecting the values and objectives of the MPA,
- must have secure status which can only be revoked by a Parliamentary process, and
- contributes to the representativeness, comprehensiveness or adequacy of the national system.

Area management operates at a range of scales across the marine environment for a variety of primary purposes. Many managed marine areas that also benefit biodiversity conservation are not included in the NRSMPA. Examples of the types of marine managed areas that are not included in the NRSMPA are some indigenous protected areas, some areas established to protect fish habitat, and some areas under cooperative management arrangements with industry. Biosphere Reserves, established under the UNESCO Man and the Biosphere Program, contribute to biodiversity conservation and their core areas can be included in the NRSMPA as protected areas.

Principles for developing the NRSMPA

1. *Regional framework:* The Integrated Marine and Coastal Regionalisation for Australia (IMCRA) provides the national and regional planning framework for developing the NRSMPA, with ecosystems used as the basis for determining representativeness. The IMCRA is a spatial framework for classifying Australia's marine environment into bioregions that make sense ecologically and are at a scale useful for regional planning.
2. *Comprehensiveness:* The NRSMPA will include the full range of ecosystems recognized at an appropriate scale within and across each bioregion.
3. *Adequacy:* The NRSMPA will have the required level of reservation to ensure the ecological viability and integrity of populations, species and communities.
4. *Representativeness:* Those marine areas that are selected for inclusion in MPAs should reasonably reflect the biotic diversity of the marine ecosystems from which they derive.
5. *Highly protected areas:* The NRSMPA will aim to include some highly protected areas (IUCN Categories I and II) in each bioregion.
6. *Precautionary principle:* The absence of scientific certainty should not be a reason for postponing measures to establish MPAs to protect representative ecosystems. If an activity is assessed as having a low risk of causing serious or irreversible adverse impacts, or if there is insufficient information with which to assess fully and with certainty the magnitude and nature of impacts, decision making should proceed in a conservative and cautious manner.
7. *Consultation:* The processes of identification and selection of MPAs will include effective and high quality public consultation with appropriate community and interest groups, to address current and future social, economic and cultural issues.
8. *Indigenous involvement:* The interests of Australia's indigenous people should be recognised and incorporated into decision making.
9. *Decision making:* Decision making processes should effectively integrate both long term and short term environmental, economic, social and equity considerations.

The last point is not relevant to the scope of this report. Many of the principles used are those mentioned in Annexes II and III of the COP 9 Decision IX/20 to the CBD (Appendix 1), notably representativity, replication, and adequacy. Ecologically and biologically significant areas (EBSAs) are not mentioned, as this terminology was developed later, but the intent is partially captured under the 2nd principle (Comprehensiveness). There is no specific mention of connectivity either. The reason could be that other terms (such as representativity) were expected to capture connectivity, or although

conceptually understood, in practice connectivity was considered hard to clearly incorporate as an operational objective.

Strategic Plan of Action

The Strategic Plan of Action ("the Plan") for the NRSMPA (ANZECC Task Force on Marine Protected Areas 1999) integrated the policy and planning framework and outlined a set of actions to achieve the goals of the NRSMPA. The Plan provided a guide to understanding the NRSMPA by defining it in the context of an array of existing mechanisms and agreements that promote the conservation of Australia's marine biodiversity. The Plan concentrated on the establishment of the NRSMPA, including a performance assessment for the NRSMPA, and a set of actions that reflect both national intention and government priorities. The Plan is a long-term national blueprint. Yearly reviews are to be undertaken to assess progress. Progress between stages will be dependent on the success of actions and the level of resources provided by the jurisdictions responsible for implementing the actions. Where there are overlapping or consequential actions, these are to be managed accordingly. There is a list of publications relevant to establishing the NRSMPA. These include an analysis of the approach in assessing the principles of comprehensiveness, adequacy and representativeness (CAR) of MPA proposals for inclusion in the Commonwealth waters component of the NRSMPA (Scientific Peer Review Panel for the NRSMPA 2006). Justification of CAR is not discussed further, as it is consistent with the CBD's direction (Appendix 1).

2) Great Barrier Reef Marine Region

Background

The federal government enacted the *Great Barrier Reef Marine Park Act* in 1975 around the Great Barrier Reef. The legislation also established a managing agency with regulatory authority, called the Great Barrier Reef Marine Park Authority ("the Authority"). The Act provided for the establishment and management of a large protected area covering virtually an entire marine ecosystem encompassing an area of 344,400 km^2. The Act also established a process for planning and managing the multiple-use GBRMP using a variety of tools including zoning.

Zoning has long been regarded as the cornerstone of management of the GBRMP, but has evolved and changed considerably over the last 25 years (Kenchington and Day 2011, Osmond et al. 2010). The multiple-use zoning approach separates conflicting uses, and allows a wide range of marine activities, many of which are managed through a permit system. The original round of zoning plans was completed in the 1980s and was biased towards coral reefs, particularly in the more pristine areas to the north. It resulted in 4.8% of the total extent of the GBRMP being placed in no-take zones. An internal review by Authority staff in the mid-1990s revealed continuing declines in reef ecosystem health and key species and that the agency's mandate to protect the range of biodiversity was not being achieved. The review concluded that the amount and distribution of fully protected no-take zones were inadequate for protecting the full range of habitats known to occur throughout the GBRMP. In response, the Authority initiated the Representative Areas Program in 1999 as a basis for rezoning the GBRMP, and the new zoning plan was completed and became law in July 2004.

Today the GBRMP's zoning provides very high levels of protection ("no-take" zones and very small "no-go" zones) which together cover one third (33.33%, or 115,550 km^2) of the GBRMP (Osmond et al. 2010). Reasonable uses, including certain fishing activities, are allowed to continue in other zones. A further 33% is zoned such that the benthic habitat is fully protected. The new marine park zoning implements, in a quantitative manner, many of the theoretical design principles discussed in the literature. For example, the new network of NTAs has at least 20% protection per "bioregion," minimum levels of protection for all known habitats and special or unique features, and minimum sizes for NTAs of at least 10 or 20 km across at the smallest diameter (Fernandes et al. 2005). In addition, the Authority uses a range of other management 'tools', including permits, public education, enforcement

and more recently Plans of Management, Special Management Areas and some temporal closures, to regulate access and to control and mitigate impacts associated with human use of the GBRMP.

The GBRR covers the area of ocean from the tip of Cape York in the north to past Lady Elliot Island in the south, with mean low water as its western boundary and extending eastwards a distance of between 70 and 250 km (see Map 1 in the Great Barrier Reef Outlook Report (GBRMPA 2009)). It includes about 70 Commonwealth-owned islands. However, the majority of islands in the Great Barrier Reef is owned by the Queensland Government or privately and are not included in the GBRR (GBRMPA 2009).

The Region's boundaries match those of the GBRMP, except the Region also includes the areas around major ports. An Outlook Report (GBRMPA 2009) aimed to assess all parts of the ecosystem within the Region, including everything from mangroves and seagrass meadows to coral reefs and the open ocean. For the purposes of this report all these components are referred to as the Great Barrier Reef ecosystem or simply the Great Barrier Reef.

Where it is relevant to the Great Barrier Reef ecosystem, the Outlook Report also looked beyond the boundaries of the Region and included information about adjacent islands, neighbouring marine areas and the Great Barrier Reef catchment. The Outlook Report is a summary of the past and present condition of the Great Barrier Reef and presents its possible future.

The management strategies currently in place to protect the GBRMP include a comprehensive multiple-use zoning system that provides high levels of protection in key areas, while allowing a variety of other sustainable uses, including many types of fishing, to occur in other zones across the marine park. The Representative Areas Program took a systematic approach to the rezoning to ensure that the range of biodiversity within the Great Barrier Reef was adequately protected. The proportion of the park protected by no-take zones now comprises the world's largest network of no-take zones.

A. MPA Network Objectives

A1. The network goal(s), objectives and the process used to identify the objectives.

Since the *Great Barrier Reef Marine Park Act* was passed in 1975, the GBRMP has been managed in accordance with the Goal of the GBRMP Authority: to provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef in perpetuity through the care and development of the GBRMP. The objectives for rezoning the GBRMP focused on maintaining biological diversity, including genetic, species and ecosystem diversity, protecting ecological processes and ecosystem function, protecting marine habitats, and protecting and restoring depleted or threatened species. To address the primary ecological objectives, independent scientific advisors helped develop a suite of eleven biophysical operational principles to aid in the design of the new zoning plan. These principles included such objectives as ensuring replication of NTAs within each bioregion; representing at least 20% or more of each bioregion in NTAs [including biophysically special and unique features]; and representing cross-shelf and latitudinal diversity in the no-take network (Osmond et al. 2010).

Another suite of four social, economic. cultural, and management feasibility operational principles were similarly developed by a separate steering committee to limit potential impacts upon users. These comprised such fundamental aspects as locating NTAs wherever possible so they were complemented by adjoining terrestrial protected areas or other MPAs. Another principle recommended that boundaries of NTAs be easily identified using definable features along the coast or using simple boundaries and latitude/longitude GPS points offshore; this principle maximized public understanding and compliance as well as facilitated enforcement (Osmond et al. 2010).

The most recent GBRMP Authority objectives and strategies for the period 2010-2014 are:

Objective 1: Address key risks affecting the outlook for the Great Barrier Reef

- Generate, capture and apply the best available science to improve understanding of ecosystem resilience, risks to that resilience and response options
- Develop and implement responses (including adaptation strategies) to climate change, with Government, industry, reef users and the community
- Support initiatives to improve water quality entering the Great Barrier Reef
- Contribute to the protection of coastal ecosystems that support the Great Barrier Reef
- Partner with the Queensland Government, other governments, Traditional Owners and other relevant bodies to address the remaining impacts from fishing, and illegal fishing and poaching and other emerging risks using an ecosystem based management approach
- Deliver communication and education about the key risks affecting the outlook for the Great Barrier Reef and ways to mitigate these risks

Objective 2: Ensure that management delivers ecologically sustainable use of the Great Barrier Reef

- Provide effective legislative, policy, planning, assessment and permitting arrangements to achieve ecologically sustainable use of the Great Barrier Reef
- Partner with Traditional Owners to ensure sustainable traditional use of marine resources and protection of Traditional Owner cultural and heritage values
- Partner with the Queensland Government to deliver an effective field management program
- Collaborate with industry, reef users, other governments and the community to implement best practice approaches and certification programs to ensure protection and sustainable use of the Great Barrier Reef

Objective 3: Maintain a high performing, effective and efficient organisation

- Provide timely, accurate and effective advice to Government
- Adhere to legislative, regulatory and reporting requirements, including heritage and World Heritage obligations
- Ensure processes and systems are in place to generate, capture and apply the best available knowledge, information and technologies to inform and support management of the Great Barrier Reef
- Provide for a safe, positive and supportive workplace environment
- Ensure we have skilled, professional and knowledgeable people who work well together and are focussed on our corporate priorities
- Ensure an accountable, responsive and adaptive organisation that maximises operational effectiveness and efficiency and plans for continuous improvement
- Ensure the Great Barrier Reef Marine Park Authority remains a world leader in marine protected area management

A2. An analysis of how network-level objectives differed from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?).

While strategic objectives conceptually may not have differed between the overall GBRR/GBRMP and its zoned NTAs, operational objectives do differ. Operational objective considerations included such fundamental aspects as locating NTAs wherever possible so they were complemented by adjoining terrestrial protected areas or other MPAs, and recommending that boundaries of NTAs be easily

identified using definable features along the coast or using simple boundaries and latitude/longitude GPS points offshore. This last principle maximized public understanding and compliance as well as facilitating enforcement. The Authority applied both sets of operational principles to guide the new zoning network, but gave primary consideration to addressing biophysical operational principles due to the primacy of ecological goals in the Act (Osmond et al. 2010).

B. Design Criteria

B1. The extent to which the network design criteria/properties and steps recommended in Annexes II and III of Decision IX/20 of the ninth meeting of the Conference of the Parties (COP 9) to the Convention on Biological Diversity (CBD) have been part of the planning process are discussed, along with other design criteria if they were factored in.

The design of the GBRMP was completed before this Convention, but since the GBRR/GBRMP effectively includes the entire coral reef ecosystem, the relevant CBD design criteria can be presumed to have been incorporated. For example, representative examples of each of 70 broad habitat types or 'bioregions' were defined, and the levels of replication and amount of no-take area to be established were considered separately for each one. For most bioregions, it was recommended that a specific percentage should be protected in no-take zones (where recreation is permitted). It was recognised that protecting only representative examples of habitats or bioregions would potentially result in unique or otherwise special locations being excluded, and so a separate process was used to derive a list of such areas that needed protection (UNEP World Conservation Monitoring Centre 2008).

C. Indicators and Monitoring Protocols

The revised *Great Barrier Reef Marine Park Act* 1975 included the following monitoring requirements:

54. Great Barrier Reef Outlook Report

(1) The Authority must prepare and give to the Minister a report in relation to the Great Barrier Reef Region every 5 years. The first report must be given to the Minister by 30 June 2009.

(2) The report must be prepared in accordance with the regulations (if any).

Content of report

(3) The report must contain the following matters:

(a) an assessment of the current health of the ecosystem within the Great Barrier Reef Region and of the ecosystem outside that region to the extent it affects that region;

(b) an assessment of the current biodiversity within that region;

(c) an assessment of the commercial and non-commercial use of that region;

(d) an assessment of the risks to the ecosystem within that region;

(e) an assessment of the current resilience of the ecosystem within that region;

(f) an assessment of the existing measures to protect and manage the ecosystem within that region;

(g) an assessment of the factors influencing the current and projected future environmental, economic and social values of that region;

(h) an assessment of the long-term outlook for the ecosystem within that region;

(i) any other matter prescribed by the regulations for the purposes of this paragraph.

C1. The specific indicators developed for the network design criteria/properties (e.g., representativity, connectivity, replication, adequacy) to evaluate the effectiveness of the network design itself.

No specific indicators have been identified but for biodiversity, specific habitats and species' populations have been assessed (Appendix 2), and for a "healthy ecosystem", the area's physical, chemical, and ecological processes, along with the prevalence of diseases, have been assessed (Appendix 3). Appendices 4-8 show how other features were assessed.

C2. The monitoring protocols or other methods used to evaluate progress towards meeting network objectives, including the process used in their selection, and how adequate the indicators are in measuring the effectiveness of an MPA network in achieving its objective(s) and whether and how baseline values were established.

The first Outlook Report (GBRMPA 2009) required by the *Great Barrier Reef Marine Park Act* 1975 identified climate change, continued declining water quality from catchment runoff, loss of coastal habitats from coastal development and remaining impacts from fishing and illegal fishing and poaching as the priority issues reducing the resilience of the Great Barrier Reef. It also highlighted gaps in information required for a better understanding of ecosystem resilience. The "Outlook On-line" has a more exhaustive analysis and contains hundreds of useful references for a range of topics and issues (for example, components of ecosystem health), but is too comprehensive to go into detail in this report.

Summaries of the various sections of the Outlook Report, with specified goals, management considerations and processes used to identify the objectives, are summarized in Table 3.

Table 3: Specified GBRR goals, management considerations and criteria used in assessment, and assessment summary appendices of the Great Barrier Reef Outlook Report (GBRMPA 2009).

Goal	Management considerations	Criteria used in assessments	Assessment summary
To provide for the long term protection and conservation of the environment, biodiversity and heritage values of the Great Barrier Reef Region.	Should protect and conserve its values for all future generations and to present its values to the world. These values may be cultural, spiritual, economic, social or physical, and demonstrate continuing connections with the Great Barrier Reef Region and its natural resources.	Section 54(3)(b) of the *Great Barrier Reef Marine Park Act* 1975 requires "…an assessment of the current biodiversity within …" the Great Barrier Reef Region. This assessment is based on two assessment criteria: habitats to support species populations of species and groups of species.	Appendix 2
	A healthy ecosystem is one where ecological, physical and chemical processes are maintained.	Section 54(3)(a) of the *Great Barrier Reef Marine Park Act* 1975 requires "...an assessment of the current health of the ecosystem within the Great Barrier Reef Region and of the ecosystem outside that region to the extent that it affects that region ". This assessment is based on four assessment criteria: 1) physical processes, 2) chemical processes, 3) ecological processes, and 4) outbreaks of diseases, introduced species and pest species.	Appendix 3
Other objectives of this Act are to do the following, so far as is consistent with the main object: (a) allow ecologically sustainable use of the Great Barrier Reef Region for purposes including the	The Great Barrier Reef Marine Park is a multiple use area, providing protection, ecologically sustainable use, understanding and enjoyment. In managing the ecosystem, environmental, economic and social benefits and impacts are all considered in pursuing the best outcomes for both the Great Barrier Reef and the community.	Section 54(3)(c) of the *Great Barrier Reef Marine Park Act* 1975 requires '… an assessment of the commercial and non-commercial use …' of the Great Barrier Reef Region. The assessment is based on two assessment criteria: 1) benefits of use, and 2) impacts of use.	Appendix 4

Goal	Management considerations	Criteria used in assessments	Assessment summary
following: (i) public enjoyment and appreciation; (ii) public education about and understanding of the Region; (iii) recreational, economic and cultural activities; (iv) research in relation to the natural, social, economic and cultural systems and value of the Great Barrier Reef Region; (b) encourage engagement in the protection and management of the Great Barrier Reef Region by interested persons and groups, including Queensland and local governments, communities, Indigenous persons, business and industry; (c) assist in meeting Australia's international responsibilities in relation to the environment and protection of world heritage (especially Australia's responsibilities under the World Heritage Convention).	The experience of the last two decades has shown that much of what will happen to the Great Barrier Reef in the future will be determined by factors external to it and to Australia, [justifying] consideration of factors affecting the Great Barrier Reef's values.	This assessment of the factors that currently and are projected to influence the Great Barrier Reef's environmental, economic and social values addresses the three major external factors – climate change, coastal development and catchment runoff. It also considers the influence of direct use of the Region, based on the information outlined [above].	Appendix 5
	How effectively the Great Barrier Reef is protected and managed strongly influences the resilience of the ecosystem. Many government agencies, stakeholders and community members contribute to protection and management of the Great Barrier Reef, both on the water and in the catchment. A broad assessment of the effectiveness of the management activities currently undertaken by all these contributors is an important component in determining the major risks that remain for the Great Barrier Reef and predicting its outlook.	Section 54(3)(f) of the *Great Barrier Reef Marine Park Act* 1975 requires '…an assessment of the existing measures to protect and manage the ecosystem …' within the Great Barrier Reef Region. The assessment was undertaken by two independent external expert assessors based on six assessment criteria: 1) understanding of context, 2) planning, 3) financial, staffing and information inputs, 4) management systems and processes, 5) delivery of outputs, and 6) achievement of outcomes.	Appendix 6
	Ecosystem resilience refers to the capacity of an ecosystem to recover from disturbance or withstand ongoing pressures. It is a measure of how well an ecosystem can tolerate disturbance without collapsing into a different state that is controlled by a different set of processes. Resilience is not about a single ideal ecological state, but an ever-changing system of disturbance and recovery. An understanding of the ecosystem's resilience - its ability to absorb or recover from these threats - is an important part of predicting its likely outlook.	Section 54(3)(e) of the *Great Barrier Reef Marine Park Act* 1975 requires "…an assessment of the current resilience of the ecosystem …" within the Great Barrier Reef Region. This overall assessment of ecosystem resilience is based on the information provided in the above assessments, namely the current state and trends of the Great Barrier Reef ecosystem's biodiversity and health as well as the trends in direct use, the factors influencing future environmental values and the effectiveness of protection and management arrangements. It is supplemented by a series of case studies addressing recovery after disturbance.	Appendix 7

Goal	Management considerations	Criteria used in assessments	Assessment summary
	In the early 1980s, the priorities for managing the Great Barrier Reef were to address the identified risks arising from the absence of a planning regime, the lack of basic scientific knowledge to underpin management decisions and the lack of management. By the late 1990s, management directions were focused on the critical issues of conservation, water quality, coastal development, fisheries, tourism and recreation. More recently, the potentially catastrophic risk of climate change was assessed and became a focus of management in 2007. This assessment addresses the risks that remain to the Great Barrier Reef after considering the effectiveness of existing measures to protect and manage the ecosystem.	To assess the risks to the Great Barrier Reef ecosystem posed by the 41 [identified high priority] threats, the Australian Standard for risk assessment (AS/NZS 4360:2004) was followed. The best available information about the current state of the ecosystem, current use patterns, factors that are influencing the ecosystem, effectiveness of management and current resilience of the ecosystem was used	Appendix 8

As Dobbs et al. (2011) stated, "*[t]he Great Barrier Reef Outlook Report was the first produced in response to a newly legislated requirement for five-yearly reports on the status of and outlook for the Great Barrier Reef. It adopted an ecosystem approach, assessing all habitats and species, ecosystem processes and major uses* (…) *coupled with an assessment of management effectiveness, it provided a risk-based forward-looking projection for the ecosystem.* (…) *With no pre-determined path to follow for interpreting the legislative requirements, the [GBRMP] Authority,* (…) *with relevant Australian and Queensland Government agencies,* (…) *researchers, industry representatives and the community,* (…) *has developed a repeatable structure and method for Great Barrier Reef Outlook Reports that impartially and consistently considers the evidence and clearly presents the findings*."

C3. The extent to which "citizen science" (community-level participation) is utilised as part of the monitoring.

Citizen science is highly utilised, as per objective 2 above. A number of Australian and Queensland Government agencies, researchers, industry representatives and members of the public contributed to the development of the Outlook Report (GBRMPA 2009). The GBRMP Authority's four Reef Advisory Committees (external experts who provide independent advice on critical issues) and eleven Local Marine Advisory Committees (committees centred on regional centres along the coast) provided advice throughout the Report's development.

The GBRMP Authority held community workshops to learn about changes to the Great Barrier Reef by listening to community members' stories of the past. In addition, an Outlook Forum attended by 42 participants including scientists, leaders from industry, interest groups and the community and government representatives developed likely 'outlooks' for the Great Barrier Reef.

C4. The extent by which network-level monitoring protocols and other evaluation methods differed from those used to evaluate the progress of the individual components of the network.

C5. Efforts to evaluate the degree to which individual network components (individual MPAs) and their objectives contributed to achieving the network level objectives, and if there were any, the types of analyses used to measure this.

For both the above two headings, since the GBRMP is one large MPA, the monitoring of individual bioregion zones and a separation of the effectiveness of individual bioregion zones in meeting the overall MPA objectives has not been undertaken, or at least such analyses are not currently available.

D. Management measures

D1. In addition to MPAs, other tools or management measures being used to achieve the various types of network objectives, if any.

The overall assessment of the effectiveness of management measures is shown in Table 4 (GBRMPA 2009). Available management measures were focused mostly on "coordination & planning" rather than on spatial management, the focus of this report, but it was stated that while many of the management measures employed in the GBRR and beyond are making a positive difference, for example the GBRMP Zoning Plan of 2003, the ability to address cumulative impacts remains weak.

Over the last 30 years, a range of management tools have been applied, or developed in the GBRMP, including a comprehensive ocean zoning system, to ensure the wide range of marine activities are ecologically sustainable (Day 2008). The multiple-use zoning system governs all human activities, providing high levels of protection for specific areas, while allowing a variety of other uses elsewhere. This means that virtually all reasonable activities are allowed, including most types of fishing, shipping, dredging and aquaculture, in certain zones within the GBRMP. Zoning ensures an overriding conservation rationale for the entire area, minimizes impacts and conflicts, and provides for high levels of protection for specific representative areas, while allowing a variety of other uses to continue in other zones.

Spatial planning and zoning in the GBRMP, widely regarded as the cornerstone of its management, has evolved and changed considerably since the first zoning plan in 1981 (Day 2008). Because both natural systems and management approaches are never static, a wide variety of changes can, and do, occur which made the need for monitoring, evaluation and adaptation of spatial and other plans necessary on a continuing basis. Drawing on this unique long-term experience in the GBRMP, Day (2008) discussed key aspects of effective monitoring and evaluation, and summarized lessons learned from over two decades of adaptive management. The lessons learned during the monitoring processes in the

GBRMP, and which are relevant to the context of Marine Spatial Planning, have been summarized by Day (2008), and while those lessons are quite intuitive and general (e.g., start with a modest monitoring programme and do not wait for all the answers or perfect science before taking management action), they are comprehensive and are collectively useful to ensure that all factors are considered.

Based on the extensive monitoring, evaluation and reporting efforts that have been done in the GBRMP, Day (2008) noted that the variety of management approaches has changed considerably and been modified since their initial setup. Although spatial planning and zoning are, and will remain, a cornerstone of management for the Great Barrier Reef, he described the major changes that have occurred since the first spatial zoning plan in 1981. His observations were too numerous to detail here, but the following two general conclusions are particularly relevant:

a) "*Cumulative impacts are increasingly becoming recognised as an insidious, but important, management issue. The cumulative impacts of many small decisions (individually of apparently minimal consequence, but collectively the 'death by a thousand cuts' syndrome) are real issues for both managers and decision-makers, particularly those involved in marine spatial management*."

b) "*Management of any marine area cannot be expected to function effectively or achieve any objective unless [the following] ongoing management challenges are adequately addressed[:]* (…) *establishing effective partnering arrangements; providing jurisdictional coordination; ensuring that information relevant for management is collected; providing management resources, including an enforcement capability; and developing public awareness and education.*"

Table 4: Overall assessment of the effectiveness of existing measures to protect and manage the Great Barrier Reef ecosystem (reproduction of Fig. 6.5, GBRMPA 2009).

Managment topic	Scale	Complexity			Summary	Effectiveness if existing measures to protect and manage					
		Social	Biophysical	Jurisdictional		Contact	Planning	Inputs	Processes	Outputs	Outcomes
Coastal development	Coastal catchment areas and mainly inshore waters	Major	Major	Major	A lack of integrated planning, resources and enforcement in managing coastal development is compromising protection of the Great Barrier Reef.	G	P	P	P	P	P
Water quality	Great Barrier Reef catchment and mainly inshore waters	Major	Major	Major	Substantial resources are being provided to improve the water quality of the Great Barrier Reef. But progress is slow and patchy	VG	G	G	P	P	P
Fishing	Region-wide but variable in intensity	Major	Major	Moderate	A lack of information and coordination, plus variable uptake of best practice management, is limiting the effectiveness of fisheries management.	G	G	P	G	G	P
Climate change*	Region-wide	Major	Major	Major	The broad threats of the Great Barrier Reef from climate change are understood and management emphasis is on adaptation and improving resilience to charge.	VG	G	G	G	G	P
Traditional use of marine resources	Region-wide but limited in intensity	Major	Moderate	Moderate	Improvements are being made in the management of traditional use, including joint resource use agreements, but progress is slow.	VG	G	P	G	G	G
Recreation (not including fishing)	Region-wide but limited in intensity	Major	Moderate	Moderate	Management of recreation is generally indirect and coordination is lacking.	VG	G	G	G	G	G
Biodiversity protection	Region-wide	Minor	Major	Moderate	Many biodiversity protection measures, for example zoning plans, are making a difference, but there is no overarching framework to guide and coordinate management actions.	VG	G	G	G	G	G
Heritage	Region-wide	Moderate	Minor	Moderate	There is strong awareness of heritage values and protection arrangements are in place.	VG	VG	G	G	G	G
Ports and shipping	Concentrated around ports and shipping lanes	Moderate	Moderate	Moderate	Comprehensive management and coordination has minimised shipping incidents. Ports management appears to have protected natural values, but there is a lack of overall strategic planning.	VG	G	G	G	G	VG
Commercial marine tourism	Region-wide but limited in intensity	Major	Moderate	Moderate	Coordinated and professional management of tourism ensures a sustainable industry that contributes to Marine Park management.	VG	VG	G	VG	VG	VG
Defence	Limited in area and duration	Minor	Minor	Minor	Thorough assessment, coordination and planning mean that defence activities are well managed in the Great Barrier Reef	VG	VG	VG	VG	VG	VG
Scientific research	Region-wide but limited in intensity	Minor	Moderate	Minor	Reseach activities are environmentally sustainable and are enhancing community understanding,	VG	VG	VG	VG	VG	VG

VG = Very good G = Good P = Poor VP = Very Poor

As part of the Great Barrier Reef Outlook Report (GBRMPA 2009), the GBRMP Authority commissioned two external assessors to provide an independent assessment of the measures to protect and manage the ecosystem. The assessment included all activities both inside and outside the GBRR that contribute to the protection and management of the ecosystem. Hockings and Gilligan's (2010) assessment was incorporated into "Chapter 6, Existing Protection and Management" of the Great Barrier Reef Outlook Report (2009), but Table 5 below was revised by the authors in 2010.

Hockings and Gilligan's (2010) revised assessment (Table 5) examined the range of component activities identified as key elements of the existing measures to protect and manage the Great Barrier Reef. They found that management effectiveness challenges were evident for those issues which are broad in scale and complex socially, biophysically and jurisdictionally (i.e., climate change, coastal development, water quality, fishing). The corollary is that effectiveness is strongest on issues limited in scale or intensity and presenting only minor or moderate complexity (i.e., Defense and Scientific Research). Modest effectiveness in management process and outputs for traditional use may only be sustained if shortcomings in management inputs were addressed.

In response to the Outlook report, the national and Queensland governments prepared a response document (Australia and Queensland governments 2010). It accepted that the Outlook Report identified key priorities for management, including improving the quality of water flowing into the Reef from adjacent catchments, protecting key coastal habitats, and managing the broader ecosystem impacts of extractive activities such as fishing. The effectiveness of action to address these key pressures will be critical in rectifying current areas of concern and meeting future challenges presented by climate change. The response document also noted that the Outlook Report identified key gaps in the understanding of the Reef, and that addressing these gaps will help to better understand drivers of its long term future and to put in place appropriate responses.

3) Victoria

The State of Victoria's marine environment covers 10,174 km^2. It extends three nautical miles (5.6 km) from the coastline to depths of about 120 m. Compared with similar cool-temperate marine environments elsewhere, it is unusually rich in species, with over 12,000 species of aquatic plants and animals. Across the state there are 30 MPAs that have been reserved to protect environmental, historical or cultural features. There are five types of MPAs in Victoria, making up 11.7% of the Victorian marine environment:

1) Marine National Parks
2) Marine Sanctuaries
3) Marine and Coastal Parks
4) Marine Parks
5) Marine Reserves.

An audit by the Victorian Auditor-General (2011) examined how effectively Victoria's MPAs have been managed to protect marine biodiversity. It assessed Parks Victoria, as the agency with primary responsibility, on its planning frameworks, management activities, and monitoring, evaluation and reporting activities relevant to MPAs. The audit also assessed the Department of Sustainability and Environment's (DSE) role in marine policy and marine biosecurity [invasive species management issues], and the fishing compliance activities that the Department of Primary Industries performs in MPAs[2].

[2] DEPI was established during 2013, bringing together the former-Department of Sustainability and Environment and the former-Department of Primary Industries.

Table 5: Hockings and Gilligan's (2010) revised assessment of the component activities identified as key elements of the existing measures to protect and manage the Great Barrier Reef.

Managment topic	Scale	Complexity			Effectiveness if existing measures to protect and manage						Summary
		Social	Biophysical	Jurisdictional	Contact	Planning	Inputs	Processes	Outputs	Outcomes	
Coastal development	Coastal areas and mainly inshore waters	Major	Major	Major	G	P	P	P	P	P	A lack of integrated planning, resources and enforcement in managing coastal development is compromising protection of the Great Barrier Reef.
Water quality	Great Barrier Reef catchment and mainly inshore waters	Major	Major	Major	VG	G	G	P	P	P	Substantial resources are being provided to improve the water quality of the Great Barrier Reef. But progress is slow and patchy
Fishing	Region-wide but variable in intensity	Major	Major	Moderate	G	G	P	G	G	P	A lack of information and coordination, plus variable uptake of best practice management, is limiting the effectiveness of fisheries management.
Climate change*	Region-wide	Major	Major	Major	VG	G	G	G	G	P	The broad threats of the Great Barrier Reef from climate change are understood and management emphasis is on adaptation and improving resilience to charge.
Traditional use of marine resources	Region-wide but limited in intensity	Major	Moderate	Moderate	VG	G	P	G	G	G	Improvements are being made in the management of traditional use, including joint resource use agreements, but progress is slow.
Recreation (not including fishing)	Region-wide but limited in intensity	Major	Moderate	Moderate	VG	G	G	G	G	G	Management of recreation is generally indirect and coordination is lacking.
Biodiversity protection	Region-wide	Minor	Major	Moderate	VG	G	G	G	G	G	Many biodiversity protection measures, for example zoning plans, are making a difference, but there is no overarching framework to guide and coordinate management actions.
Heritage	Region-wide	Moderate	Minor	Moderate	VG	VG	G	G	G	G	There is strong awareness of heritage values and protection arrangements are in place.
Ports and shipping	Concentrated around ports and shipping lanes	Moderate	Moderate	Moderate	VG	G	G	G	G	VG	Comprehensive management and coordination has minimised shipping incidents. Ports management appears to have protected natural values, but there is a lack of overall strategic planning.
Commercial marine tourism	Region-wide but limited in intensity	Major	Moderate	Moderate	VG	VG	G	VG	VG	VG	Coordinated and professional management of tourism ensures a sustainable industry that contributes to Marine Park management.
Defence	Limited in area and duration	Minor	Minor	Minor	VG	VG	VG	VG	VG	VG	Thorough assessment, coordination and planning mean that defence activities are well managed in the Great Barrier Reef
Scientific research	Region-wide but limited in intensity	Minor	Moderate	Minor	VG	VG	VG	VG	VG	VG	Reseach activities are environmentally sustainable and are enhancing community understanding,

VG = Very good G = Good P = Poor VP = Very Poor

A. MPA Network Objectives

A1. The network goal(s), objectives and the process used to identify the objectives.

A system of 24 highly protected Marine National Parks and Sanctuaries was declared in Victoria on November 16, 2002, adding to the existing system of six MPAs comprising three Marine and Coastal Parks, two Marine Parks and one Marine Reserve. The new system of Marine National Parks and Sanctuaries was designed to protect and conserve representative examples of marine biodiversity, ecological processes and natural features. The vision for Victoria's Marine National Parks and Marine Sanctuaries system is to preserve the diversity of their marine environment, its flora and fauna, its natural beauty, and the diversity of activities that will be found there (Parks Victoria 2003). (Note: it is realized that a "system" does not necessarily equal a network, but these two terms have not been differentiated in the literature from Victoria. Parks Victoria used the word "MPA system", but the Auditor's report, accepted by the Government, referred to the system as a "MPA network". In this section, the words are thus considered synonymous).

The [biological and habitat] objectives for use and management of Victoria's marine waters (ECC 2000) are to:

- conserve natural ecosystems and associated biota;
- maintain the water and sediment characteristics of natural ecosystems and, where these are degraded, progressively improve them.

Victoria's Biodiversity Strategy was released in 1997. The *Environment Conservation Council (ECC) Act* 1997 stated, amongst other things, that the Council must have regard to "the need to protect and conserve biodiversity."

A2. An analysis of how network-level objectives differed from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?).

The ECC's (2000) recommendations were for the establishment of the following MPA system of legislated protected areas: *Marine National Parks*: highly protected areas which contribute to a system representing the range of marine environments and in which no fishing, extractive or damaging activities are allowed; *Marine Sanctuaries*: these complement the recommended marine national parks, and contribute to providing a comprehensive, adequate and representative system of MPAs, and are smaller, highly protected areas designated for protection of their special natural values, in which no fishing, extractive or damaging activities are allowed; and *Special Management Areas:* areas designated (formally through legislation or through other management arrangements) for protection of their special natural values, including: breeding, nursery and haul-out areas for marine mammals such as seals and whales; breeding and roosting areas for seabirds and shorebirds; areas of special value for recreational or commercial fisheries, such as nursery areas; intertidal and shallow subtidal areas with a high diversity of marine invertebrates; and areas of special biological, geomorphological or palaeontological value, in which fishing and other uses are generally allowed.

However, to date, only the first two MPA types (i.e., Marine National Parks and Marine Sanctuaries) have been established.

While no listing of site-specific MPA objectives is available, the objectives by legislative category are the following, as outlined in *Victoria's System of Marine National Parks and Sanctuaries: Management Strategy* 2003–2010 (Parks Victoria 2003):

- Marine National Park objectives are to:
    a) conserve and protect biodiversity and natural processes;

b) maintain natural ecosystems as a reference against which other areas may be compared; and

c) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments.

- Marine Sanctuary objectives are to:

a) conserve and protect the biodiversity and natural processes within the sanctuary;

b) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments, where consistent with (a).

- Special Management Area objectives, had they been established, were to:

a) protect the identified special values for the site;

b) unless otherwise specified, provide for recreational and commercial fishing activities, passive recreation, education and scientific study, to be carried out in ways that minimally affect the area and the particular values requiring protection.

There are no final management plans, and therefore objectives, to date for the other three types of state MPAs: Marine and Coastal Parks, Marine Parks and Marine Reserves. The government established them between 1984 and 1986 with the purpose of conserving, or sustainably managing, marine biodiversity rather than preserving it. While these parks have some protections in place, they are of a lower level than in Marine National Parks and Sanctuaries.

Parks Victoria's management of the Victorian MPAs is now progressing (perhaps partly as a result of the recent audit's conclusions described below) from an establishment phase using a risk-based approach to management to an asset-led and objectives-based approach which includes clearer and more measurable statements of desired condition of the natural assets they were established to conserve. This asset-led and objectives-based approach to management is consistent with the 2010 Land and Biodiversity White Paper (DSE 2009) outcomes and meets the recommendations of the Victorian Auditor General's report on MPA management released in 2011 (Parks Victoria 2011, Victorian Auditor-General 2011). However, a critique of the White paper (Coffey and Wescott 2010) notes that while "The White Paper has many "goals" and "outcomes" that are very welcome, there are no timelines associated with these broad aims". Under this process, Parks Victoria intends to more clearly define its conservation intent for the priority natural assets identified for its MPAs, establish additional objectives for the mitigation of threats to those assets, and develop management and monitoring strategies based on the above objectives. A process for developing Conservation Outcome Statements for the MPAs has been initiated, beginning with the development of outcomes for the Marine National Parks.

The process is still evolving and next steps are to:

1. Review and refine Outcome Statements developed.
2. Engage Traditional Owners in identifying key Natural Assets (including Natural and Cultural Values).
3. Engage the community in the Conservation Outcomes process.
4. Government agencies and land managers will be engaged to discuss overlap and conflict between Parks Victoria's conservation outcomes and other agency outcome statements. Conservation Outcome statements will be amended as required.
5. A marine scientific advisory committee (or small technical groups) will be established to develop detailed targets and thresholds of concern for indicators for natural assets and threats.

B. Design Criteria

B1. The extent to which the network design criteria/properties and steps recommended in Annexes II and III of Decision IX/20 of the ninth meeting of the Conference of the Parties (COP 9) to the Convention on Biological Diversity (CBD) have been part of the planning process are discussed, along with other design criteria if they were factored in.

MPAs were established prior to development of the CBD Annexes, but some of the CBD's points have nevertheless been addressed, as discussed in the discussion on the NSRMPA (earlier in this document).

C. Indicators and Monitoring Protocols

C1. The specific indicators developed for the network design criteria/properties (e.g., representativity, connectivity, replication, adequacy) to evaluate the effectiveness of the network design itself.

C2. The monitoring protocols or other methods used to evaluate progress towards meeting network objectives, including the process used in their selection, and how adequate the indicators are in measuring the effectiveness of an MPA network in achieving its objective(s) and whether and how baseline values were established.

C3. The extent to which "citizen science" (community-level participation) is utilised as part of the monitoring.

C4. The extent by which network-level monitoring protocols and other evaluation methods differed from those used to evaluate the progress of the individual components of the network.

C5. Efforts to evaluate the degree to which individual network components (individual MPAs) and their objectives contributed to achieving the network level objectives, and if there were any, the types of analyses used to measure this.

None of the above headings could be adequately addressed, as explained below in an audit of Victoria's MPA network. However, the weaknesses in Victoria Park's management approach are nevertheless relevant, so they can be avoided, and a summary of the auditor's findings is therefore provided below.

Audit Conclusions (Victorian Auditor-General 2011)

"Parks Victoria cannot show that marine biodiversity is being protected or that the related management obligations of applying resources as intended are being discharged. Little environmental management activity is evident across its MPAs. In common with the 2010 performance audit, "Control of Invasive Plants and Animals in Victoria's Parks", this audit points to systemic weaknesses with planning, program management and resource allocation that should be addressed."

Audit Findings (Victorian Auditor-General 2011)

1) Managing MPAs

"Parks Victoria could not demonstrate that it is effectively managing MPAs or that it is being effective or efficient in protecting marine biodiversity within MPAs. This is largely because dedicated funding for managing MPAs has been used for other activities. This has contributed to a lack of dedicated marine staffing and expertise, and a consequent lack of demonstrable activity to achieve management plan objectives. While dedicated funding for marine-related activities has not been used as intended, management and reporting systems within Parks Victoria are such that it is not possible to determine where these funds were applied.

Gaps in program documentation, including lack of detail about the objectives, outputs and outcomes for the programs and the activities that Parks Victoria undertakes, mean it is not in a position to assess whether its programs have been effective.

As Parks Victoria cannot track activity against labour, its biggest cost, it is also not able to show that the delivery of its programs and activities has been efficient. This situation is exacerbated by the absence of a database for capturing and reporting on activities to management, and the absence of evaluation frameworks and performance indicators."

2) Suggested planning for MPAs (Victorian Auditor-General 2011)

"DSE is responsible for state marine environmental policy. However, it has not developed a policy to direct management of the marine environment — one that encompasses all marine areas, integrates well across catchments and coastal areas, and enables consistent planning across both MPAs and other marine waters to achieve agreed outcomes.

Shortcomings exist with planning at the state level. While Parks Victoria had developed a plan for marine national parks and sanctuaries -"Victoria's System of Marine National Parks and Sanctuaries: Management Strategy 2003–2010" - it had neither fully implemented nor evaluated it before it expired in 2010.

Unclear roles, responsibilities and accountabilities between stakeholders prevent effective planning. Poor information sharing about threats to marine biodiversity exacerbates this.

An absence of regular risk assessment review, detailed action plans and a lack of evaluation - both of management plans and activities - undermine planning at the park level. Parks Victoria has not reviewed its MPA risk assessments since 2005, and it therefore has no reliable basis to judge whether the risks identified then remain current, and whether their respective risk ratings still apply. It has not completed an assessment for the other marine parks in the MPA network.

There are no final management plans for marine and coastal parks. Collectively, these parks are larger than the marine national park and sanctuary network and possess significant environmental value. While Parks Victoria has developed management plans for all 24 marine national parks and sanctuaries, which broadly detail threats and management objectives, the plans lack detailed targets, prioritised actions or responsibilities and time frames."

In summary, although there is no field assessment, the audit assessment indicates that any results obtained, had any field assessment been conducted, would have been difficult to interpret. In addition, the audit addresses many relevant issues, notably concerning the need to initially establish meaningful and relevant objectives and allocate sufficient human resources to allow them to be met. A series of recommendations to address these shortcomings are provided, but are not elaborated on here.

D. Management measures

D1. In addition to MPAs, other tools or management measures being used to achieve the various types of network objectives, if any.

Fisheries in Victoria were, until 2013, managed by the Department of Primary Industries. This department was also responsible for marine compliance activities in MPAs. While the audit (Victorian Auditor-General 2011) stated that poorly integrated planning, weaknesses in identifying threats and inadequate park management plans, which meant that Parks Victoria was not in a position to protect marine biodiversity effectively and manage MPAs, this does not necessarily mean that fisheries management measures are not in place. Concerning the MPAs alone, the audit, however, found that:

- Planning was not integrated across agencies, resulting in inadequate sharing of information about threats to marine biodiversity;

- There were no final management plans for marine and coast parks, which make up 53% of the state's MPA network;
- Neither park management plans nor any other documents detailed targets, prioritised actions or assigned responsibility and time frames for management actions;
- An absence of risk assessment reviews meant there was little assurance that risks identified and ranked in 2005 remained current.

CALIFORNIA

Background

California's *Marine Life Protection Act* (MLPA) of 1999 directed the state to redesign California's system of MPAs to function as a network in order to *"increase coherence and effectiveness in protecting the state's marine life and habitats, marine ecosystems, and marine natural heritage, as well as to improve recreational, educational and study opportunities provided by marine ecosystems subject to minimal human disturbance. California has taken a regional approach to redesigning MPAs along its 1,100 mile (1770 km) coastline"*. Significant progress has been made towards the successful regional implementation of the MLPA and the development of a cohesive statewide network of MPAs in its five marine regions: north coast, north central coast, San Francisco Bay, central coast and south coast.

There are different protected area classifications used in California's MPA network that include three MPA designations, a marine recreational management area, and special closures:

- *State Marine Reserve (SMR):* Prohibits all take and consumptive use (commercial and recreational, living or geologic). Scientific research, and non-consumptive uses are allowed.
- *State Marine Park (SMP)*: Prohibits commercial take but may allow select recreational harvests to continue. Scientific research and non-consumptive uses are allowed.
- *State Marine Conservation Area (SMCA)*: May allow select recreational and commercial harvests to continue. Scientific research and non-consumptive uses are allowed.
- *State Marine Recreational Management Area (SMRMA)*: Provides subtidal protection equivalent to an MPA, while allowing legal waterfowl hunting. Scientific research and non-consumptive uses are allowed.
- *Special closure*: Geographically specific area that prohibits human entry. Special closures are generally smaller in size than MPAs and are designed to protect breeding seabird and marine mammal populations from human disturbance.

The Central Coast study region (CCSR) was the first of five statewide study regions to complete the MLPA MPA network planning and implementation process in 2007. To date, this process has also been completed for the North Central Coast (2010), South Coast (2012), North Coast (2012), and is underway for the San Francisco Bay. These areas cover the entire mainland California coast. Given the recent establishment of these MPA networks, there have been no evaluations to date as to how the objectives in any of these regions are being met (CDFG 2008c).

1) The South Coast Region

On December 15, 2010, the California Fish and Game Commission adopted a regional MPA network for the South Coast. These MPAs took effect on January 1, 2012. The South Coast region encompasses approximately 2,351 mi^2 (6089 km^2) of state waters from Point Conception (Santa Barbara County) south to the California/Mexico border, including state waters around the Channel

Islands. The network of 50 new of modified MPAs and two special closures (including 13 MPAs previously established at the northern Channel Islands) covers approximately 355 mi^2 (919 km^2) of state waters or about 15% of the south coast region (CDFW 2014a) (Table 6).

Table 6: Summary statistics (as of October 2014) for protected areas within state waters in the South Coast region (CDFW 2014a).

Type of MPA	Count	Area (sq mi) of MPAs in South Coast State Waters	Percent of South Coast State Waters
SMR	19	241.46	10.27%
SMP	0	0.00	0.00%
SMCA (no-take)	10	33.60	1.43%
SMCA	21	80.36	3.42%
SMRMA	0	0.00	0.00%
Special Closures	2	1.89	0.08%
Total[1]	**50**	**355.42**	**15.12%**

[1] Totals include the 13 northern Channel Islands MPAs (effective since 2003) but do not include special closures.

A. MPA Network Objectives

A1. The network goal(s), objectives and the process used to identify the objectives.

With respect to setting Goals and Objectives for MPAs, the MLPA requires that all MPAs have clearly identified goals and objectives, and suggests several possible objectives. The MPA design process begins with setting regional goals and objectives that are consistent with the MLPA, then identifying goals and objectives for individual MPAs (CDFG 2008b; Figure 1). It is recommended that these regional goals are substantially similar, if not the same, to the goals of the MLPA. Once set, goals and objectives influence crucial decisions regarding size, location and boundaries, as well as management measures and the focus of monitoring and evaluation programs. The goals and objectives of other complementary programs are also consulted, such as the Nearshore Fishery Management Plan adopted under the *Marine Life Management Act* (MLMA) and the Abalone Recovery and Management Plan. In addition, considerations for the design of MPA networks may differ within each region. Design considerations are developed that complement the goals and objectives and specify items to be taken into account while preparing alternatives.

MPAs in California have both site-level (or MPA-level objectives) and regional objectives. The regional objectives are largely a restatement of the goals of the MLPA under which the MPAs are being put into effect. Individual MPA objectives vary between regions, due to differences in the way in which they were developed, but generally were intended to state what was hoped, by the stakeholders, would be achieved by any individual MPA as a contribution to the regional network (L. Whiteman, California Ocean Science Trust, pers. comm.).

There are six goals (specified in the Act) that guide the development of MPAs in the MLPA planning process (CDFG 2008b):

1. Protect the natural diversity and abundance of marine life, and the structure, function and integrity of marine ecosystems.
2. Help sustain, conserve and protect marine life populations, including those of economic value, and rebuild those that are depleted.

3. Improve recreational, educational and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity.
4. Protect marine natural heritage, including protection of representative and unique marine life habitats in California waters for their intrinsic value.
5. Ensure California's MPAs have clearly defined objectives, effective management measures and adequate enforcement, and are based on sound scientific guidelines.
6. Ensure the State's MPAs are designed and managed, to the extent possible, as a network.

A2. An analysis of how network-level objectives differed from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?).

No such analysis has been done, but network and site-specific relationships are shown in Figure 2. Site-specific objectives are mostly identified local features for protection and permitted activities by local peoples.

Detailed [operational] objectives of the South Coast Region under each [strategic] goal are (CDFG 2009):

Goal 1. To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.

1. Protect and maintain species diversity and abundance consistent with natural fluctuations, including areas of high native species diversity and representative habitats.
2. Protect areas with diverse habitat types in close proximity to each other.
3. Protect natural size and age structure and genetic diversity of populations in representative habitats.
4. Protect biodiversity, natural trophic structure and food webs in representative habitats.
5. Promote recovery of natural communities from disturbances, both natural and human induced, including water quality.

Goal 2. To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.

1. Help protect or rebuild populations of rare, threatened, endangered, depressed, depleted, or overfished species, and the habitats and ecosystem functions upon which they rely.
2. Sustain or increase reproduction by species likely to benefit from MPAs, with emphasis on those species identified as more likely to benefit from MPAs, and promote retention of large, mature individuals.
3. Sustain or increase reproduction by species likely to benefit from MPAs with emphasis on those species identified as more likely to benefit from MPAs through protection of breeding, spawning, foraging, rearing or nursery areas or other areas where species congregate.
4. Protect selected species and the habitats on which they depend while allowing some commercial and/or recreational harvest of migratory, highly mobile, or other species; and other activities.

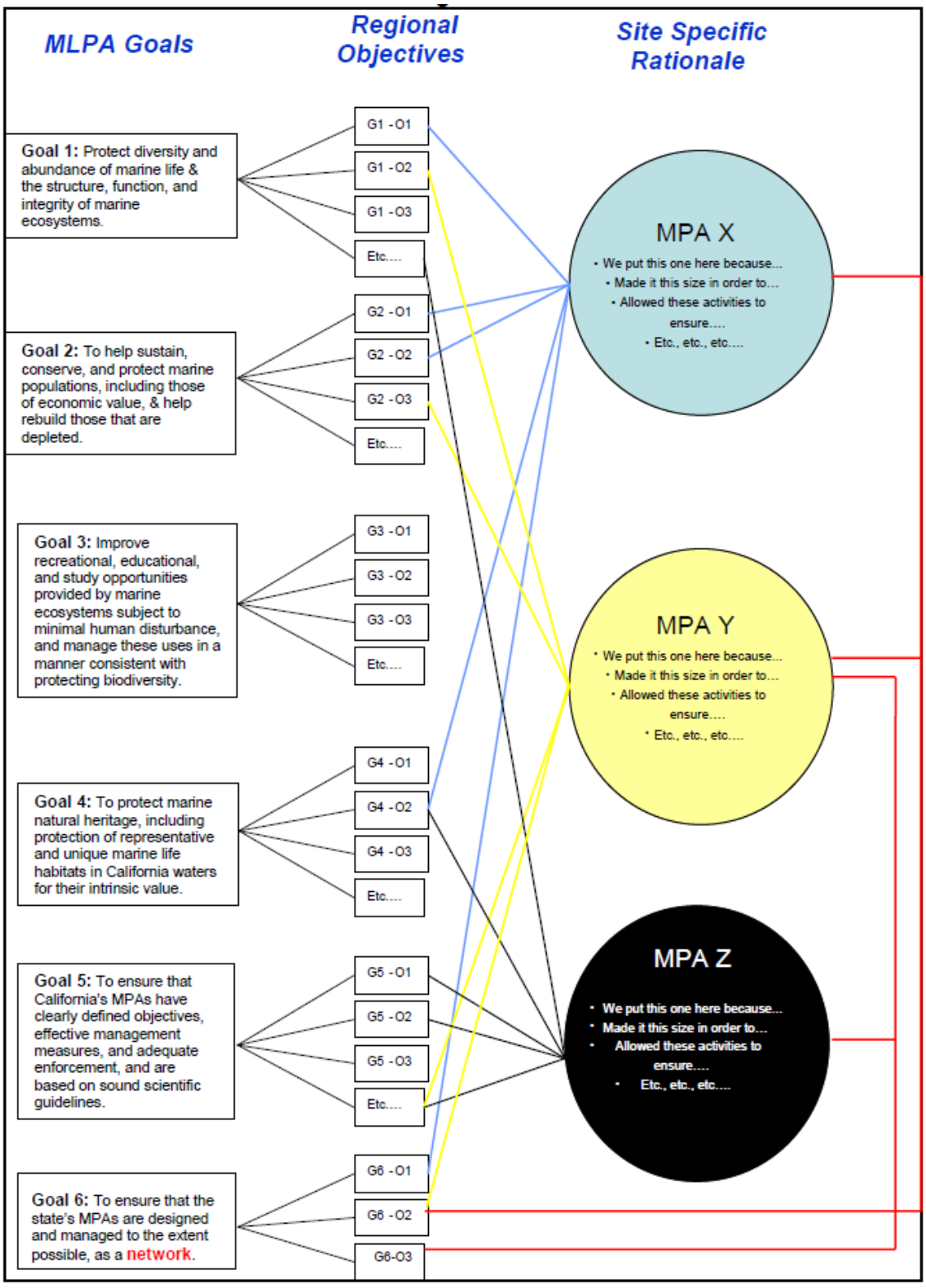

Figure 1: Connections between Goals and Regional Objectives identified by the SCRSG for MPAs in the South Coast MPA Planning Phase (reproduction of Fig. 1, CDFG 2008b). Note: lines connecting the site-specific rationales to the regional objectives are not all shown, and are just representative).

Goal 3. To improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbances, and to manage these uses in a manner consistent with protecting biodiversity.

1. Sustain or enhance cultural, recreational, and educational experiences and uses (for example, by improving catch rates, maintaining high scenic value, lowering congestion, increasing size or abundance of species, and protection of submerged sites).
2. Provide opportunities for scientifically valid studies, including studies on MPA effectiveness and other research that benefits from areas with minimal or restricted human disturbance.
3. Provide opportunities for collaborative scientific monitoring and research projects that evaluate MPAs that promote adaptive management and link with fisheries management, seabird and mammals information needs, classroom science curricula, cooperative fisheries research and volunteer efforts, and identifies participants.

Goal 4. To protect marine natural heritage, including protection of representative and unique marine life habitats in south coast California waters, for their intrinsic value.

1. Include within MPAs key and unique habitats identified by the MLPA Master Plan Science Advisory Team for this study region.
2. Include and replicate to the extent possible [practicable], representatives of all marine habitats identified in the MLPA or the California *Marine Life Protection Act* Master Plan for Marine Protected Areas across a range of depths.

Goal 5. To ensure that south coast California's MPAs have clearly defined objectives, effective management measures, and adequate enforcement, and are based on sound scientific guidelines.

1. Minimize negative socio-economic impacts and optimize positive socio-economic impacts for all users including coastal dependent entities, communities and interests, to the extent possible, and if consistent with the *Marine Life Protection Act* and its goals and guidelines.
2. Provide opportunities for interested parties to help develop objectives, a long-term monitoring plan that includes standardized biological and socioeconomic monitoring protocols, a long-term education and outreach plan, and a strategy for MPA evaluation.
3. Effectively use scientific guidelines in the California Marine Life Protection Act Master Plan for Marine Protected Areas.
4. Ensure public understanding of, compliance with, and stakeholder support for MPA boundaries and regulations.
5. Include simple, clear, and focused site-specific objectives/rationales for each MPA and ensure that site-level rationales for each MPA are linked to one or more regional objectives.

Goal 6. To ensure that the south coast's MPAs are designed and managed, to the extent possible, as a component of a statewide network.

1. Provide opportunities to promote a process that informs adaptive management and includes stakeholder involvement for regional review and evaluation of management effectiveness to determine if regional MPAs are an effective component of a statewide network.
2. Provide opportunities to coordinate with future MLPA regional stakeholder groups in other regions to ensure that the statewide MPA network meets the goals of the MLPA.
3. Ensure ecological connectivity within and between regional components of the statewide network. [Note: each "region" is a network, but the regions together will form a state-wide network, important as the ranges of many species extend beyond "region" boundaries]

4. Provide for protection and connectivity of habitat for those species that utilize different habitats over their lifetime.

B. Design Criteria

B1. The extent to which the network design criteria/properties and steps recommended in Annexes II and III of Decision IX/20 of the ninth meeting of the Conference of the Parties (COP 9) to the Convention on Biological Diversity (CBD) have been part of the planning process are discussed, along with other design criteria if they were factored in.

Because the network was set-up before the COP 9 to the CBD (CBD 2008), direction generated at COP 9 was not specifically addressed in California. However, the points listed (representativity, connectivity, replication and adequacy) were nevertheless considered, as shown by the following.

The science team for the MLPA Initiative developed guidance regarding the design of MPA networks (CDFG 2008a). *"This guidance, which is expressed in ranges for some aspects such as size and spacing of MPAs, was the starting point for regional discussions of alternative MPAs. Although this guidance is not prescriptive, any significant deviation from it should be consistent with both regional goals and objectives, and MLPA requirements. The following guidelines are linked to specific objectives, and not every MPA will necessarily achieve all guidelines":*

1. The diversity of species and habitats to be protected, and the diversity of human uses of marine environments, prevents a single optimum network design in all environments.
2. To protect the diversity of species that live in different habitats and those that move among different habitats over their lifetime, every 'key' marine habitat should be represented in the MPA network.
3. To protect the diversity of species that live at different depths, and to accommodate the movement of individuals to and from shallow nursery or spawning grounds to adult habitats offshore, MPAs should extend from the intertidal zone to deep waters offshore.
4. To best protect adult populations, based on adult neighborhood sizes and movement patterns, MPAs should have an alongshore extent of at least 5-10 km (3-6 mi or 2.5-5.4 nmi) of coastline, and preferably 10-20 km (6-12.5 mi or 5.4-11 nmi). Larger MPAs would be required to fully protect marine birds, mammals, and migratory fish.
5. To facilitate dispersal among MPAs for important bottom-dwelling fish and invertebrate groups, based on currently known scales of larval dispersal, MPAs should be placed within 50-100 km (31-62 mi or 27-54 nmi) of each other.
6. To provide analytical power for management comparisons, and to buffer against catastrophic loss of an MPA, at least three to five replicate MPAs should be designed for each habitat type within each biogeographical region.
7. To lessen negative impact, while maintaining value, placement of MPAs should take into account local resource use and stakeholder activities.
8. Placement of MPAs should take into account the adjacent terrestrial environment and associated human activities.
9. To facilitate adaptive management of the MPA network into the future, and the use of MPAs as natural scientific laboratories, the network design should account for the need to evaluate and monitor biological changes within MPAs.

Together, these guidelines address all the CBD principles, including EBSAs. Although this term is not specifically used, it is addressed in point 2 above, which is spatially focused and refers to "key" habitats. Connectivity, also not specifically referred to here, was also considered and is addressed in

points 4 and 5.

Regarding the consideration of habitats in the design of MPAs, the "*MLPA calls for protecting representative types of habitat in different depth zones and environmental conditions. The science team generally confirms that all but one of the habitats identified in the MLPA occur within state waters: rocky reefs, intertidal zones, sandy or soft ocean bottoms, underwater pinnacles, kelp forests, submarine canyons, and seagrass beds. Seamounts do not occur within state waters. The science team also notes that rocky reefs, intertidal zones, and kelp forests are actually broad categories that include several types of habitat.*

The science team identifies five depth zones which reflect changes in species composition: intertidal, intertidal to 30 meters, 30 meters to 100 meters, 100 meters to 200 meters, and deeper than 200 meters. They also call for special delineation of estuaries as a critical California coastal habitat. Finally, the science team recommends expanding the habitat definitions to include ocean circulation features, principally upwelling centers, freshwater plumes from rivers, and larval retention areas."

Regarding species likely to benefit from MPAs, the "*MLPA requires the identification of species likely to benefit from MPAs. Identifying these species may also assist in identifying habitat areas that can contribute to achieving the goals of the MLPA. The Department prepared a list of such species. The Department works with the science team in refining this list for each region. This includes identifying species on the list that are in direct need of consideration when designing MPAs, as opposed to those that may benefit but are not in immediate need of additional protection.*"

C. Indicators and Monitoring Protocols

C1. The specific indicators developed for the network design criteria/properties (e.g., representativity, connectivity, replication, adequacy) to evaluate the effectiveness of the network design itself.

Goals 1 and 2 of the South Coast Region (listed above) require ecological monitoring using indicators and other metrics chosen to provide information about populations, species, and ecosystems (MPA Monitoring Enterprise 2011). Of these, ecosystems provide the overarching umbrella, as the highest level of organization of the system, and thus provide the top level of the monitoring hierarchy.

The South Coast MPA Monitoring Plan was developed to guide monitoring of MPAs in California's South Coast Region, which includes draft monitoring metrics for long-term assessments of the condition and trends of ecosystems, including human activities, inside and outside MPAs in the South Coast region (MPA Monitoring Enterprise 2011). These monitoring metrics are subject to ongoing review and revision, taking into consideration comments received during agency and public review. Assessment of ecosystem condition and trends is implemented by monitoring South Coast Ecosystem Features, chosen to collectively represent and encompass the region's ecosystems, including humans, for the purposes of MPA monitoring. Ten Ecosystem Features have been identified for the South Coast region. These are:

1. Rocky Intertidal Ecosystems
2. Kelp & Shallow (0-30m depth) Rock Ecosystems
3. Mid-depth (30-100m depth) Rock Ecosystems
4. Estuarine & Wetland Ecosystems
5. Soft-bottom Intertidal & Beach Ecosystems
6. Soft-bottom Subtidal (0-100m depth) Ecosystems
7. Deep (>100m depth) Ecosystems, including Canyons

8. Nearshore Pelagic Ecosystems (the water column habitat within state waters deeper than 30m)
9. Consumptive Uses
10. Non-consumptive Uses

There are two options for monitoring Ecosystem condition through time: Ecosystem Feature Checkups and Ecosystem Feature Assessments. Ecosystem Feature Checkups are designed to be carried out by community and citizen-scientist groups and thus use simplified sampling protocols and methods. The metrics for Checkups are referred to as Vital Signs, and they collectively provide a coarse-grained evaluation of ecosystem condition. Ecosystem Feature Assessments are more detailed and technically demanding than Checkups and thus are likely to be implemented by government agencies and research institutions. The latter monitoring option relies on the identification of key attributes, which are important aspects of the structure or functioning of the Ecosystem Feature, and indicators that provide insight into the condition of each key attribute.

These draft monitoring metrics were developed in consultation with technical experts, agency scientists and stakeholders in the region (MPA Monitoring Enterprise 2011). In selecting indicators many considerations were taken into account, including species identified as priorities by stakeholders during public workshops: those with important ecological roles, likely fast and slow MPA responders, species with different life history characteristics, fished species which may be likely to show an MPA response, and unfished species for comparison with fished species. In the MPA monitoring plan, tables are provided that list the selected vital signs together with the selected and optional key attributes and indicators for each Ecosystem Feature.

C2. The monitoring protocols or other methods used to evaluate progress towards meeting network objectives, including the process used in their selection, and how adequate the indicators are in measuring the effectiveness of an MPA network in achieving its objective(s) and whether and how baseline values were established.

An evaluation for the whole South Coast network has not yet been done, but an initial evaluation of the Channel Island MPA network, which is part of the larger South Coast network, has been done, and results are described below under a separate heading. However, objectives again differed from the CBD's, so the questions posed cannot be directly answered.

C3. The extent to which "citizen science" (community-level participation) is utilised as part of the monitoring.

This is not clear, as monitoring has not been extensive to date, but it is planned for, as detailed above.

C4. The extent by which network-level monitoring protocols and other evaluation methods differed from those used to evaluate the progress of the individual components of the network.

This could not be ascertained, as there are no assessments of individual MPAs, and individual MPAs have basically generic network objectives. Evaluation activities are phrased on what will be done in the future, and for the region as a whole, evaluations have not been done to date. The main focus has been on developing a monitoring plan (MPA Monitoring Enterprise 2011).

Analysis and interpretation of MPA monitoring results will also consider MPA regulations and available information on MPA compliance. Because illegal take of marine organisms can influence the rates and magnitudes of population increases, information about types and levels of non-compliance will be incorporated into interpretation of documented trends. These human influences frequently impose dynamic changes on ecosystems that operate on differing spatial and temporal scales from MPA-related effects. As with natural dynamics, separating the effects of MPAs from other human influences on ecosystems is facilitated by analyzing long-term trend data and through comparisons of locations

with and without specific measurable human influences. Through development of partnerships for information exchange, data on these broad human influences will be considered in analysis and interpretation of MPA monitoring results.

C5. Efforts to evaluate the degree to which individual network components (individual MPAs) and their objectives contributed to achieving the network level objectives, and if there were any, the types of analyses used to measure this.

There is no analysis to date that addresses this, for reasons given above. However, the following potential MPA effects on ecosystem features were noted in the South Coast MPA Monitoring Plan (MPA Monitoring Enterprise 2011). "*MPAs implemented under MLPA limit or prohibit take of living marine resources, and thus their direct effects are most likely to reflect changes associated with the reduction or elimination of living marine resource removal inside MPA boundaries. By reducing fishing, MPAs can lead to increases in the abundance and size of some fish and invertebrates within their boundaries. Not all species should be expected to respond equally, or at the same rates, to MPA implementation. Increases in the density and size of organisms inside MPAs are generally predicted to be observable first in faster growing and predatory species, and with species or populations that previously were heavily fished; this initial effect of MPA implementation is one of the most widely demonstrated worldwide. The rates and magnitudes of population changes are also likely to be influenced by historical levels of fishing in areas subsequently designated as MPAs, as well as ongoing fishing activities inside MPAs that allow fishing and outside MPA boundaries. Monitoring of local species densities will reveal changes in predicted fast- and slow-responding species and in species that play key ecological roles within particular ecosystems.*

MPAs may also result in indirect effects in marine ecosystems. If abundances of functionally important fish and invertebrate herbivores and predators increase, cascading changes throughout the ecosystem may be expected, as ecological processes and interactions shift. Additionally, MPAs may increase ecosystem resilience, which can improve the capacity of ecosystems to resist, or recover from, changes due to other types of influences (e.g., climate change impacts). Monitoring important aspects of ecosystems that contribute to ecosystem structure and function facilitates detection and interpretation of such community- and ecosystem-level effects of MPAs.

Ultimately, MPAs may also lead to fishery benefits through adult and larval spillover. Adult spillover occurs when increased fish production within MPA boundaries causes individuals to move outside the MPA, where they contribute more broadly to the structure and function of ecosystems in the region and also support associated fisheries. Detection of these effects is challenging given that many species range over large geographic areas. However, analytical models which incorporate spatially explicit fishing data, including effort and catch, combined with ecological data illustrating species densities and movement patterns, can reveal contributions of MPAs to ecosystems and fisheries outside their boundaries. This latter effect of MPA implementation, however, may take many years to realize and detect."

D. Management measures

D1. In addition to MPAs, other tools or management measures being used to achieve the various types of network objectives, if any.

The full suite of fisheries and ocean activity management tools available are largely the same that are applied world-wide. Evidence of their presence, although not their details, is given by the following from MPA Monitoring Enterprise (2011). Ecosystem-based management does not manage the ecosystem directly but rather is focused on management of human activities. "*Although defined as a separate Ecosystem Feature, trends in many consumptive uses are obviously related to, and in some cases dependent upon, trends in key aspects of the ecological Ecosystem Features and the broader*

oceanographic and climatic environment. *Forging appropriate links between the ecological and human use Ecosystem Features during the selection of monitoring metrics, data collection and analyses, allows assessment of the relationships between these ecosystem elements and the consequences for MPA effectiveness in achieving MLPA goals. Further, as with the ecosystems in the region, a broad range of external drivers influence the patterns and intensity of human uses associated with MPA implementation. Perhaps most importantly, broad economic drivers also strongly influence commercial and recreational fishing activities. This was evidenced in the recent declines in coastal economies and increases in fuel prices that have directly influenced commercial and recreational fishing ventures. In addition, MPA regulations are part of a broader suite of fishery management regulations and tools that control fishing activity inside and outside MPA boundaries. This suite of information will be incorporated into integrated analyses to examine trends in consumptive uses with respect to individual MPAs, key ports and access locations, and across the region as a whole."*

2) Channel Islands Marine Protected Area Network

Note: The standard structure of the report template has also not been used for this region, as its content would be basically the same as that for the South Coast MLPA region, described above.

The Channel Islands National Marine Sanctuary (CINMS) network is now part of the California MLPA South Coast Region, as per the following. "*The South Coast region includes all state waters along the California coastline from Point Conception to the California/Mexico border, including the Channel Islands. On December 15, 2010, the California Fish and Game Commission adopted a regional MPA network for the South Coast. These MPAs took effect on January 1, 2012."* However, because of both the Sanctuary's longer history and because a monitoring exercise has recently been conducted in it alone, it is also considered separately in the following.

Designated in 1980, the CINMS consists of an area off the coast of California of approximately 1,470 square miles (3807 km^2) adjacent to the following islands and offshore rocks: San Miguel Island, Santa Cruz Island, Santa Rosa Island, Anacapa Island, Santa Barbara Island, Richardson Rock, and Castle Rock, extending seaward to a distance of approximately six nautical miles (11 km). The islands and rocks vary in distance from 12 to 40 nautical miles (22 to 74 km) offshore from Santa Barbara and Ventura counties in southern California. The Sanctuary supports a rich and diverse range of marine life and habitats, unique and productive oceanographic processes and ecosystems, and culturally significant resources.

The Sanctuary's original 1983 goals were stated as follows (NOAA 2009b):

- *Resource Protection* - The goal assigned highest priority for management is to enhance protection of the marine environment and resources of the Channel Islands National Marine Sanctuary.
- *Research* - Research activities within the program are directed to resolving management concerns and increasing the understanding of the Sanctuary environment and significant resources.
- *Interpretation* - Interpretative programs aim to enhance public awareness and understanding of the significance of the Sanctuary and the need to protect its resources.
- *Visitor Use* - The Sanctuary goal for visitor management is to encourage commercial and recreational use of the Sanctuary that is compatible with protection of its significant resources.

"*In general, the Sanctuary has made progress towards accomplishing the broad goal areas of the original plan: resource protection, research, interpretation, and visitor use. Through enforcement of regulations and collaboration with other agencies and constituents CINMS has enhanced protection of Sanctuary resources. The Sanctuary has made strides towards directing research efforts to resolving*

management concerns and increasing understanding of the Sanctuary environment and resources, including through use of the Sanctuary's research vessels. The Sanctuary has developed interpretative programs that enhance public awareness and understanding of the significance of the Sanctuary and the need to protect its resources. The Sanctuary has encouraged commercial and recreational use of the Sanctuary that is compatible with protection of its significant resources, such as placing trained naturalists on board commercial whale watching vessels." (NOAA 2009b)

In 2002 the California Fish and Game Commission established a network of MPAs within the nearshore waters of the Channel Islands National Marine Sanctuary (CINMS or Sanctuary). NOAA expanded the MPA network into the sanctuary's deeper waters in 2006 and 2007 (Figure 2). The entire CINMS MPA network consists of 11 marine reserves where all take and harvest is prohibited, and two marine conservation areas that allow limited take of lobster and pelagic fish. This MPA network encompasses 241 square nautical miles (821 km^2). The Channel Islands MPA network is designed to:

- Protect and restore habitats and ecosystems.
- Provide a refuge for all sea life.
- Provide reference areas for research and educational opportunities.
- Protect the nation's marine natural heritage for future generations.

The Channel Islands MPAs are a work in progress, as existing MPAs are being evaluated for their effectiveness in achieving network effectiveness. One of the major areas that PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans targeting the coastal ocean ecosystem along the U.S. west coast) science aims to inform is the design of MPAs and their networks. Once a need for a MPA has been identified, two key questions are asked:

1. How should they be designed to best meet their intended goals?
2. What is the best available science for informing that design?

PISCO's research and policy and outreach program are designed to produce information to inform the design of MPA networks and assure that the best available scientific information is available to processes involved in their development. Once an MPA or network of MPAs has been established, two more key questions are asked:

1. Are they meeting goals for which they were established?
2. Might their design be improved for meeting their goals (e.g., size, location)?

To determine how well MPAs are effectively fulfilling their goals, PISCO scientists monitor MPAs and the surrounding ecosystem to document the response of populations and ecosystems to the establishment of the MPAs. PISCO's experience in operating large scale, long-term monitoring programs has enabled it to inform the design and implementation of monitoring programs for the kelp forests and rocky shore ecosystems it studies, including the coastal oceanography. Adapting PISCO's kelp forest, rocky shore and oceanographic monitoring program for MPA networks in the California

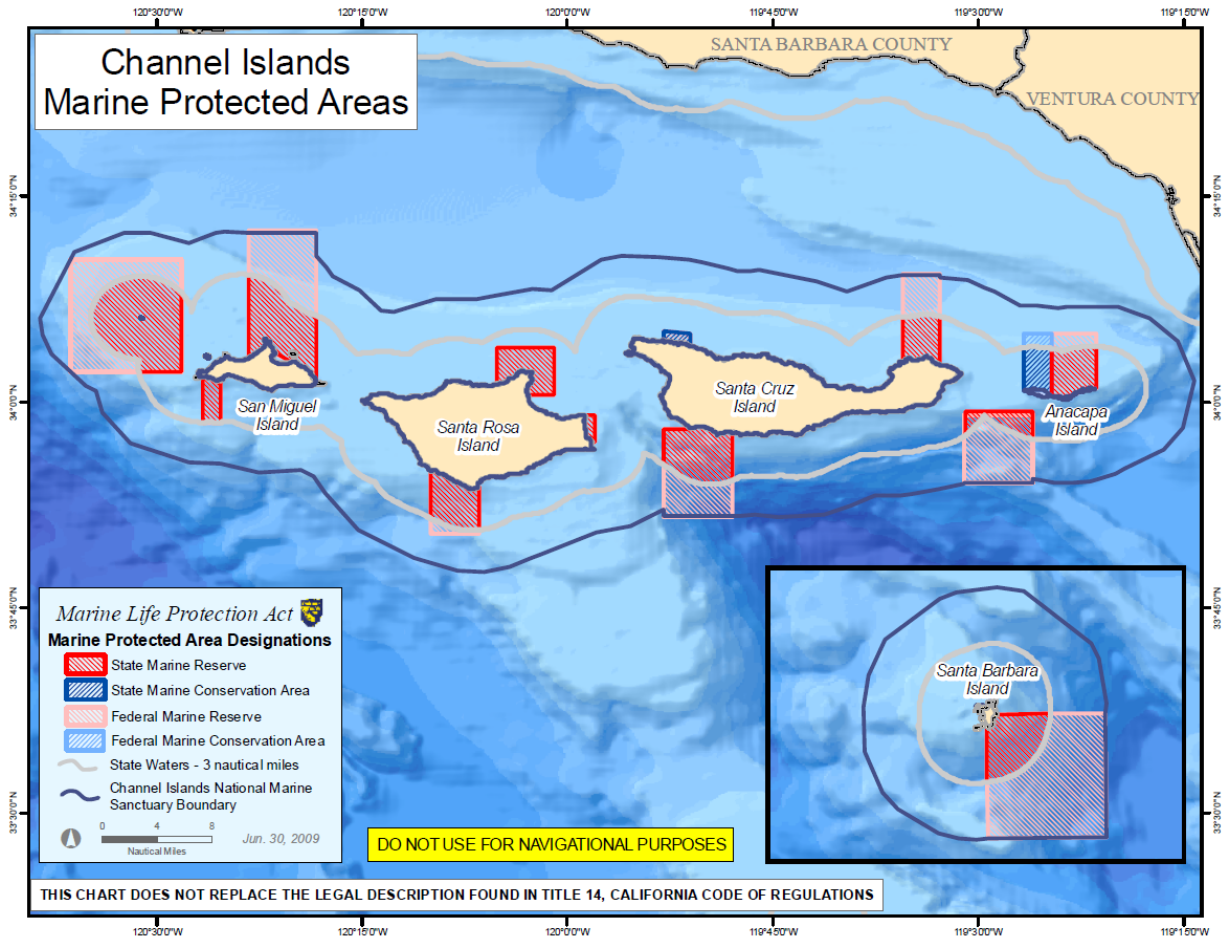

Figure 2: Channel Islands Marine Protected Areas (reproduction of figure by NOAA (2014)).

Channel Islands and central coast of California, PISCO has helped to document changes in kelp forest ecosystems in recently established MPAs in the Channel Islands and establish the baseline conditions of populations and kelp forest ecosystems on the central coast.

The revised Sanctuary's goals (an update of the Sanctuary's original 1983 goals) are derived from the *National Marine Sanctuaries Act.* Of a total of nine goals, four are relevant to the scope of this report. These goals are as follows (NOAA 2009b):

1. Protect the natural habitats, ecological services and biological communities of all living resources inhabiting the Channel Islands National Marine Sanctuary, and the sanctuary's cultural and archaeological resources, for future generations;
2. Where appropriate, restore and enhance natural habitats, populations and ecological processes within the Channel Islands National Marine Sanctuary;
3. Provide comprehensive and coordinated conservation and management of the Channel Islands National Marine Sanctuary, as well as the activities affecting it, in a manner complementing existing regulatory authorities; and
4. Create models of and incentives for ways to conserve and manage national marine sanctuaries, including the application of innovative management techniques.

Network Effectiveness – the First Five Years (2003 to 2008)

A public symposium on the first five years of monitoring, enforcement and education programs for the Channel Islands Marine Protected Area Network was held in 2008 (Airamé and Ugoretz 2008). To determine if the MPAs were protecting marine species and habitats, scientists monitored ecological changes and studied changes in habitats; abundance and size of species of interest; the ocean food web and ecosystem; and the movement of fish and invertebrates from MPAs to surrounding waters. Additionally, they monitored human activities such as commercial and recreational fisheries, and compliance with MPA regulations. Although five years was not long enough to determine if the MPAs accomplished all of their goals, this initial analysis offered a glimpse of the changes that were beginning to take place and illustrated the types of information that will eventually be used to assess the MPAs' effectiveness.

Monitoring Plan

"The three broad goals of monitoring were: to establish baseline data, record changes in resources and evaluate effectiveness of the Marine Protected Areas Network. Information gathered from monitoring activities help determine the effects the MPAs are having on the ecological relationships, biological communities and habitats within the MPA Network and the Sanctuary" (CINMS 2010)

Revised Final Rule Sanctuary Regulations

Revised regulations are now in effect, and the management plan revision process has been completed. Changes to sanctuary regulations clarify and strengthen protections for marine habitats, sensitive species, water quality and submerged cultural and historical resources. Highlights of the regulatory changes include:

- protecting natural ecosystems from the introduction of non-native species;
- protecting the area's water quality by prohibiting harmful vessel discharges;
- prohibiting discharges beyond the boundary of the sanctuary that enter and damage the sanctuary's resources; and
- improving habitat protection by limiting or prohibiting activities that impact the sea floor.

The revised regulations (NOAA 2009a) for the Sanctuary implement prohibitions on:

"Exploring for, developing, or producing minerals within the Sanctuary; abandoning matter on or in Sanctuary submerged lands; taking marine mammals, sea turtles, or seabirds within or above the Sanctuary; possessing within the Sanctuary any marine mammal, sea turtle, or seabird; marking, defacing, damaging, moving, removing, or tampering with Sanctuary signs, monuments, boundary markers, or similar items; introducing or otherwise releasing from within or into the Sanctuary an introduced species; and operating motorized personal watercraft within waters of the Sanctuary that are coextensive with the Channel Islands National Park."

3) The Central Coast Region

Note: The report template has also not been used for this region, as its content would be basically the same as that for the South Coast MLPA region, described above.

The Central Coast region encompasses approximately 1,144 mi^2 (2963 km^2) of state waters from Pigeon Point (San Mateo County) south to Point Conception (Santa Barbara County). A network of 29 MPAs covering approximately 207 mi^2 (535 km^2) of state waters or about 18% of the central coast region has been in place since September 2007 (CDFW 2014b) (Table 7)

Table 7: Summary statistics for MPAs within state waters in the Central Coast region as of October 2014 (CDFW 2014b)

Type of MPA	Count	Area (sq mi) of MPAs in Central Coast State Waters	Percent of Central Coast State Waters
SMR	13	86.25	7.54%
SMCA	14	111.21	9.72%
SMCA/SMP	1	6.26	0.55%
SMRMA	1	3.07	0.27%
Total	**29**	**206.79**	**18.08%**

As mandated by the MLPA, the Central Coast Study Region (CCSR) process (2004-2007) examined all existing MPAs within the CCSR, and created a suite of new MPAs along the central coast that will function as part of a statewide network of MPAs once the implementation of the MLPA is completed. In the MLPA process, MPAs are designed by members of a Regional Stakeholder Group in a collaborative public process, who work closely with the Science Advisory Team (SAT), the Blue Ribbon Task Force (BRTF), and the Department of Fish and Game, to develop a suite of alternative MPA proposals.

In 2007 there were 12 existing state MPAs in the region, and a special invertebrate closure at Año Nuevo (San Mateo County). The MPAs existing prior to the implementation of the MLPA varied in size and comprised 3.8% of the study region in their total area. More than half of these allowed the take of most recreationally or commercially important species. Certain existing areas such as the Point Lobos State Marine Reserve were considered key areas which provided full protection of marine resources. The following management plan for Central Coast MPAs summarized the network description and key features and considerations for design and implementation of MPAs. These are similar to those for the South Coast region (listed above) but are not identical (CDFG 2008c).

Goal 1. To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.

1. Protect areas of high species diversity and maintain species diversity and abundance, consistent with natural fluctuations, of populations in representative habitats. Protect marine life communities associated with areas of diverse habitat types in close proximity to each other.
2. Protect natural size and age structure and genetic diversity of populations in representative habitats.
3. Protect natural trophic structure and food webs in representative habitats.
4. Protect ecosystem structure, function, integrity and ecological processes to facilitate recovery of natural communities from disturbances both natural and human induced.

Goal 2. To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.

1. Help protect or rebuild populations of rare, threatened, endangered, depleted, or overfished species, where identified, and the habitats and ecosystem functions upon which they rely.
2. Protect larval sources and enhance reproductive capacity of species most likely to benefit from MPAs through retention of large, mature individuals.

3. Protect selected species and the habitats on which they depend while allowing the harvest of migratory, highly mobile, or other species where appropriate through the use of state marine conservation areas and state marine parks.

Goal 3. To improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbances, and to manage these uses in a manner consistent with protecting biodiversity.

1. Ensure some MPAs are close to population centers and research and education institutions and include areas of traditional non-consumptive recreational use and are accessible for recreational, educational, and study opportunities.
2. To enhance the likelihood of scientifically valid studies, replicate appropriate MPA designations, habitats or control areas (including areas open to fishing) to the extent possible.
3. Develop collaborative scientific monitoring and research projects evaluating MPAs that link with classroom science curricula, volunteer dive programs, and fishermen of all ages, and identify participants.
4. Protect or enhance recreational experience by ensuring natural size and age structure of marine populations.

Goal 4. To protect marine natural heritage, including protection of representative and unique marine life habitats in central California waters, for their intrinsic value.

1. Include within MPAs the following habitat types: estuaries, heads of submarine canyons, and pinnacles.
2. Protect species associated with, and replicate to the extent possible, representatives of all marine habitats identified in the MLPA or the Master Plan Framework across a range of depths.

Goal 5. To ensure that central California's MPAs have clearly defined objectives, effective management measures, and adequate enforcement, and are based on sound scientific guidelines.

1. Minimize negative socio-economic impacts and optimize positive socio-economic impacts for all users, to the extent possible, and if consistent with the *Marine Life Protection Act* and its goals and guidelines.
2. For all MPAs in the region, develop objectives, a long-term monitoring plan that includes standardized biological and socioeconomic monitoring protocols, and a strategy for MPA evaluation, and ensure that each MPA objective is linked to one or more regional objectives.
3. To the extent possible, effectively use scientific guidelines in the Master Plan Framework.

Goal 6. To ensure that the central coast's MPAs are designed and managed, to the extent possible, as a component of a statewide network.

1. Develop a process for regional review and evaluation of implementation effectiveness that includes stakeholder involvement to determine if regional MPAs are an effective component of a statewide network.
2. Develop a mechanism to coordinate with future MLPA regional stakeholder groups in other regions to ensure that the statewide MPA network meets the goals of the MLPA.

"*Design and implementation considerations were additional factors that may help fulfill provisions of the MLPA related to facilitating enforcement, encouraging public involvement, and incorporating socio-economic considerations, while meeting the act's goals and guidelines. Design considerations were*

applied as the location, category (reserve, park or conservation area), size and other characteristics of potential MPAs were developed. Design and implementation considerations are cross cutting (they apply to all MPAs) and are not necessarily measurable. In developing regional goals and objectives for the central coast, the Central Coast Regional Stakeholder Group (CCRSG) identified several issues relevant to this ToR that should be considered in the design of marine protected areas" (CDFG 2008c):

1. In evaluating the siting of MPAs, considerations shall include the needs and interests of all users;
2. To the extent possible, site MPAs to prevent fishing effort shifts that would result in serial depletion;
3. In developing MPA proposals, consider how existing state and federal programs address the goals and objectives of the MLPA and the central coast region as well as how these proposals may coordinate with other programs; and
4. To the extent possible, site MPAs adjacent to terrestrial federal, state, county, or city parks, marine laboratories, or other "eyes on the water" to facilitate management, enforcement, and monitoring.

SOUTH AFRICA

Background

Information on South Africa's MPAs is limited, and most of the information presented below, unless otherwise noted, is from Tunley (2009). The first MPA in South Africa was established in 1964 in Tsitsikamma. In 1977, a government-established task group developed a policy on MPAs that set out criteria for MPA management (Lemm and Attwood 2003) and declared that the management of a MPA should be assigned to one competent authority (Attwood et al. 2000). Hockey and Buxton (1989) completed a review on the "State of MPAs" and found that:

- The legislation relevant to MPAs was too diverse and in need of consolidation,
- A decentralised system whereby Provincial authorities have the ability to designate MPAs would be more effective, and
- The awareness and enforcement at MPAs was not sufficient.

From 1990 onwards, South Africa declared many MPAs (Bewana 2009). By 1996, there was a listed total of 112 marine and coastal protected areas, and in response to conflict over resources, ambiguous goals and requests for additional protected areas, a Marine Reserves Task Group was established. This task group was commissioned to review the administration, management, design and representativity of MPAs and to prepare a policy for MPAs in South Africa (Attwood et al. 1997). The review, which involved a questionnaire survey, identified the following weaknesses in management relevant to the scope of this report:

- The absence of a national MPA coordinating body;
- Inadequate legislation (*Sea Fisheries Act*) to control non-fishing related activities in MPAs;
- MPAs mainly focused on preservation of ecosystems and enhancement of fisheries, at the expense of multiple-use of MPAs;
- Lack of management plans;
- Objectives for MPAs not documented or publicized;
- Lack of participatory process that involve consultation of users and adjacent communities; and

- Inadequate monitoring programmes.

The *Marine Living Resources Act No 18. of 1998* (MLRA) was created to replace the previous legislation pertaining to MPAs and fisheries. In 2000, 19 MPAs were declared under this Act. An assessment of the state of management of MPAs conducted by Lemm and Attwood (2003) was more exhaustive than the previous reviews as it involved site visits and interviews with those most involved in MPA management. It indicated that there had been considerable improvement since the previous assessment, notably through new national legislation that governs both fisheries and MPAs and the assignment of a national coordinating body (i.e., the Marine and Coastal Management branch (MCM) of the Department of Environmental Affairs (DEA)). However it was reported that most of the weaknesses found in the previous assessment still needed substantial improvement.

A reassessment of management conducted by Bewana (2009) was less exhaustive than the previous assessment and results were reported at an institutional level. This reassessment indicated that there was much variation in management efficiency between management agencies and highlighted progress in the central coordination of MPAs and improved structuring of conservation agencies in dealing with MPAs.

The identified weaknesses included:

- lack of stakeholder participation,
- MPAs still had a rather narrow focus towards conservation of marine resources and biodiversity and ecotourism,
- lack of multiple use MPAs, and
- inadequate zoning, management plans and permit issuing procedures.

The assessment of the state of MPA management undertaken by Lemm and Attwood (2003) flagged risks and weaknesses in the management of MPA's in South Africa. This assessment then guided management interventions over the five year period up until 2009. The assessment by Tunley (2009) was a more exhaustive, site-level evaluation of the state of management of MPAs in South Africa that both reported on and acknowledged progress made through the actions of national and provincial agencies involved in MPA management and the NGOs supporting MPA management, and prioritized needs and weaknesses to guide actions of these agencies and NGOs. Managers from each of the Government Gazetted 22 MPAs were interviewed and representatives of each of the seven management authorities completed questionnaires. Discussions were held with biologists and social scientists involved in various MPAs to supplement the information. Each MPA was visited and discussions were held with MPA staff in order to gain a broader perspective of the issues faced.

The conclusions were that the co-ordination and formalization of MPA management has improved substantially through the development of agreements between the MCM and conservation authorities for the management of 21 of the 22 Government Gazetted MPAs. The implementation of legislation requiring that MPAs situated adjacent to terrestrial protected areas must be managed by the management authority for the protected area in an integrated manner also greatly improved the situation. The deficiencies regarding the management of non-consumptive recreational activities highlighted in the 2003 assessment persisted.

There was progress with regard to the formulation of MPA management plans; however, in several cases, it was indicated that few aspects of the management plans were useful to managers and that the plans needed to be updated. Furthermore, the involvement of stakeholders during the management planning processes for the majority of the MPAs had not been sufficient and the information available to planners was only partially adequate.

Today (as of November 2014) there are 21 marine MPA's in South Africa promulgated under the MLRA.

A. MPA Network Objectives

A1. The network goal(s), objectives and the process used to identify the objectives.

Different MPAs had a variety of objectives, which were mostly not consistent among MPAs, and no network objectives could be found.

A2. An analysis of how network-level objectives differed from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?).

Since no network objectives have been specified, this analysis could not be conducted. Nevertheless, there have been several noted benefits stemming from the fact that the MLRA governs both fisheries and marine conservation (Lemm and Attwood 2003); however it was suggested that this limits the conceptualization of the purpose and benefits of MPAs to fisheries management (Sunde and Isaacs 2008). Section 43 of the MLRA stipulates that MPAs may be declared by the Minister to protect marine species and the environment on which they depend, to facilitate fisheries management, and to diminish any conflict arising from competing uses in the area. This reflects the international consensus that MPAs can have varied objectives. However, the MLRA does not explicitly state that conservation is the primary objective of MPAs, as has been suggested by the CBD, which could lead to confusion in application.

In 2000, 19 MPAs were declared but no specific objectives were provided for each MPA and only some permitted activities were listed. Given that MPAs can accomplish a broad range of objectives, Tunley (2009) emphasized that it is essential that objectives are defined for the network of MPAs as well as the individual MPAs to guide the MPA design and management intent and actions. However, the five MPAs that have been proclaimed since 2000 did have specified objectives and regulations for the respective MPAs. It was therefore recommended that an updated Government Gazette be published which clearly defines each of the MPAs specific objectives.

B. Design Criteria

B1. The extent to which the network design criteria/properties and steps recommended in Annexes II and III of Decision IX/20 of the ninth meeting of the Conference of the Parties (COP 9) to the Convention on Biological Diversity's (CBD) have been part of the planning process are discussed, along with other design criteria if they were factored in.

This could not be determined, but seems unlikely to have been addressed. There were several MPAs in which critical areas for the maintenance of the ecological integrity of the system were excluded or not afforded sufficient protection in the MPA, or where there was insufficient stakeholder involvement in the design of the MPA and the zonation. This has resulted in much dissatisfaction and in most cases non-compliance in many of the MPAs.

C. Indicators and Monitoring Protocols

C1. The specific indicators developed for the network design criteria/properties (e.g., representativity, connectivity, replication, adequacy) to evaluate the effectiveness of the network design itself.

C2. The monitoring protocols or other methods used to evaluate progress towards meeting network objectives, including the process used in their selection, and how adequate the indicators are in measuring the effectiveness of an MPA network in achieving its objective(s) and whether and how baseline values were established.

Five MPAs are part of the West Coast National Park. These MPAs are managed by South African National Parks (SANParks) and the MCM. However, Tunley (2009) found that there was no comprehensive strategy for monitoring of management effectiveness and adaptive management within SANParks for the West Coast National Park MPAs. Sporadic monitoring of resource conditions, inventories, and use had been conducted through external programs; however there was no system implemented to monitor social conditions. A large amount of research (17 projects in 2009) had been and was being conducted in the MPAs, and researchers do inform management of the need for actions or interventions.

Driver et al. (2005) mapped for the first time the marine habitats in all of South Africa's waters. The National Spatial Biodiversity Assessment (NSBA) marine team recognized 34 marine biozones, extending from the coastal (or supratidal) zone to the end of the EEZ, which marks the end of South African waters. The integrity of different marine habitats was evaluated by quantitative expert assessment of the impacts of nine major categories of resource use and other influences on the marine environment, in each marine biozone. They then assessed the status of marine ecosystems, using the marine biozones and the then current levels of impact on those biozones: 65% of marine biozones were considered threatened, with 12% critically endangered, 15% endangered, 38% vulnerable, and 35% least threatened. Priority actions to conserve marine biodiversity suggested included:

1. Engage with the commercial fishing industry to find ways to reduce negative impacts on marine biodiversity (both on fish stocks themselves, and on marine habitats, especially soft-bottom trawling grounds), thus contributing to the long-term health of the industry.
2. Expand marine protected areas, especially in the Namaqua bioregion, and beyond the coastal region into the deep sea region. Representative protection of the South African EEZ cannot be achieved with coastal MPAs that extend two or three nautical miles (3.7-5.6 km) offshore. The proposed Namaqualand MPA will play an important role in this regard, although MPAs do not always ensure adequate protection of their biodiversity and more effort needs to go into ensuring compliance within MPAs.
3. Initiate an integrated approach to managing resources at the local level, especially for coastal areas not in MPAs.

Lombard et al. (2004) conducted a national spatial assessment of the conservation status of selected marine biodiversity patterns in South Africa’s marine environment. Results of the species analyses showed that many species may occur in existing no-take MPAs, but their status within these MPAs is unknown and surveys within reserves are required to confirm both their presence, and their viability. Even if all existing MPAs were proclaimed as no-take MPAs, gaps would still exist in the protection of these species. Analyses of intertidal habitats showed that no-take MPAs did not provide adequate protection for these habitats. Results of the offshore species analyses showed that representative protection of the South African EEZ cannot be achieved with coastal MPAs that extend two or three nautical miles (3.7-5.6 km) offshore. Threat status analyses made it clear that extractive marine living resource use is the overriding threat to South African marine biodiversity, and it affects all depth strata and all bioregions.

C3. The extent to which “citizen science” (community-level participation) is utilised as part of the monitoring.

Tunley (2009) reported that managers indicated that SANParks considered positive relations with local communities as critical and that efforts had been made to include them in management, and presumably thus monitoring. The local communities' tolerance of illegal activities in the MPA was viewed as low; however illegal activities were not always reported to the authorities. There was mixed support for the MPA and its staff with some significant opposition where people's livelihoods had been affected by the MPA. There are some benefits from the MPA that go to locals; however these are not

distributed equitably. Despite efforts to include and engage all stakeholders, it was indicated that a minority could not engage adequately, and that the distribution of economic benefits to local communities was not equitable while recreational benefits were going mostly to visitors.

D. Management measures

D1. In addition to MPAs, other tools or management measures being used to achieve the various types of network objectives, if any.

The interests of resource users and communities influence the performance of MPAs and thus need to play a role in shaping the development and management of MPAs (Beaumont 1997, Kelleher 1999, Pomeroy et al. 2006). A major weakness identified in a number of the management plans was the limited meaningful involvement of affected local communities in the planning process. It is also essential to consider that each location has unique social characteristics. Therefore, the diversity of coastal people and communities, especially in relation to their livelihood strategies, needs to be understood when planning and managing MPAs (Pomeroy *et al.* 2006). This understanding can only come from effective, meaningful engagement with all affected communities (Dudley 2008, IUCN 1994).

In support of this, Sowman et al.'s (2011) extensive research in two coastal fishing communities highlighted impacts and conflicts arising from a conventional approach to MPA identification, planning and management. They stated that a historical perspective on MPA identification and governance in South Africa reflects the continued influence of a top-down and natural science-based paradigm that has hardly changed over the past half century, despite the wealth of literature, and a growing consensus, that advocates the need to adopt a more integrated and human-centered approach. Based on extensive research in two coastal fishing communities, they highlighted impacts and conflicts arising from this conventional approach to MPA identification, planning and management. They suggested that failure to understand a particular fishery system in all its complexity, in particular the human dimensions, and involve resource users in planning and decision-making processes, undermines efforts to achieve conservation and fisheries management objectives. The customary rights of local resource users, and their food and livelihood needs in relation to marine resources, need to be acknowledged, prioritized and integrated into planning and decision-making processes. They noted that a huge challenge in South Africa is convincing ecologists, fisheries scientists and managers that MPA success depends on addressing the root causes of resource decline and incorporating social factors into MPA identification, planning and management.

In summary, although information on this network is limited, its assessments to date, like the audit in Victoria mentioned above, provides useful insight into how to best determine relevant MPA objectives.

PHOENIX ISLANDS PROTECTED AREA (KIRIBATI)

The Phoenix Islands Protected Area (PIPA), like the Great Barrier Reef Marine Park, is a large area that includes largely subsistence-based communities. It is a single-zoned MPA, not an MPA network, but is included here because some of its objectives and its management approach may be relevant to the situation in the Canadian Arctic, which also is huge in area, sparsely populated and supports subsistence exploitation. Because of these characteristics, the standard template for this report has not been utilized.

The PIPA has an area of 408,250 km^2 and includes eight atoll islands, two submerged reefs and at least 14 identified seamounts and their surrounding mainly deep water marine area (Figure 3, PIPA Office 2009). It is currently the largest MPA in the world. The Phoenix Islands, lying in the heart of the Pacific Ocean, contain eight out of 33 islands in Kiribati and constitute 11.34% of Kiribati's EEZ. While the islands have supported different people over their history, their small size and isolation, even by Pacific standards, have meant they have not been able to support permanent human settlements. And

because of this isolation, the islands and seas around them have retained a pristine condition that few other islands have been able to. The framework exists to protect and sustain these islands in a way that benefits Kiribati's economy and the people that live on the populated islands.

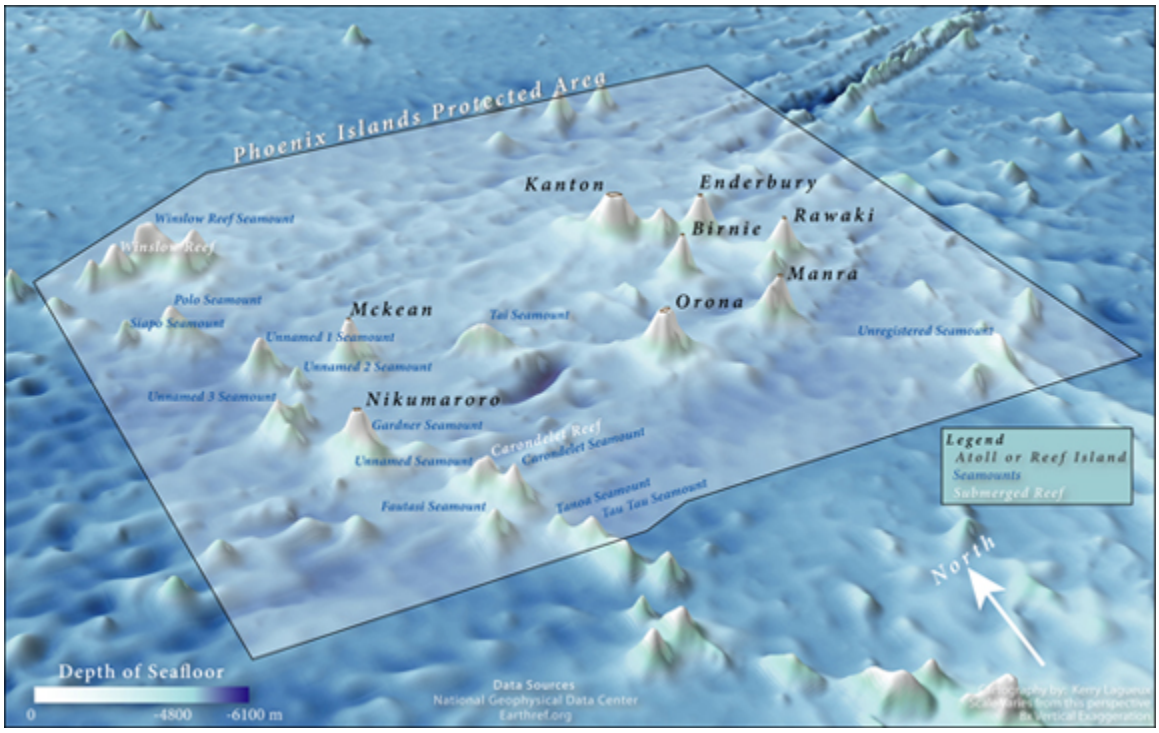

Figure 3: Phoenix Islands Protected Area (reproduction of figure by PIPA Office (2009)).

The Phoenix Islands Protected Area Draft Management Plan (PISC 2009) condenses all the elements that are necessary to maintain PIPA as a pristine set of islands in the middle of a vast ocean. From laws to staffing to enforcement to monitoring to financing, it summarizes all the elements needed to manage and maintain the Phoenix Islands. The vision for PIPA is "*to conserve and manage the natural and cultural heritage of the Phoenix Islands for the sustained benefit of the peoples of the Republic of Kiribati and the world*." There are a number of guiding principles that form the foundation of the plan, namely: intergenerational equity, ecological sustainability, the precautionary principle, integrated planning and management, stakeholder consultation and participation, capacity-building and technology transfer, adaptive management, ecosystem approach, resilience, and transparency of decision making. Ones felt relevant to the scope of this report are:

- *Ecological sustainability* - Ecological sustainability is the foundation of both social and economic development. Key elements of management and planning for ecological sustainability include ecosystem-based management, conservation of ecological processes, protection of critical habitats, use not to exceed maximum sustainable yield or carrying capacity, conservation of biodiversity in general and conservation of rare and endangered species in particular.
- *Integrated planning and management* - Many of the activities that can potentially threaten Protected Areas (PAs) occur outside their borders, including terrestrial areas, and often come under the jurisdiction of other management agencies. Management of PAs should consider all potential sources of threats and develop a management protocol that addresses these threats. In order to achieve this, management of the PA will need to be integrated with management responsibilities of the other relevant agencies.

- *Adaptive management* – PA management needs to be viewed as an adaptive process or experiment that is varied in response to changes in the character and intensity of threats, increased knowledge, and changes in the composition of the local community. Adaptive management requires the establishment of performance measures at the outset of management. The results of systematic monitoring of key indicators are evaluated against the agreed performance measures, and management adjusted (if necessary) to ensure that objectives and goals are being achieved.
- *Ecosystem Approach* - A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (IUCN 2006). The application of the ecosystem approach will help to reach a balance of the three objectives of the CBD: conservation, sustainable use, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

The *PIPA Regulations* established in 2008 set the long term management objectives for the PIPA Management Plan. Objectives relevant to the scope of this report are (PISC 2009):

1. To conserve and manage substantial examples of marine and terrestrial systems to ensure their long-term viability and to maintain genetic diversity;
2. To conserve depleted, threatened, rare or endangered species and populations and, in particular, to preserve habitats considered critical for the survival of such species;
3. To conserve and manage areas of significance to the lifecycles of economically important species such as tuna;

Section 6(2)(d) of the *PIPA Regulations* requires that the PIPA Management Committee monitor the management of PIPA and Section 6(6) further requires that a monitoring programme be implemented in accordance with the Environment Act, PIPA Regulations and Management Plan. This monitoring programme is being finalised as part of the PIPA Management Plan (PISC 2009).

Existing monitoring (Table 8) since the establishment of PIPA has included water temperature loggers and monitoring of pre and post coral bleaching, assessment and follow up monitoring of key seabird and invasive species populations (as part of the atoll restoration programme), marine and terrestrial surveys and observations as part of boat visits to PIPA, and ongoing fisheries surveillance of Kiribati's EEZ (inclusive of PIPA). There are two basic components for Monitoring and Evaluation of PIPA under this Plan:

- Scientific research and monitoring to detect trends in core and important PIPA values and issues (e.g., seabird populations, visitors numbers); and
- Management Plan Implementation Monitoring - task and process monitoring and evaluation of the management system used by PIPA to ensure improvement in a cost effective and efficient manner, and to implement adaptive management (including addressing new issues and threats as they may arise).

The draft management plan envisages that the Minister, in consultation with the PIPA Management Committee and the Principal Environment Officer, shall issue a report on the state of the PIPA every four years. The report would include the following environmental and management indicators:

1. Bird population trends;
2. Bird nesting pairs population trends;
3. Live coral cover trends;
4. Selected reef fish population trends;

5. Reef shark population trends;
6. Turtle population trends;
7. Pelagic conditions within the PIPA, including fisheries landing trends;
8. Annual visitor number trends; and
9. Such other matters as the PIPA Management Committee shall choose to report.

Table 8: PIPA Marine Ecosystem Monitoring (PISC 2009).

Indicator	Parameter	Periodicity
Coral Reef Health	Coral cover, Benthic cover	Previous (2000,2002,2005) @ 4 years
	Coral Diversity and Health (Disease, Bleaching)	Previous (2000,2002,2005) @ 4 years
	Water temperatures	Continuous water temperature loggers since 2000, satellite data, continuous since 1990s.
Selected indicator Reef Fish and threatened species, e.g., clams	Diversity, Abundance, Size class structure, Endemism	Previous (2000,2002,2005) @ 4 years
Sharks	Diversity, Abundance, Lagoon nursery Populations	Previous (2000,2002,2005) @ 4 years
Turtles	Diversity, Abundance – nesting, Surveys	Previous (2000,2002,2005) @ 4 years
Tuna/Offshore Fishing	Effort, Catch, Bycatch	Continuous by Kiribati Government Fisheries as part of Deep Water Fishing Nation management, note 100% observer coverage is now mandatory in Kiribati waters.
Submerged Reefs/Seamounts	Baseline surveys, Species diversity, and abundance	2002 (partial survey down to 900 m). Effort will be based on resources available – deep sea mission planned for mid-2009.

Several terrestrial and marine surveys have been conducted over the past decades in the Phoenix Islands. However, since the methodologies used by researchers were different, it is difficult to compare results over time to document changes to these resources. Another difficulty in past surveys is that many were not quantitative. With the new management plan, the objective is to standardize quantitative methods for each key species or group of organisms so that results can be comparable over time.

The use of zonation is a core tool of PIPA Management, including a phased zonation approach to establish core protection measures as resources and capacity allow. In this Management Plan (2010-2014), two phases of PIPA zonation are proposed: the current or Phase 1 Zonation and an increase of 25% in the no-take zone coverage once the PIPA Trust Fund income reaches an adequate capitalization level to compensate for any losses in Distant Water Fishing Nation (DWFN) license fees associated with such limitations.

Four levels of protection are incorporated into the Management Plan (PISC 2009):

1. *No-Take Zones* – total ban of all extractive activities, and strict control of all activities to ensure no impact to marine and terrestrial species or habitats. This is the strictest level of protection and all activities must be explicitly assessed and permitted by the PIPA Management Committee.
2. *Restricted Use* – sustainable and subsistence use of resources are allowed in this zone, allowing some "take" of specified allowable species, and construction/habitat alteration that has the purpose of enhancing the management and use of PIPA, but is assessed to have non-significant impacts on species and habitats. Currently, this designation applies solely to Kanton Island, and all activities are managed under a Kanton Sustainable Use Plan.
3. *Fisheries Exclusion zone* – commercial extraction by purse seines is prohibited, but longlines are allowed. Based on Fisheries Regulation, this applies to a belt from 12-60 nm (22-111 km) around an atoll. In PIPA, this designation applies solely to Kanton Island.
4. *Ocean buffer zone* – The remainder of PIPA excluding zones 1, 2 and 3 above. Fishing activities are allowed under permits as per the current rules and regulations governing fishing in Kiribati. All other activities in the sea or on/under the seafloor must be assessed and permitted by the PIPA-MC. All activities in this zone should be commensurate with the objectives of PIPA.

Phase 1 PIPA Zonation:

The objective of Phase 1 Zonation is to secure the protection of the eight PIPA islands, lagoons, reefs and nearshore habitats. This series of island-based no-take zones amount to just over 15,000 km^2 or 3.7% of the PIPA area. The following is a summary of Phase 1 Zonation:

a) No-Take Zones around seven PIPA islands (2.6%, excluding Kanton Atoll). All activities in these areas must be non-extractive and all require individual permits obtained from PIPA.

b) Restricted Use zones at Kanton (0.3%) – with an administrative population of about 30 people, extensive historical use, and good anchorage and airstrip. Designated for multiple use for purposes of PIPA management and sustainable development, and ongoing national presence.

c) Fisheries Exclusion zone (9.5%) - Marine area, Kanton from 12 nm to 60 nm (22-111 km), exclusion for purse seiners but longliners allowed.

d) Ocean Buffer zone (87.7%). Buffer zone for the restricted zones of the MPA. No current uses other than those licensed by MFMRD (purse seine, longline, pole and line) and none can be initiated without permitting from MFMRD and PIPA. Future zones to be considered for protection in this zone include:

    a. Submerged reefs – Winslow and Carondelet
    b. Seamounts - Tai, Polo, Siapo, Gardner, Tanoa, Fautasi, Tau Tau and others.
    c. Sea floor
    d. Pelagic zones

The extent to which the different NTAs (zones) within PIPA utilized the CBD's criteria in planning is difficult to assess. However, in action, the complete protection of seven discrete atolls is replication, and since it appears that these NTAs extend to 22 km off the atolls, they include EBSA-equivalent areas and are both representative and adequate in scale of protection for most coral reef species. Within each atoll for coral reef species, they also address connectivity.

CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC NETWORK

Background

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") entered into force on 25 March 1998, after ratification by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approval by the European Union (EU) and Spain. The year 2010 was agreed by the OSPAR Commission as the target date for having completed "*a joint network of well-managed MPAs that, together with the Natura 2000 network, is ecologically coherent*" (OSPAR Commission 2013).

"I*n the period 2005-2012, all twelve OSPAR Contracting Parties bordering the North-East Atlantic selected and nominated sites as components of the OSPAR Network of MPAs. The contributions by Contracting Parties differ substantially regarding distribution of sites across coastal and offshore waters as well as regarding overall coverage of their national waters by OSPAR MPAs."* (OSPAR Commission 2013). It should be noted that some Natura 2000 sites are part of the OSPAR network. Natura 2000 sites for initial contribution towards the OSPAR MPA network were selected on the basis of one or more of the following OSPAR MPA Stage 1 Ecological criteria: 1) Threatened or declining species and habitats/biotopes, 3) Ecological significance, and 5) Representativity (Aish et al. 2008, OSPAR Commission, 2003).

"By 31 December 2012, the OSPAR Network of MPAs comprised a total of 333 MPAs sites, including 324 MPAs situated within national waters of Contracting Parties and two MPAs situated entirely in Areas Beyond National Jurisdiction (ABNJ), one MPA protecting only the water column above an area subject to a submission to the UN Commission on the Limits of the Continental Shelf (UN CLCS) for an extended continental shelf, four MPAs encompassed by an area subject to a submission to the UN CLCS, where the seabed and subsoil are protected by the concerned Contracting Party while the water column is protected collectively by all Contracting Parties; and two MPAs, encompassed by an area subject to a submission to the UN CLCS, where the seabed and subsoil are protected by the Contracting Party while the water column remains unprotected.

Collectively, these sites cover ca. 700.600 km² or 5.17 % of the OSPAR maritime area in the North-East Atlantic. As the vast majority of sites have been designated in Contracting Parties' territorial waters, overall coverage of coastal waters by OSPAR MPAs is consequently higher at 21.74%. Overall coverage of offshore areas, i.e., the EEZs of Contracting Parties, by OSPAR MPAs remains low at 1.53%. The distribution of MPAs across the five OSPAR Regions is likewise imbalanced, resulting in major gaps of the MPA Network. The Greater North Sea, the Celtic Seas and the Wider Atlantic are the best represented OSPAR Regions, with 10.39%, 7.90%, and 4.66% coverage by OSPAR MPAs respectively. While coverage of the Bay of Biscay and the Iberian Coast is at 3.12%, the Arctic Waters have 1.55% protected by OSPAR MPAs. (OSPAR Commission 2013).

To ensure the "*sustainable use, protection and conservation of marine biological diversity and its ecosystems"*, it was recognized that the "j*oint network of well-managed marine protected areas (…), together with the Natura 2000 network [*had to be] *ecologically coherent"*. However, "*comprehensive conclusions on the ecological coherence of the OSPAR Network of MPAs are still not possible due to the unavailability of sufficient relevant ecological data on the distribution of species and habitats in the OSPAR maritime area". Considering the spatial arrangement of its components*, (…) *the OSPAR Network of MPAs cannot be judged to be ecologically coherent yet. However, certain regions of the OSPAR MPA Network, i.e. the Greater North Sea, the Celtic Seas, around the Azores and the ABNJ/High Seas of the Wider Atlantic, show first signs of ecological coherence.* (OSPAR Commission 2013).

As no sufficiently detailed information on the management of sites has been made available by Contracting Parties, it remains similarly impossible at this time to comprehensively conclude on the extent to which OSPAR MPAs are well-managed. While in general a number of sites are subject to management regimes, including conservation objectives, management plans and specific regulatory measures, no evidence on their effectiveness in achieving the goals for which these were established has been provided. Management plans and measures for many sites are still being prepared. (OSPAR Commission 2013)

A. MPA Network Objectives

A1. The network goal(s), objectives and the process used to identify the objectives.

The aims of the OSPAR MPA Network are (OSPAR Commission 2013):

- to protect, conserve and restore species, habitats and ecological processes which have been adversely affected by human activities;
- to prevent degradation of, and damage to, species, habitats and ecological processes, following the precautionary principle; and
- to protect and conserve areas that best represent the range of species, habitats and ecological processes in the maritime area.

A2. An analysis of how network-level objectives differed from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?).

Site-specific objectives could not be found, so a comparison could not be conducted.

B. Design Criteria

B1. The extent to which the network design criteria/properties and steps recommended in Annexes II and III of Decision IX/20 of the ninth meeting of the Conference of the Parties (COP 9) to the Convention on Biological Diversity (CBD) have been part of the planning process are discussed, along with other design criteria if they were factored in.

As with the Natura 2000 MPAs, no information was available on how sites were determined, apart from being representative of different habitat types that are listed in Annex 1 of the EU Habitats Directive.

C. Indicators and Monitoring Protocols

C1. The specific indicators developed for the network design criteria/properties (e.g., representativity, connectivity, replication, adequacy) to evaluate the effectiveness of the network design itself.

The year 2010 was determined by the OSPAR Commission as the target date for having completed an *ecologically coherent* network of *well-managed* marine protected areas, and the most recent status report on the OSPAR Network of MPAs (OSPAR Commission 2013) provides a summary of available information and on this basis assesses to what extent the target has been achieved. While the concept of *ecological coherence* nowadays is commonly used in the context of establishing protected area networks, no specific definition for the term 'ecological coherence' has yet been formally agreed upon internationally and only a few theoretical concepts and practical approaches have been developed for an assessment of the ecological coherence of a network of MPAs.

OSPAR generally agreed that an ecological coherent network of MPAs:

- interacts with and supports the wider environment;

- maintains the processes, functions, and structures of the intended protected features across their natural range; and
- functions synergistically as a whole, such that the individual protected sites benefit from each other to achieve the two objectives above.

Additionally, the network may also be designed to be resilient to changing conditions (*e.g.,* climate change).

Within OSPAR the following theoretical and practical framework to address the ecological coherence of the MPA Network has been adopted (OSPAR Commission 2013):

- **Guidance on developing an ecologically coherent Network of OSPAR Marine Protected Areas** (Reference Number: 2006-3)

  This document sets out 13 key principles to assist in interpreting the concept of an ecologically coherent network of MPAs in the context of the OSPAR maritime area.

- **Guidance for the design of the OSPAR Network of Marine Protected Areas: a self-assessment checklist** (Reference Number: 2007-6)

  This document provides a checklist to assess the ecological coherence of a network of MPAs at different scales; *e.g.,* local, regional, national, or international areas.

- **Background Document to support the assessment of whether the OSPAR Network of Marine Protected Areas is ecologically coherent** (Publication Number: 320/2007)

  The Background Document summarises existing literature on ecological coherence of MPA networks, and describes possible criteria and guidelines for assessing whether the OSPAR Network is ecologically coherent. It builds upon the Guidance document on developing an ecologically coherent network of OSPAR MPAs (Reference Number: 2006-3) and groups the 13 principles set out in the Guidance under four assessment criteria, which when taken together, are considered both necessary and sufficient to assess the ecological coherence of a MPA network. These main assessment criteria are Adequacy/Viability, Representativity; Replication; and Connectivity.

  In practice, these criteria should take into account the size of MPAs, the coverage of species and habitats by MPAs, the distribution of MPAs across biogeographic regions, the number of replicate sites for specific features of interest, as well as between-site connections at different scales.

C2. The monitoring protocols or other methods used to evaluate progress towards meeting network objectives, including the process used in their selection, and how adequate the indicators are in measuring the effectiveness of an MPA network in achieving its objective(s) and whether and how baseline values were established.

All text in this section is taken from the status report by the OSPAR Commission (2013).

"Over time though, OSPAR had to accept that a comprehensive analysis of the ecological coherence of the OSPAR Network of MPAs, as originally envisaged in the OSPAR Guidance, would for the time being not be possible due to the limited availability of ecological data, in particular on the distribution of species populations and habitats in the North-East Atlantic and their actual proportion being effectively covered by OSPAR MPAs. (…) Recognising this current lack of detailed ecological data, the need became apparent for practical approaches which can be applied in the absence of such data.

The Background Document (Publication Number: 320/2007) already noted that ecological coherence is a holistic concept reliant on many constituent parts, and that tests might rather indicate when it has not

been perfectly achieved, i.e., some of the parts are missing or not functioning as they should. Thus, the degree to which an MPA network is – or is not – ecologically coherent must be stated as likelihood, based on a continuum of progressively more detailed tests, until a test is not met. It should therefore involve a process of staged assessments, beginning with an initial assessment that is straightforward and achievable.

In consequence and on the basis of previous work, three initial spatial tests were identified as a means of making an initial evaluation of whether the OSPAR Network of MPAs was ecologically coherent or not. These tests, considered as a starting point to complement the guidelines and principles, are described in the:

- **Background Document on three initial spatial tests used for assessing the ecological coherence of the OSPAR MPA Network** (Publication Number: 360/2008)

  This document describes three initial spatial tests which evaluate whether the network is:

  i) spatially well distributed, without more than a few gaps;

  ii) covers at least 3% of most (seven of the ten) relevant Dinter biogeographic provinces; and

  iii) represents most (70%) of the OSPAR threatened and/or declining habitats and species (with limited home ranges), such that at least 5% [or at least three sites] of all areas in which they occur within each OSPAR Region is [are] protected.

  These tests aim to identify whether an MPA network shows the first signs of ecological coherence, and are the first step in a multiple step assessment. However, until the MPA network has passed these three initial tests, there is no need to scale up the assessment process. These initial tests have already been applied in the 2007, 2008, and 2009/2010 OSPAR Reports on the progress made in developing the OSPAR Network of Marine Protected Areas (Publication Numbers: 359/2008, 389/2009, and 493/2010 respectively)." As of 2013 (OSPAR Commission 2013), conclusions from these tests were:

Test 1: Is the OSPAR MPA Network spatially well-distributed, without more than a few major gaps?

"[C]onsidering the vast areas in Regions I, IV and, more generally, in offshore areas throughout all the Regions that are not covered by MPAs, overall the Network of MPAs is not yet well-distributed across the OSPAR maritime area. If the MPA Network is generally not well-distributed in space, then it is very likely not connected and/or representative, and probably is not replicated and/or adequate. Thus, it is very likely not ecologically coherent."

Test 2: Does the OSPAR MPA Network cover at least 3% of most (seven of the ten) relevant Dinter biogeographic provinces?

"In 2012, the majority of the ten biogeographic provinces considered in this test surpass the 3% threshold coverage by OSPAR Marine Protected Areas. (…) *Hence, for the first time the results of this initial spatial test indicate a degree of ecological coherence of the OSPAR Network of MPAs with regards to coverage of the various biogeographic provinces within the North-East Atlantic. Although not part of the test, it should be noted that the Barents Sea sub-province also surpasses the threshold coverage level with 5.8% coverage by OSPAR MPAs."*

Test 3: Are most (70%) of the threatened and/or declining species and habitats (with limited home ranges) represented in the OSPAR Network of MPAs, such that at least 5% [or at least three sites] of all areas in which they occur within each OSPAR Region is [are] protected?

"This test, including its square-bracketed text, could not be conducted as neither is comprehensive spatial data available regarding the distribution of species populations and habitats across the OSPAR maritime area, nor is the reporting by Contracting Parties complete with regards to the extent to which these features are subject to their respective MPAs.

Under these circumstances, no reliable conclusions can be drawn on the 'adequacy' or 'representativity' of the OSPAR Network of MPAs regarding the protection it provides for specific species or habitats identified by OSPAR to be under threat and/or in decline."

In addition to these tests, "[a] secondary and wholly complementary approach to assessing ecological coherence has been developed that focuses on the way in which representative features (i.e., species and habitats) are incorporated within the OSPAR Network of MPAs. This approach is described in A matrix approach to assessing the ecological coherence of the OSPAR MPA Network (MASH 08/5/6-E)

This matrix addresses six elements of network ecological coherence that have been recognised as important constituent parts:

1. Features;
2. Representativity;
3. Replication;
4. Connectivity;
5. Resilience; and
6. Adequacy/Viability.

"It proposed clear success criteria that are required to assess the likelihood that these elements are adequately represented within the network, drawn from both agreed OSPAR guidance on developing an ecologically coherent network of OSPAR MPAs (Reference Number: 2006-3), international scientific literature and expert judgement. This approach is envisaged to be applied at the OSPAR maritime area level as well as at a biogeographical level.

Effectively applying this matrix methodology requires, at least for some aspects of the assessment, comprehensive ecological data, e. g. regarding the distribution of populations of species and of habitats in the North-East Atlantic as well as information on the extent to which species and habitats are covered by OSPAR MPAs. The limited availability of such data within OSPAR Contracting Parties remains the main constraint regarding the application of this approach."

The 2007 meeting of the OSPAR Biodiversity Committee (BDC) agreed that the World Bank score card (Gubbay 2005, World Bank 2004), in the MPA network discussion focusing on the UK's portion of the Natura 2000 Network should be adopted as a tool for use by OSPAR Contracting Parties in the self-assessment of management effectiveness of OSPAR MPAs and urged Contracting Parties to apply it in their management of MPAs (OSPAR Commission 2007). In order to obtain evidence regarding the practicability of this methodology, the Working Group on Marine Protected Areas, Species and Habitats (MASH) in 2008 invited the United Kingdom and France to apply this matrix approach for an assessment of the ecological coherence of OSPAR MPAs in the English Channel as a test case, but conclusions are not yet available.

C3. The extent to which "citizen science" (community-level participation) is utilised as part of the monitoring.

"Public participation is an important and often mandatory part of environmental decision making ([EU] federal agencies are now required to encourage public participation and to provide access to all information in keeping the Aarhus Convention). In this sense, specific stakeholder involvement in MPA development and management is a topic of growing interest, taking into account that social factors are

the primary determinants of the success of MPAs. In spite of this, most agencies dealing with MPAs are just beginning to learn how to design and conduct an effective participatory process for MPAs, to gain understanding of the implications of increased stakeholder involvement and how to improve the process". (OSPAR Commission 2008).

C4. The extent by which network-level monitoring protocols and other evaluation methods differed from those used to evaluate the progress of the individual components of the network.

C5. Efforts to evaluate the degree to which individual network components (individual MPAs) and their objectives contributed to achieving the network level objectives, and if there were any, the types of analyses used to measure this.

An inventory in all OSPAR Contracting Parties revealed the following (OSPAR Commission 2011b): *"Evaluation approaches are still being developed. In the European Marine Strategy Framework Directive (MSFD), eleven qualitative descriptors of Good Environmental Status (GES) have been identified (OSPAR Commission 2011b). To provide guidance to these descriptors, the European Commission prepared criteria and methodological standards for each descriptor to assess progress towards the GES, as well as indicators related to them.* (…) *All countries have elaborated an overview of existing monitoring programmes, but the presentation and accessibility of these overviews varies between countries. Belgium, Germany and the United Kingdom developed dedicated marine meta-databases searchable in English on the Internet (MUMM-database, Marine Monitoring Manual and UK DMOS). Details included in these databases vary between countries. Denmark, France, Ireland, Norway, Portugal, Spain, Sweden and the Netherlands do not have such specific databases and their marine data are less easily accessible for other countries [– some are in their native languages, some are stored in the databases of different organisations,] and others are embedded in Integrated Management Plans for different regions."*

"In the Netherlands and the United Kingdom, a first step has been undertaken to identify programmes and/or parameters using a systematic process. The processes in both countries are based screening of existing programmes for their potential to contribute to the identified EU indicators for MSFD descriptors. The Netherlands carried out a feasibility test resulting in a table showing indicator potential programmes that could deliver to that indicator, including what still needs to be done to make it operational and interpretable. The UK mapped monitoring parameters from programmes included in their marine meta-database to the EU indicators using the SeadataNet' Parameter Discovery Vocabulary (P021)."

"Challenges mentioned by countries are the uncertainty about the way the MSFD will be implemented in their country (Germany, Norway, Ireland), (potential) lack of funding (Belgium, Portugal), and lack of guidance offered by the EU indicators (Belgium, Germany, Ireland, Spain, Sweden). A potential challenge may also be that some countries will have to deal with different marine regions and/or sub-regions (e.g., France, Spain, Portugal)."

However, no analyses addressed efforts to evaluate the degree to which individual network components (individual MPAs) and their objectives are contributing to achieving the network level objective.

D. Management measures

D1. In addition to MPAs, other tools or management measures being used to achieve the various types of network objectives, if any.

As no sufficiently detailed information on the management of sites has been made available by Contracting Parties (OSPAR Commission 2010), it remains similarly impossible at this time to comprehensively conclude on the extent to which OSPAR MPAs are well-managed. While in general a

number of sites are subject to management regimes, including conservation objectives, management plans and specific regulatory measures, no evidence on their effectiveness in achieving the goals for which these were established has been provided. Management plans and measures for many sites are still being prepared. It is presumed that a wide-range of management tools are being utilised, bit no details specific to OSPAR MPAs could be found.

In summary, while this network has not yet met its objectives, its evaluation process is considered relevant to the level of specificity MPA objectives in Canada might have.

UK'S PORTION OF THE NATURA 2000 NETWORK

Background

Natura 2000 is the centre piece of the EU's nature and biodiversity policy. It is an EU-wide network of nature protection areas established under the 1992 European Commission's (EC) Habitats Directive. The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats. It is comprised of Special Areas of Conservation (SACs) designated by Member States under the Habitats Directive, and also incorporates Special Protection Areas (SPAs) which were designated under the 1979 Birds Directive. Natura 2000 is not a system of strict nature reserves where all human activities are excluded. The establishment of this network of protected areas also fulfills a community obligation under the CBD.

The term 'European Marine Site' (EMS) (as defined in the UK's The Conservation of Habitats and Species Regulations 2010) refers to those marine areas of both SACs and SPAs, which are protected under the EC Habitat and Birds Directives (JNCC 2007). 'SACs with marine components' are defined as those that contain qualifying marine habitats of species. These areas range from entirely subtidal to exclusively intertidal, and vary in size from large (such as Lleyn Peninsula and the Sarnau SAC) to relatively small (such as Kenfig SAC). An EMS can be an entire SAC or SPA, or only part of one (the SAC/SPA may also include terrestrial areas). However, EMS is not a statutory site designation: these areas are essentially management units for those parts of Natura 2000 sites which extend beyond the Site of Special Scientific Interest (SSSI) / Area of Special Scientific Interest (ASSI) designations in the UK.

There are currently 108 SACs with marine components, covering 7.6% of the UK sea area. Information on the management status of these sites is available; 88 of these SACs are completely in inshore waters (within 12 nautical miles (22.2 km)), 16 are completely in offshore waters and there are two sites which straddle inshore and offshore waters. On the land and in the sea out to 12 nautical miles, the identification of SACs is the responsibility of country conservation agencies. Beyond 12 nautical miles, the JNCC is responsible for the identification of SACs. It should be noted that the UK Sea area is part of two OSPAR Regions: Region II – Greater North Sea and Region III – Celtic Seas, that some Natura 2000 sites are part of the OSPAR MPA network (Aish et al. 2008), and that OSPAR makes recommendations that are relevant for the management of Natura 2000 sites.

A. MPA Network Objectives

A1. The network goal(s), objectives and the process used to identify the objectives.

Instead of defining MPA network objectives per se, results of studies such as the UKMMAS community (2010) and the OSPAR Commission (2011a) have focused on identifying recommended activities for coastal management. The Joint Nature Conservation Committee (JNCC) concluded, regarding marine assessments, that there are a number of steps in the environmental management cycle that need to be completed to determine if marine biodiversity is being protected, with a crucial step in the cycle being the assessment and interpretation of data collected during monitoring programs.

Examples of what was recommended for the UK's waters by the OSPAR Commission (2011a), unfortunately very general in nature, were the following:

OSPAR Region II – Greater Northern Sea

- *Develop coordinated spatial planning*
  With pressure from multiple activities increasing and intense competition for space, improved marine spatial management is particularly urgent.
- *Promote further action to manage fishing effort*
  OSPAR must keep cooperating with the fisheries authorities to support sustainable management of fishing, including reductions in discards, improved stock assessments and better reporting and mitigation of by-catch of marine mammals and long-lived shark, skate and ray species.
- *Focused targets to reduce pollution*
  Efforts to reduce pollution from nutrients, hazardous substances and the oil and gas industry should now be focused on problem areas and regional hotspots, with appropriate reduction targets for discharges and losses in particular places.

OSPAR Region III – Celtic Seas

- *Develop coordinated spatial planning*
  Demand for space from human activities is increasing, especially for marine renewable energy developments, so improved marine spatial management is particularly urgent.
- *Reduce marine litter*
  Monitoring of marine litter must continue. OSPAR needs to promote efforts to stop litter entering the marine environment.
- *Promote sustainable fishing*
  OSPAR needs to promote fisheries management plans that address depleted stocks, and encourage the adoption of rules to prevent fishing from damaging the seabed.

A2. An analysis of how network-level objectives differed from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?).

The EU Commission services (2007) provided guidelines for the establishment of the Natura 2000 network in the marine environment, listing conservation objectives, definition of conservation measures, and purpose and scope:

Conservation objectives

Conservation measures were to "*aim at maintenance or restoration of species and habitat for which the site has been designated to favourable conservation status*." The following box states the definition of the "favourable conservation status" concept.

Favorable conservation status (Habitats Directive provisions, art1)

Conservation status of a natural habitat, in accordance with the Habitats Directive, is considered as the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species. It will be taken as 'favourable' when:

- its natural range and areas it covers within that range are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The *conservation status* will be taken as 'favourable' when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis;

Possible natural features present in a marine Natura 2000 site, for which conservation objectives have to be defined, are found among the following: Marine birds in accordance with the Birds Directive, and Habitat types listed in annex I, Species listed in annex II (18 marine species, including fish, reptile, cetacean, and seal species), and Marine species listed in annex IV and V of the Habitats Directive.

"From this point it is the responsibility of the competent authorities in each Member State to define the objectives to be reached in terms of conservation status for these features. A clear definition on conservation objectives with measurable indicators and an appropriate monitoring programme are major elements for the successful management of a Natura 2000 site.

Questions to be answered will include: What is the global objective? What are the specific objectives? What is to be protected and/or restored? What is the final agreed target protection level? What is to be done? Who will do it? In what timeframe? Some of these questions may appear obvious. Nevertheless, they are not always easy to respond to in a clear and operational way".

Definition of conservation measures

"Data from surveillance and monitoring programmes should allow Member States to identify the conservation status of species and habitats present in the sites. Member States will also need to identify potential pressures. Thereafter, they will need to define appropriate maintenance and/or conservation measures to deliver favourable conservation status. In fulfillment of Article 6.1 of the Habitats Directive, they will need to establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites. For the different features subject to protection in a given site, their conservation status at present, their target status and the time scale to reach it, are the driving elements for the definition of conservation measures to be taken."

Purpose and Scope

"In the case of the marine environment, it would be a good and strategically useful management measure to consider, in addition to the key Natura 2000 features, habitat types and species covered in

regional agreements protection lists, and areas containing habitat types and species of conservation concern that may, reasonably, be included in a further adaptation of the Habitats Directive annexes. (…) This approach will also favour the coherence of future marine protected areas under Natura 2000 and other sets of protected areas.

This approach will also contribute to enhancing the compatibility between Natura 2000 and other networks established under regional agreements/conventions (OSPAR, HELCOM or Barcelona). It will also facilitate the process of selection and management of future sites resulting from a more complete application of the Habitats Directive in the marine environment."

Based on the aforementioned information, it has become evident that for the EU, with so many nations involved, trying to establish effective, timely action has been a very slow and complicated process. It has been challenging to find clearly defined objectives for either individual MPAs or for the Natura 2000 network. However, among the 63 UK marine sites under the UK's The Conservation of Habitats and Species Regulations 2010, the marine management plan for the Flamborough Head SAC, provides information relevant to this report. The Flamborough Head Management Plan presents the following vision for Flamborough in 2025 (Stockdale 2007):

"The Sea – A healthy and wildlife rich sea containing internationally important chalk reefs, with a local sustainable fishery operating from Flamborough, Filey, Bridlington, Grimsby, Scarborough and Whitby, and unspoilt beaches and coves to offer people the opportunity to experience and understand the marine environment in safety."

In order to work towards this vision, the Flamborough Head Management Plan will:

- Adopt a broad based approach to management that brings together the management of wildlife, landscape and access on the head,
- Integrate with the management of the wider coast, and
- Seek to adopt the Ecosystem Approach to the management of Flamborough Head.

English Nature in collaboration with several other organizations produced quite detailed guidelines for developing conservation objectives for marines SACs (EN, SNH, CCW, EHS (DoE(NI)), JNCC & SAMS 2001). These guidelines state that "*a conservation objective for a SAC defines the condition or range of conditions that a habitat or species population should be in. The Habitats Directive guides the making of these judgements by establishing that the aim of measures taken under it is the maintenance or restoration of favourable conservation status of the habitats and species. The degree to which the Directive's definition of favourable conservation status applies directly to individual sites* (…) [*may be*] *subject to different interpretations* (…)[,] *conservation objectives for individual sites must be expressed in a way that is consistent with the overall goal of favourable conservation status."*

UK conservation agencies have been required to develop ways of expressing conservation objectives which are practical, as well as meeting the statutory requirements set out in Appendix 9. In this appendix, Table 1 summarises the legal requirements for conservation objectives on marine Natura 2000 sites, Table 2 summarises the various practical considerations for the development of conservation objectives on marine Natura 2000 sites. Table 3 lists the various components ('targets') of favourable conservation status, as defined in the Directive.

In summary, there has been no analysis in the UK of how network-level objectives differ from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?)

B. Design Criteria

B1. The extent to which the network design criteria/properties and steps recommended in Annexes II and III of Decision IX/20 of the ninth meeting of the Conference of the Parties (COP 9) to the

Convention on Biological Diversity's (CBD) have been part of the planning process are discussed, along with other design criteria if they were factored in.

A simple answer to the above is not available, as no documentation was found regarding how the habitats in Annex 1 of the EU Habitats Directive occurring in the UK were identified, other than through topography. For example, there are three marine habitats and four marine species (grey and common seals, bottlenose dolphin, harbour porpoise) "*known to occur in significant numbers in UK waters away from the coast*" for which the EC has stated that additional SACs must be designated, with the former listed on Annex I to the Habitats Directive and the latter listed in Annex II to the Habitats Directive. (For a listing of natural habitat types of community interest, whose conservation requires the designation of SACs, see the Council Directive on the conservation of natural habitats and of wild fauna and flora). These three marine habitats are:

- Sandbanks which are slightly covered by seawater all the time;
- Reefs;
- Submarine structures made by leaking gases;

These three habitats will be subject to a scientific reserve in the EU Atlantic Biogeographic region, which means that additional SACs may be required for the adequate protection of these habitats. To date, SACs have been designated in the UK to protect habitat essential to the two species of seals and bottlenose dolphin. The UK is nearing completion of the marine SAC network, and the UK contribution to the network will be assessed by the EC at a biogeographic level. Whilst the assessment of Member States' contributions to the network is conducted by the Commission, in order to effectively advise Government on a suitable number and range of sites to propose to the Commission, the JNCC has considered the network in a whole UK context, and to a more limited extent, in a wider European context. The JNCC has conducted the network analysis by examining three principles, as laid out in Article 3 of the Habitats Directive. These are the principles of Natural Range, Sufficiency and Proportionality. The JNCC is identifying areas of these habitats in UK offshore waters and assessing whether they are suitable for designation as SACs (DETR 1998).

C. Indicators and Monitoring Protocols

C1. The specific indicators developed for the network design criteria/properties (e.g., representativity, connectivity, replication, adequacy) to evaluate the effectiveness of the network design itself.

There was no evidence of any relevant indicators to evaluate the effectiveness of the UK's Natura 2000 MPA network design, other than the achievement of favourable conservation status for specific species.

C2. The monitoring protocols or other methods used to evaluate progress towards meeting network objectives, including the process used in their selection, and how adequate the indicators are in measuring the effectiveness of an MPA network in achieving its objective(s) and whether and how baseline values were established.

A EU goal was to complete, by 2010, a joint network of well-managed MPAs (the OSPAR Network) that, together with the Natura 2000 network, was ecologically coherent. The first UK-wide assessment of progress towards that vision, the *Charting Progress,* showed in 2005 that the UK seas were productive and supported a wide range of ecosystems, but it also revealed that human activities were adversely affecting marine life. The second report on the state of the UK seas, *Charting Progress 2* (UKMMAS community 2010), provided a considerably improved assessment of the productivity of their seas, and the extent to which human uses and natural pressures are affecting their quality – addressing the specific species, habitats and economic issues of the eight UK marine regions.

The first assessment recommended a more coordinated and systematic approach to marine monitoring, assessment and data collection, which was addressed in 2006 by the UK Marine Monitoring and Assessment Strategy (UKMMAS). Its goal was the efficient and robust collection of marine data, and the UK Directory of Marine Observing Systems (UKDMOS) was set up to help coordinate monitoring programmes.

The report raised the issue of the desired state UK seas should be in in order to be considered "*clean, healthy, safe, productive and biologically diverse within a framework of sustainable development. Some of the thresholds used (for example those derived from the EU Water Framework Directive) use a state that was 'natural' before human pressures were introduced as a reference. Others, for example, those for the fisheries assessment undertaken by the Productive Seas Evidence Group, are based on the EU Common Fisheries Policy, which aims for the harvesting of fish at sustainable levels. When assessing habitats and species,*(…) *difficulties were sometimes found in determin[ing] what a natural state is; ecosystems are dynamic, and change due to natural causes, and in some cases monitoring programmes have started too recently to provide accurate records of natural conditions. The Charting Progress 2 assessment has used the assessment criteria that are widely used for assessing the state of the seas, and has not attempted to resolve this issue.* (…) *[A]ssessing the impacts of multiple pressures and determining the most important human impacts have still to be realised. Adopting an ecosystem-based approach requires an understanding of how the various pressures contribute to any change in the structure and functioning of ecosystems. An appropriate methodology is needed."*

A detailed manual exists for monitoring the different Natura 2000 habitats (Davies et al. 2001). The UK view regarding the status of marine Natura 2000 sites is that "*unless there is evidence to the contrary, a widespread assumption is that the sites were in favourable condition when originally selected and therefore, the pattern of human use at that time was not causing significant damage*". In practice, there is a programme of monitoring and reporting on the condition of each site to the EC every six years.

C3. The extent to which "citizen science" (community-level participation) is utilized as part of the monitoring.

The EU Natura 2000 has Integration Projects whose objectives are to: (i) support park and county public institutions to implement Natura 2000 objectives; (ii) strengthen capacity for EU-compliant reporting and biodiversity monitoring; and (iii) introduce programs that involve a wide group of stakeholders in Natura 2000 network management. A component involves ecological network capacity building using consultant services to help promote intersectoral cooperation, and pilot programs to among other things, introduce a park volunteer program.

Concerning stakeholder involvement, consultation is now the norm and management committees and the development of management plans involve a wide spectrum of interested parties. There are also opportunities for stakeholders to comment on initiatives surrounding MPAs from contributing to the site selection process, through to establishment, implementation, enforcement and monitoring.

C4. The extent by which network-level monitoring protocols and other evaluation methods differed from those used to evaluate the progress of the individual components of the network.

This could not be assessed, as no comprehensive evaluation of progress of the individual components of the network has been conducted.

C5. Efforts to evaluate the degree to which individual network components (individual MPAs) and their objectives contributed to achieving the network level objectives, and if there were any, the types of analyses used to measure this.

The World Wildlife Fund (WWF) conducted an analysis (Gubbay 2005) that examined key issues in relation to the management effectiveness of two types of UK MPAs – Marine Nature Reserves and marine SACs. Their findings are summarized below. They included:

- a consideration of potential criteria for evaluating effectiveness;
- case studies that try to apply these criteria; and
- a discussion of some of the constraints and barriers to the effective management of MPAs in the UK.

The methodologies used by Gubbay (2005) to evaluate the management effectiveness of MPAs were published in a IUCN Guidebook prepared in collaboration with WWF and NOAA (Pomeroy et al. 2004), and a World Bank 'Score Card (World Bank 2004).'

The IUCN Guidelines were used to investigate whether indicators linked to goals and objectives of individual MPAs could be used to evaluate UK MPAs (three case studies are presented, with objectives listed); and the first four parts of the World Bank Score Card was used to evaluate the UK MPA programme [network] in its entirety. Both techniques had recently been developed prior to being used by Gubbay (2005), and this was the first utility test of how they might work in practice. As the UK MPA programme was then established, it was also then timely to test these approaches and consider their potential application in the UK.

Management Effectiveness Study Conclusions (Gubbay 2005)

IUCN Guidelines

- The desk study that tested the methodology on three sites shows that it is a relevant and feasible technique for UK MPAs.
- The evaluation technique was straightforward, and there were no problems listing MPA objectives and linking these to indicators for sites that had management plans. The suggested indicators cover familiar ground and are mostly relevant to UK sites.
- The mix of qualitative and quantitative data required to report on the indicators makes the approach both practical and useful. This also means that data can be drawn from many sources.
- The area of greatest weakness for UK sites, in terms of the availability of information, appears to be socio-economic data. This is likely to be lacking, or not specific enough to evaluate social-economic indicators for some MPAs.
- By identifying gaps and areas where information is limited, the IUCN Guidelines could have an additional benefit of identifying opportunities for future study and research.
- A careful consideration of which indicators to use will be necessary at the outset. It is unlikely to be necessary (or feasible) to use all the potential indicators. However, they should ideally be drawn from each of the three clusters in the IUCN Guidelines (biophysical, socio-economic and governance). There is scope to link some of these to existing indicators, e.g., those being used to report on site condition in SACs.
- There is a case for providing an overview and conclusions of the findings for each site. The approach tested here, which appears to be feasible, is to apply the same broad categories that are used to report on UK sustainability indicators.

World Bank Score Card

- The Score Card was devised to give an overview of the management effectiveness of individual MPAs. The work undertaken showed that it can also be used to evaluate the context, planning,

inputs and process elements of an MPA programme. However, the outputs and outcomes questions are best addressed at the individual site level.

- The questions and scoring methodology are straightforward and could easily be applied to evaluate individual MPAs. Using them to evaluate an entire MPA programme requires awareness of the different stages and levels of progress of the sites that are part of the programme. Using the highest and lowest scores was a pragmatic solution to gaining a quick overview for a desk study.
- Including comments alongside the scoring is essential, especially as the questions are sometimes phrased in a way that does not suggest direct relevance to the UK situation. Comments will be especially valuable in highlighting gaps and indicating what actions should be taken to improve effectiveness.
- Using highest and lowest scores can be a useful way of showing what and how much needs to be done to bring all parts of the programme (and sites) up to the same standard. Examples of sites falling into the different categories, and perhaps some case studies, could be included to provide more detailed supporting material for a comprehensive UK evaluation exercise.
- The Score Card approach will give a view of the current situation but, because it provides an overview, it is probably most useful in showing trends. Repeat evaluations are therefore needed to make best use of this method of evaluation.

D. Management measures

D1. In addition to MPAs, other tools or management measures being used to achieve the various types of network objectives, if any.

According to the EC (2014), *"The establishment of the Natura 2000 network [was considered] a major achievement[, and] attention [has] now turn[ed] towards management of the sites. Within six years after their designation as Sites of Community Importance (SCI), Member States* [were to] *designate these sites as Special Areas of Conservation and adopt conservation measures involving, if need be, appropriate management plans and other measures which correspond to the ecological requirements of the natural habitat types and the species of Community interest.* (…) *According to the EU nature directives* [(i.e., Birds Directive, Habitats Directive)], *the conservation objectives should be met while taking account of economic, social, cultural, regional and recreational requirements. It is for the Member States to establish the most appropriate methods and instruments for implementing the directives and for achieving the conservation objectives of Natura 2000 sites.*

The European Commission, in close cooperation with Member States and stakeholders, has elaborated guidance documents with regard to the management of Natura 2000 sites. A large variety of approaches and a considerable amount of experience and best practice has become available."

Environment Council Conclusions of 21 June 2011

The EC has recently adopted a new strategy to halt the loss of biodiversity and ecosystem services in the EU by 2020. There are six main targets, and 20 actions to help the EU reach its goal. Biodiversity loss is an enormous challenge in the EU, with around one in four species currently threatened with extinction and 88% of fish stocks over-exploited or significantly depleted.

Targets relevant to the scope of this report cover:

- Full implementation of EU nature legislation to protect biodiversity,
- Better protection for ecosystems, and more use of green infrastructure,
- Better management of fish stocks,
- Tighter controls on invasive alien species, and

- A bigger EU contribution to averting global biodiversity loss.

As a contracting party to the CBD, the European Community prepared an EU Biodiversity Strategy and Biodiversity Action Plans which aimed, inter alia, to integrate biodiversity considerations into other Community policies. Marine biodiversity issues are addressed by both the Biodiversity Action Plan (BAP) for Natural Resources, and the BAP-Fisheries. Marine issues have also been raised in relation to the impact of European fishing fleets in international waters.

An earlier EU Action Plan [COM(2006) 216 final] provided clear prioritized objectives and actions to achieve a 2010 target and outlined the respective responsibilities of EU institutions and Member States. The first action identified in this EU BAP was to accelerate efforts to finalize the Natura 2000 network, and was to "complete a marine network of SPAs by 2008; adopt lists of SCI by 2008 for marine; designate SACs and establish management priorities and necessary conservation measures for SACs [by 2012 for marine]; and establish similar management and conservation measures for SPAs [by 2012 for marine]". This Action Plan also specified indicators to monitor progress, and a timetable for evaluations.

At a site level, relevant authorities are responsible for establishing the single scheme of management and, depending on their legal responsibilities (e.g., fisheries, port management, nature conservation), they will lead on the implementation of particular aspects of the scheme of management (WWF-UK 2005). Some sites have a separate advisory group which enables other stakeholders such as owners, occupiers, users, and industry representatives, to participate in the process, while in other sites there is a single group bringing all parties together. In some cases, an existing group, such as an estuary partnership, provides a ready-made structure that can be built on, and there may be existing management schemes which can be modified to reflect the conservation objectives of marine *Natura 2000* sites. Project Officers help to co-ordinate the development and implementation of the management scheme at some sites.

MPAs in the UK are currently managed as “multiple-use areas”, which means that many activities take place within a protected area but that they may also be zoned or be subject to certain conditions. Two examples are the prohibition of bottom trawling to protect benthic habitats and species, and seasonal restrictions on access to parts of the MPA to minimize disturbance to nesting seabirds. There is also an emphasis on education and interpretation at many of the sites to explain the reasons and detail of management provisions and to encourage compliance on a voluntary basis.

There is a current debate on the role and benefit of “Highly Protected Marine Reserves” or zones within larger “multiple-use areas”. Experience from other parts of the world have shown that high levels of protection, particularly prohibition of extractive activities, including fisheries, can serve specific functions including to provide a useful baseline for scientific reference and monitoring, and opportunities for habitat and species recovery and restoration, including commercial species.

MPA NETWORK SYNTHESIS

In a world-wide overview of selected MPA networks, considerable variation exists in network design, objectives definition and performance evaluation. The following is a synthesis, perhaps better stated as an interpretation, of the information presented above, structured in two manners, firstly around the general characteristics and developmental histories of the MPA networks described, and secondly around the nine elements that were asked to be considered in this overview of international MPA networks.

Table 9 summarizes the information on the profiled MPAs regarding surface area, % of the EEZ that is protected, number of MPAs in the network, and which of the categories of the IUCN protected areas management objectives that best corresponds to the respective network’s objectives.

Table 9: Major MPA network characteristics. MPA IUCN cat. refers to the management categories in the IUCN Protected Areas Categories System.

Country/Region	**Area (km^2)**	**% of the EEZ**	**No. of MPAs**	**MPA IUCN cat.**
Australia	880,000	10	200+	6
California (South)	917	15	52	5
South Africa	4523	0.4	22	4
Kiribati*	408,250	11	1	4*
Northeast Atlantic/ OSPAR	439,679	3	181	?
UK	41,000	4	189	5

EEZ = Exclusive Economic Zone, * The Phoenix Islands Protected Area is a single-zoned MPA

As discussed in the Introduction, MPA networks can be either: 1) a collection of individual MPAs established site by site in an ad-hoc manner; 2) a MPA network designed at least partially with CBD properties but which is not yet complete (gaps to be filled over time); and 3) a MPA network established as a complete package. Among the examples presented here, the South African experience demonstrates best the difficulties in trying to establish an effective MPA network in an ad-hoc manner, with no clear overarching MPA network objectives. This was compounded by a lack of available national direction and funding and the history of top-down management, with little engagement of local peoples and consideration of their desires and needs. The result at this time is a fragmented MPA network with no clear network conservation objectives, and no defined appropriate monitoring program that could assess how best to establish a functional MPA network.

The other MPA networks described, with the exception of the GBRMP and PIPA, fall to varying degrees into the second category. While many CBD criteria were at least partially incorporated into network design, either directly or indirectly, there are either still gaps in the networks, or the assessments as to the effectiveness of the networks in achieving desired objectives are still either in progress or have yet to be attempted. No networks considered here were determined to be “functional” at this time, but the best documented examples of ‘how to build a network’ were those in Australia and California. In part this was because 1) only “single political jurisdictions” and relatively large geographical areas were involved in each of these examples, which gave managers more authority to establish a comprehensive, functional network in a timely manner, and 2) because at least some networks in those areas have been established for at least a decade, there was increased time for both refinement (adaptive management) and network evaluation. However, although these networks have been designed following the best available scientific guidelines, neither has been evaluated as a network, and the older components of these networks (GBRMP and the Channel Islands), which have been evaluated, are each a single MPA with multiple, small NTAs. The importance of connectivity as a network feature and the lack of effort in evaluating connectivity in existing networks are underplayed in the literature, and hence in this review as well. The east and west coasts of Canada would appear to offer the same opportunity to develop comprehensive and functional MPA networks using CBD criteria (Appendix 1), as the management authority of living marine resources is a single jurisdiction (i.e., Canada), and like the Australian and Californian situations, the geographical scales involved are sufficiently large so as to include the home ranges of most of the species being managed.

In contrast, European MPA networks have been determined by multiparty negotiations and compromises between numerous jurisdictions that shared common resources, resulting in a slower and more complex establishment process in developing effective MPA networks (OSPAR and Natura 2000). Because of the extensive history of exploitation of living resources in European waters, which in

many cases has been over-exploitation, it is also difficult to determine what is now "representative" there. Therefore, the approach adopted has focused on protecting specific habitat types (e.g., lagoons, reefs, shallow inlets and bays), and by default their associated biological communities, which are assumed to be representative of that habitat feature. Effectiveness of the European MPA network in achieving its objectives is being assessed by whether ecological coherence has been achieved. However, the conditions by which ecological coherence might be achieved are not currently met by the nature and scale of the MPA network that has been established to date, so it has been concluded that at this time, ecological coherence is not being achieved.

Development of a complete MPA network at once, such as represented by a very large, zoned MPA like the GRMP or PIPA that includes virtually an entire "ecosystem" or a network of individual MPAs, can theoretically allow comprehensive protection of both species and habitats in a timely manner, although as shown by the GBRMP example, subsequent monitoring is still required to evaluate the effectiveness of any initial conservation attempt. When such monitoring was done in the GBRMP, it was found that desired objectives were in fact not being met. However, since the entire area was managed by a single authority, significant rezoning could subsequently be effected relatively quickly, which it was, which increased the amount of NTA in the GBRMP from about 5% to 33%.

In the examples presented, the timing of MPA network establishment has been important – only in the past 30-40 years has the scale and magnitude of the impacts of human activities been fully recognized, resulting in the identification of the need for MPAs. At present, only the remote parts of the central Pacific and the Polar regions seem to meet the current criteria, so the establishment example of the PIPA has, relevance for the Canadian Arctic.

With respect to the nine specific elements the report was tasked to specifically address, a synthesis of the information presented for each of those elements is presented in the following section in an effort to assist workshop participants when making comparisons between networks (Table 10) and in the development of advice for MPA network establishment in Canada.

A. MPA Network Objectives

A1. The network goal(s), objectives and the process used to identify the objectives.

Network goals and objectives, when identified, were mostly related to the establishment of representative MPA networks. They were most clearly enunciated in situations where a single political jurisdiction had management authority for the ecosystem's resources, whether it was a single very large, zoned MPA (GBRMP and PIPA) or a MPA network of distinct sites (e.g., California and Australian states). Habitat types were typically used as features that comprised the representative networks.

A2. An analysis of how network-level objectives differed from site-specific MPA objectives (i.e., what is the "value added" of taking a network approach?).

Where network objectives were provided, they were generally strategic and focused on elements that were common to most of the individual MPA sites. Network objectives were often a re-statement of the goals in the legislation under which the MPAs were being put into effect. In contrast, MPA sites had objectives that were more parochial. Individual MPA objectives varied due to differences in the way in which they were developed, and generally stated what was hoped by stakeholders or managers would be achieved by any individual MPA as a contribution to the network.

B. Design Criteria

B1. The extent to which the network design criteria/properties and steps recommended in Annexes II and III of Decision IX/20 of the ninth meeting of the Conference of the Parties (COP 9) to the Convention on Biological Diversity (CBD) have been part of the planning process are discussed, along with other design criteria if they were factored in.

A summary of how the different networks utilized the CBD criteria is given in Table 11. EBSA terminology came into use only within the last decade, so is not specifically mentioned in the networks established prior to 2000. However, the concept of "key" areas, which is captured by EBSAs, was referred to, so one could consider the earlier recognition of the "spatial importance of areas" as being equivalent to EBSAs in this context. Representation and replication were incorporated in virtually all networks, but connectivity was not, likely because it requires a good understanding of the life histories of species, which is largely often unavailable. Recognizing the adequacy of sites (size, etc.) in achieving desired objectives was also considered in most networks. Adequacy of sites was identified in the European networks, even though at this time it is not being assessed as it cannot be shown that ecological coherence is presently being achieved.

The extent to which the steps listed in Annex lll were utilized was variable. Habitat classification was widely used, and sites in most networks considered were evaluated on their utility as part of the network. However, the final step, evaluating adequacy, was only implemented in those rare instances where assessments of MPA network performance have been conducted (i.e., the GBRMP and the Channel Islands MPA Network). Such an assessment could not yet be carried out in Europe, as prerequisite conditions that would justify such an assessment effort have not yet been met. The audit of the State of Victoria's MPA network also concluded that because of inadequate definition of objectives, etc., such an assessment could not be carried out.

C. Indicators and Monitoring Protocols

C1. The specific indicators developed for the network design criteria/properties (e.g., representativity, connectivity, replication, adequacy) to evaluate the effectiveness of the network design itself.

The utility of these indicators by the different networks is shown in Table 11.

Table 10: Summary of the nine elements considered for the MPA networks evaluated in this report. CAR = the principles of comprehensiveness, adequacy and representativeness.

Network	Network Objectives		Use of CBD criteria	Indicators and Monitoring					Management Measures
	Design Process Used	Network Contrib. to Value		Network effectiveness evaluation	Methods Used in Monitoring Progress	Citizen Involvement	Network protocol VS Site Protocol Monitoring Differences	Eval. of Indiv. Site Contrib. to Network	Other Management Tools Used
NSRMPA	Representative network	Biodiversity protection	CAR	Yes	Yearly review	Yes	None	No-take areas	Yes
GBRMP	Large single MPA		Partially in zoning	Yes	5-year review	Yes		No-take zoned areas	Yes
Victoria, Australia	Representative network	Biodiversity protection	CAR	No	Government Audit	Beginning	None		Yes
MLPA , CA (South and Central Coasts)	Representative network	Protect structure, function and integrity of ecosystems	Partially	Not to date		Yes		No-take areas	Yes
Channel Is. Mar. Sanc, CA	Single MPA	Protect and restore habitats and ecosystems	Partially	Yes	5-yr review	Yes		No-take zoned areas	Yes
South Africa	Ad-hoc	Preservation of ecosystems and enhancement of fisheries	Unclear	Partial	Academic reviews	Minimal	None	None	Yes
IPA, Kiribati	Single MPA	conservation of biodiversity and conservation of rare and endangered species	Unclear	Not to date		Yes		No-take zones	Yes
OSPAR	Representative habitats	Ensure the sustainable use and protection and conservation of marine biological diversity	Unclear	No	Site- and species-specific evaluations	Beginning	None	No	Yes
UK's Natura 2000	Representative habitats	Maintenance or restoration of species and habitat to favourable conservation status	Unclear	Not to date	Site- and species-specific evaluations	Minimal	None	IUCN Guidebook and a World Bank 'Score Card.'	Yes

C2. The monitoring protocols or other methods used to evaluate progress towards meeting network objectives, including the process used in their selection, and how adequate the indicators are in measuring the effectiveness of an MPA network in achieving its objective(s) and whether and how baseline values were established.

Monitoring protocols were described for those networks in which monitoring has been conducted (GBRMP and Channel Islands, CA), and where monitoring protocols have been developed, but not yet implemented (Central Coast, CA). In some networks, periodic reviews (every 4-5 years) of performance are required by legislation. The processes used for the selection of protocols were largely based on advice both from scientists and from citizen stakeholders, as often local community representatives participated in the monitoring. Indicators used appear to have been effective in MPA network evaluations, but there have been too few evaluations to be specific here. Evaluations have been rather general (e.g., how have the abundances of targeted species changed), with the most comprehensive being that in the GBRMP. The determination of baseline values is generally a challenge, as different jurisdictions have identified different approaches. Where impacts by humans have been relatively recent, and where accurate historical data are available, desirable baselines are in the direction of "pristine" conditions.

In contrast, in Europe, where a pristine condition can often only be speculated upon because of the extensive industrial exploitation history of the region, the UK view regarding the status of marine Natura 2000 sites is that "unless there is evidence to the contrary, a widespread assumption is that the sites were in favourable condition when [the MPA sites were] originally selected and therefore, the pattern of human use at that time was not causing significant damage". Thus, there appears to be considerable flexibility in determining baseline conditions, as favourable condition of a species is defined in the Habitats Directive as 'favourable' when:

- its natural range and areas it covers within that range are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

C3. The extent to which "citizen science" (community-level participation) is utilised as part of the monitoring.

This was a general requirement in most of the networks where monitoring was being conducted.

C4. The extent by which network-level monitoring protocols and other evaluation methods differed from those used to evaluate the progress of the individual components of the network.

Networks have not been sufficiently monitored to clearly address this point. However, what network monitoring really has the potential to address are connectivity issues and trends in the statuses of species over a relatively large area, as opposed to those trends in a local area. As discussed above, connectivity issues are not clearly understood for most species, and achieving connectivity as an objective is not mentioned in most networks. Network monitoring protocols are thus likely to be focused more on the patterns of species statuses over the whole network area. It is therefore more in the analysis, not the monitoring per se, network and site-specific monitoring are most likely to differ.

C5. Efforts to evaluate the degree to which individual network components (individual MPAs) and their objectives contributed to achieving the network level objectives, and if there were any, the types of analyses used to measure this.

Efforts on evaluating the contributions of individual network components have focused on the effects of NTAs, whether zoned in a MPA or characteristic of an entire MPA. Most analyses, which were clearly described in the recent assessment if the Channel Islands MPA network, relate to changes in abundances,

movements, population structures and geographical ranges of selected species; and socio-economic monitoring (e.g., recreational and commercial harvest presence and activities).

A comparison of the IUCN Guidelines and the first four parts of the World Bank Score Card was used to investigate whether indicators linked to goals and objectives of individual MPAs could be used to

Table 11: Usage of the criteria from Annexes II and III of the COP 9 Decision IX/20 to the CBD (Appendix 1) by the selected MPA networks considered in this report.

Network	CBD Criteria					Initial Steps			
	EBSAs (or equivalent)	**Representa-tivity**	**Connectivity**	**Replication**	**Adequate or viable sites**	**EBSA Science**	**Classification System**	**Site Identification Analysis**	**Assess Viability**
NSRMPA		√		√	√		√	√	√
GBRMP (zones)		√		√	√		√	√	√
Victoria, Australia		√		√	√				
MLPA , CA (South and Central Coasts)	√	√	√	√	√	√	√	√	√
South Africa		√					√		
PIPA, Kiribati	√	√	√	√	√				
UK's Natura 2000	√	√		√	√		√	√	
OSPAR	√	√		√	√		√	√	

evaluate UK MPAs. With the IUCN Guidelines, the mix of qualitative and quantitative data required to report on the indicators made the approach both practical and useful. This also meant that data could be drawn from many sources. The Score Card approach gave an overview of the current situation but because it provided an overview, was probably most useful in showing trends. Repeat evaluations would be therefore needed to make best use of this method of evaluation.

D. Management measures

D1. In addition to MPAs, other tools or management measures being used to achieve the various types of network objectives, if any.

MPAs are just one management tool among a suite of management tools that are regularly used in the management of human activities exploiting marine resources within a specific jurisdiction. Since all MPA network objectives collectively strive to ensure sustainable exploitation of resources and the well-being of impacted species, these other management tools and measures also presumably contribute to the achievement of network management objectives.

CONCLUSIONS

It should be noted that other MPA networks exist that have not been discussed in this report, such as the network in New Zealand. This was solely because of funding and time constraints, and does not imply that the experiences involving these networks are not relevant for consideration. However, that the range of MPA network case examples presented here should provide sufficient material for effective and constructive discussion on how Canada may best approach its development of an effective and functional MPA network. It should also be noted that in the published literature, there are case studies of assessments of management effectiveness of protected areas from around the world, and that some, such as Hockings et al. (2006), provide guidelines on how such assessments may best be conducted.

Networks considered here that seemed the most functional and well documented were in Australia and California. In part this was because 1) only “single jurisdictions” and “ecosystems” were involved in each of these areas, which gave managers full authority to establish a comprehensive, functional network in a timely manner, and 2) because networks there have been established for at least a decade, there was increased time for both refinement (adaptive management) and network evaluation. Networks considered in other areas were either younger (PIPA), were developed in a more ad-hoc and poorly funded manner (South Africa), or were the result of complex negotiations and compromises between numerous jurisdictions that shared common resources, resulting in a slower and more complex establishment process in developing an effective MPA network (Natura 2000 and OSPAR).

Because the development history of each MPA network is unique, it is difficult to draw general conclusions from the examples described here on how to optimally design and monitor a MPA network in Canada. However, each of the MPA network experiences described in this report offers constructive perspectives – some regarding what to do and in other cases, what not to do, if achievement of a functional MPA network that effectively protects biodiversity is the ultimate goal. A bottom line is perhaps that learning about the experiences of others can be useful if there is a will to incorporate the resulting scientific knowledge into practice. Finally, the main conclusion is that MPA network experiences elsewhere have relevance to the development of a Canadian MPA network, and that they can indicate approaches which are effective, timely, and practical. Every situation is different and unique, but the approaches in MPA network development that are likely to be ultimately adopted in Canada’s oceans have invariably been considered and evaluated at least in part elsewhere at some time.

ACKNOWLEDGEMENTS

The following individuals, in alphabetical order, provided assistance in obtaining information and references relevant to this report: Astrid Schultz, Oregon; Dan Laffoley, England; Heather Terrapon, South Africa; Ian Walker, Victoria, Australia; Jean-Yves Weigel, France; Jeff Ardron, Washington, DC; John Roff, Nova Scotia; Jon Day, Queensland, Australia; Liz Whiteman, California; Mandy Barnett, South Africa; Patrick Christie, Washington; Paul Gilliland, England; Phil Dearden, BC; Sabine Jessen, BC; Sean Hastings, California; Stacy Jupiter, Fiji; Stefan Howe, Victoria, Australia; Tundi Agardy, Washington, DC; and Vera Agostini, Washington.

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APPENDICES

APPENDIX 1: ANNEXES II AND III OF DECISION IX/20 OF THE NINTH MEETING OF THE CONFERENCE OF THE PARTIES (COP 9) TO THE CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

Adapted from CBD (2008).

Table 12. Annex II: Scientific guidance for selecting areas to establish a representative network of marine protected areas, including in open ocean waters and deep-sea habitats.

Required network properties and components	**Definition**	**Applicable site specific considerations (inter alia)**
Ecologically and biologically significant areas	Ecologically and biologically significant areas are geographically or oceanographically discrete areas that provide important services to one or more species/populations of an ecosystem or to the ecosystem as a whole, compared to other surrounding areas or areas of similar ecological characteristics, or otherwise meet the criteria as identified in annex I to decision IX/20.	• Uniqueness or rarity • Special importance for life history stages of species • Importance for threatened, endangered or declining species and/or habitats • Vulnerability, fragility, sensitivity or slow recovery • Biological productivity • Biological diversit • Naturalness
Representativity	Representativity is captured in a network when it consists of areas representing the different biogeographical subdivisions of the global oceans and regional seas that reasonably reflect the full range of ecosystems, including the biotic and habitat diversity of those marine ecosystems.	A full range of examples across a biogeographic habitat, or community classification; relative health of species and communities; relative intactness of habitat(s); naturalness
Connectivity	Connectivity in the design of a network allows for linkages whereby protected sites benefit from larval and/or species exchanges, and functional linkages from other network sites. In a connected network individual sites benefit one another.	Currents; gyres; physical bottlenecks; migration routes; species dispersal; detritus; functional linkages. Isolated sites, such as isolated seamount communities, may also be included.
Replicated ecological features	Replication of ecological features means that more than one site shall contain examples of a given feature in the given biogeographic area. The term "features" means "species, habitats and ecological processes" that naturally occur in the given biogeographic area.	Accounting for uncertainty, natural variation and the possibility of catastrophic events. Features that exhibit less natural variation or are precisely defined may require less replication than features that are inherently highly variable or are only very generally defined.
Adequate and viable sites	Adequate and viable sites indicate that all sites within a network should have size and protection sufficient to ensure the ecological viability and integrity of the feature(s) for which they were selected.	Adequacy and viability will depend on size; shape; buffers; persistence of features; threats; surrounding environment (context); physical constraints; scale of features/processes; spillover/compactness.

Annex III: *Four initial steps to be considered in the development of representative networks of marine protected areas.*

1. *Scientific identification of an initial set of ecologically or biologically significant areas.* The criteria in annex I to decision IX/20 should be used, considering the best scientific information available, and applying the precautionary approach. This identification should focus on developing an initial set of sites already recognized for their ecological values, with the understanding that other sites could be added as more information becomes available.

2. *Develop/choose a biogeographic, habitat, and/or community classification system.* This system should reflect the scale of the application and address the key ecological features within the area. This step will entail a separation of at least two realms-pelagic and benthic.

3. *Drawing upon steps 1 and 2 above, iteratively use qualitative and/or quantitative techniques to identify sites to include in a network.* Their selection for consideration of enhanced management should reflect their recognised ecological importance or vulnerability, and address the requirements of ecological coherence through representativity, connectivity, and replication.

4. *Assess the adequacy and viability of the selected sites.* Consideration should be given to their size, shape, boundaries, buffering, and appropriateness of the site-management regime.

APPENDIX 2: ASSESSMENT SUMMARIES OF GBRR BIODIVERSITY.

Adapted from GBRMPA (2009).

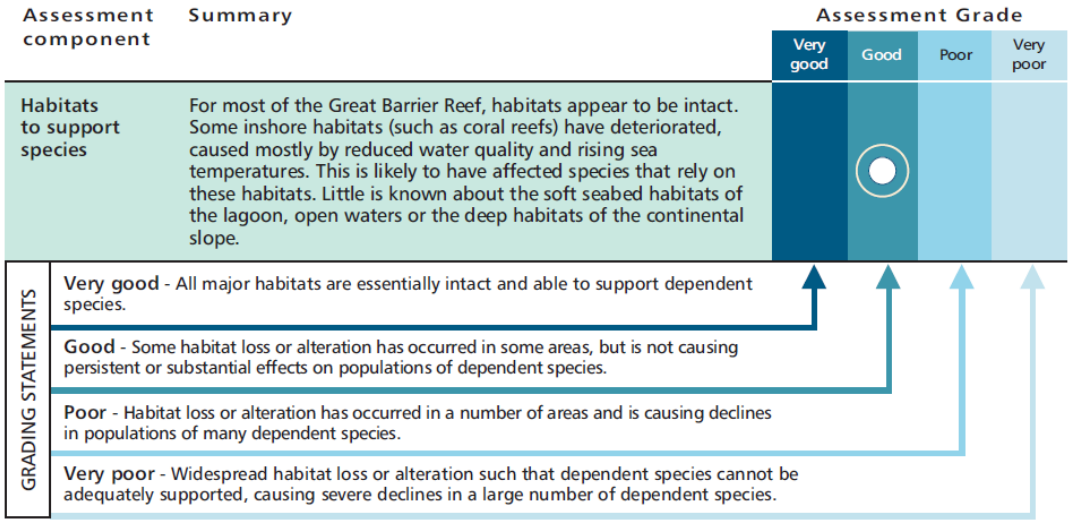
Assessment summary – Biodiversity

Section 54(3)(b) of the Great Barrier Reef Marine Park Act 1975 requires "…*an assessment of the current biodiversity within* …" the Great Barrier Reef Region. This assessment is based on two assessment criteria:

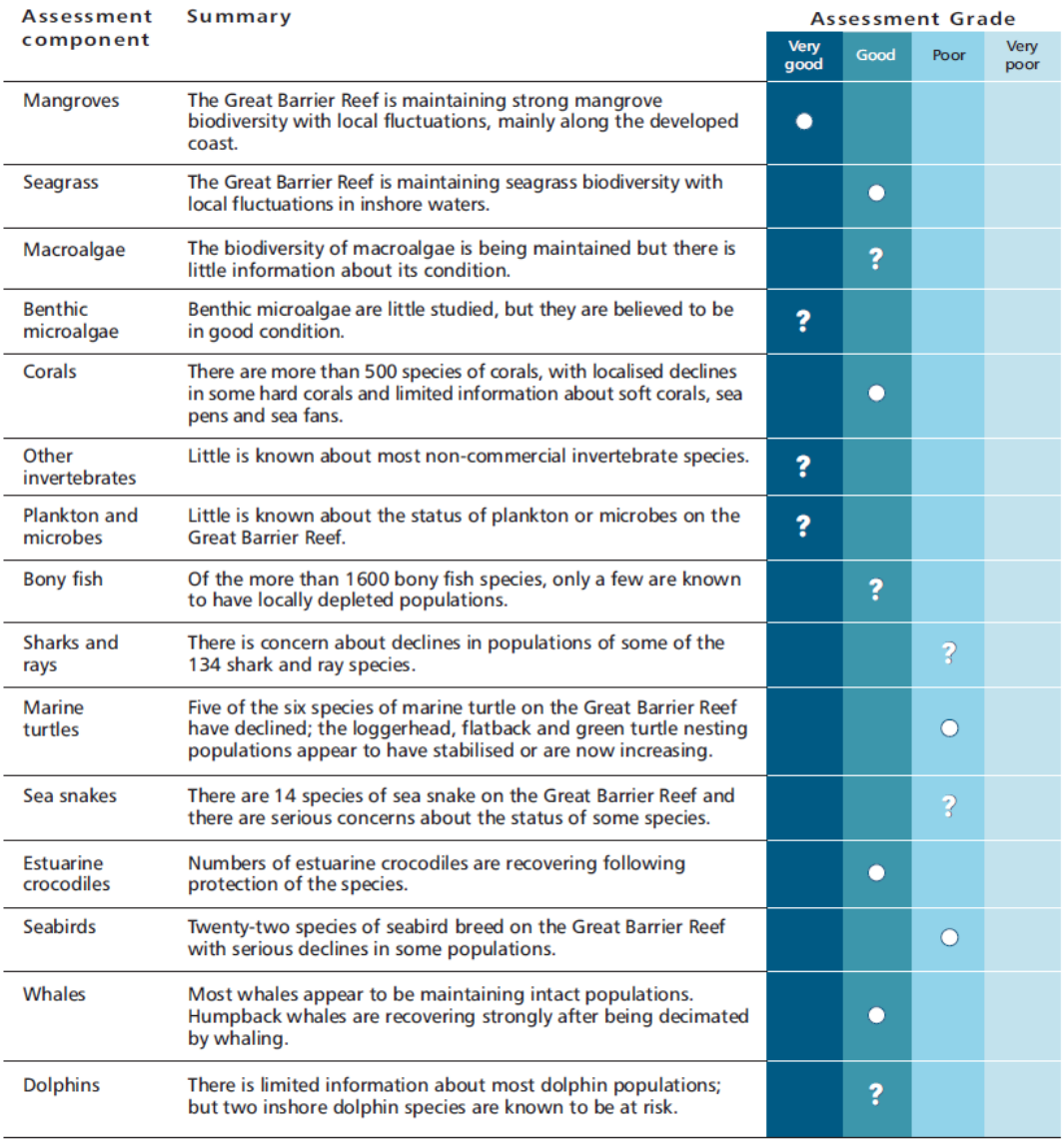
- habitats to support species
- populations of species and groups of species."

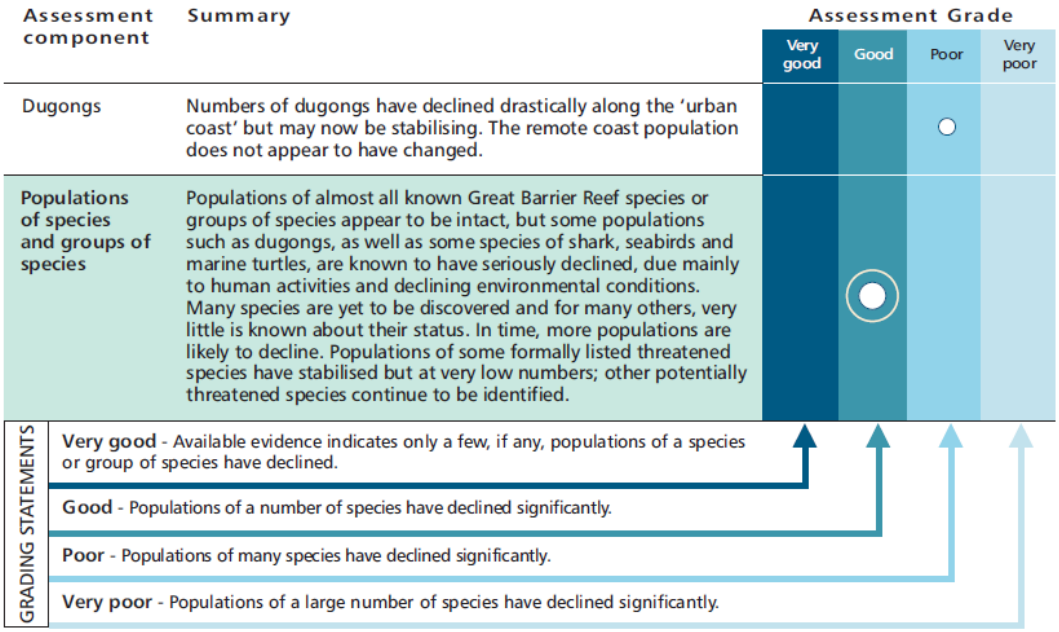
Habitats to support species

Assessment component	Summary	Assessment Grade			
		Very good	Good	Poor	Very poor
Islands	About half of the islands are within protected areas; there is limited monitoring on the condition of most islands.		●		
Beaches	In some areas, changes in coastal dynamics and reclaiming of marine areas have altered the beach habitats of the Great Barrier Reef.		●		
Mangroves	The overall area of mangrove forest adjacent to the Great Barrier Reef appears to be generally stable except where there is significant coastal development.		●		
Seagrass meadows	Changes in seagrass communities appear to be mainly due to natural cycles of decline and recovery although influenced by runoff from catchments.		●		
Reefs	Coral reef habitats are likely to be declining, more so in inshore areas, but the trends are difficult to interpret.		●		
Lagoon floor	Soft seabed habitats support more than 5000 species but are not well understood.		?		
Shoals	There is little information about the extent or condition of shoals in the Great Barrier Reef.		?		
Halimeda banks	Little is known of the status of the *Halimeda* banks that occur in the northern Great Barrier Reef but they are believed to be in very good condition.	?			
Continental slope	The continental slope is little studied but believed to be in very good condition.	?			
Open waters	Many species depend on open waters but little is known about the condition of these habitats except that inshore areas are being degraded.		?		



Populations of species and groups of species





Overall summary of biodiversity

The Great Barrier Reef is one of the world's best known and most complex natural systems and it continues to support extensive plant and animal biodiversity. This biodiversity is nationally and internationally important for the continued survival of many species.

The sheer scale of the ecosystem means monitoring has focused on a few key habitats and species or groups of species, generally those that are iconic (such as coral reefs, seabirds), commercially important (such as seagrass meadows, coral trout) or threatened (such as dugongs, marine turtles). There are few long-term monitoring programs established and the baseline from which to make comparisons is different for each group studied.

There is little detailed information about the status and trends of many habitat types within the Great Barrier Reef (for example the lagoon floor, shoals, Halimeda banks and the continental slope). However, there is some evidence of a small decline in coral reef habitat over recent decades. This may have already begun to affect species that depend on that habitat.

Populations appear to be intact for the vast majority of species or groups of species in the Great Barrier Reef ecosystem. Latitudinal and cross-shelf biodiversity appears to be being maintained; however inshore species and their habitats adjacent to the developed coast are under more pressure than those both offshore and further north. Populations of a number of ecologically significant species, particularly predators (such as sharks, seabirds) and large herbivores (dugongs), are known to have seriously declined. Declines in species or groups of species have been caused by a range of factors, some of which have been addressed with evidence of recovery of some affected species (e.g. humpback whales, the southern Great Barrier Reef green turtle stock).

APPENDIX 3: ASSESSMENT SUMMARIES OF GBRR ECOSYSTEM HEALTH.

Adapted from GBRMPA (2009).

Assessment summary – Ecosystem health

Section 54(3)(a) of the Great Barrier Reef Marine Park Act 1975 requires "...an assessment of the current health of the ecosystem within the Great Barrier Reef Region and of the ecosystem outside that region to the extent that it affects that region ". This assessment is based on four assessment criteria:

- physical processes
- chemical processes
- ecological processes
- outbreaks of diseases, introduced species and pest species

Physical processes

Assessment component	Summary	Assessment Grade: Very good	Good	Poor	Very poor
Ocean currents	Ocean currents vary naturally and there is insufficient evidence to know if patterns are changing in the Great Barrier Reef.	?			
Cyclones and wind	There is no evidence of more frequent cyclones but there is evidence of increased intensity.		●		
Freshwater inflow	Freshwater flows may be affected by drainage patterns in the catchment.		●		
Sedimentation	Exposure of the Great Barrier Reef to terrestrial sediments has increased, especially in inshore areas.			○	
Sea level	Sea levels have risen in the Great Barrier Reef and are projected to rise further.		●		
Sea temperature	Average water temperature across the Great Barrier Reef is increasing.			○	
Light	Increased sedimentation may be altering light levels in inshore areas.		?		
Physical processes	The physical processes of the Great Barrier Reef are changing, in particular sedimentation and sea temperature. Further changes in factors such as sea temperature, sea level and sedimentation are expected because of climate change and catchment runoff.		◉		

GRADING STATEMENTS

Very good - There is no evidence of significant changes in physical processes.

Good - Some physical processes have changed in some areas, but not to the extent that the changes are significantly affecting ecosystem function.

Poor - Physical processes have changed substantially in some areas to the extent that ecosystem function is significantly affected in some parts of the Region.

Very poor - Physical processes have changed substantially and over a wide area. Ecosystem function is seriously affected in much of the Region.

Chemical processes

Assessment component	Summary	Assessment Grade: Very good	Good	Poor	Very poor
Nutrient cycling	Exposure to nutrients has increased for much of the Great Barrier Reef especially in inshore areas.			○	
Pesticide accumulation	There are traces of pesticides in the Great Barrier Reef environment, the impacts of which are largely unknown.			?	
Ocean acidity	The world's oceans are becoming more acidic affecting the growth of corals.		●		

Assessment component	Summary	Assessment Grade: Very good	Good	Poor	Very poor
Ocean salinity	The salinity of Great Barrier Reef waters is generally stable, with local short-term fluctuations after flood events, mostly close to the coast.	●			
Chemical processes	For much of the Great Barrier Reef, the chemical environment has deteriorated significantly, especially inshore close to developed areas. This trend is expected to continue. Acidification of all Great Barrier Reef waters as a result of increased concentrations of atmospheric carbon dioxide is an emerging serious issue which is likely to worsen in the future.			◎	

GRADING STATEMENTS

Very good - There is no evidence of significant changes in chemical processes.

Good - Some chemical processes have changed in some areas, but not to the extent that the changes are significantly affecting ecosystem function.

Poor - Chemical processes have changed substantially in some areas to the extent that ecosystem function is significantly affected in some parts of the Region.

Very poor - Chemical processes have changed substantially and over a wide area. Ecosystem function is seriously affected in much of the Region.

Ecological processes

Assessment component	Summary	Assessment Grade: Very good	Good	Poor	Very poor
Microbial processes	Changes in the physical and chemical environment are likely to be causing changes in microbial processes, but there is little information available.		?		
Particle feeding	Most populations of particle feeders are healthy although sea cucumbers are at risk to local depletion.		●		
Primary production	There is insufficient evidence to know if patterns of primary production are changing.	?			
Herbivory	Populations of herbivorous fish are healthy and generally not under pressure; however larger herbivores, like dugongs, have declined along the urban coast.		●		
Predation	Most predator populations are relatively healthy but a few species are under serious pressure, with potential flow-on impacts.			?	
Symbiosis	Little is known about most symbiotic relationships.		?		
Reef building	The rate of reef building may be beginning to slow.		●		
Competition	Competition between corals and algae appears normal except for some inshore areas, but there is little information about other types of competition.		?		
Connectivity	Most species and habitats remain adequately connected; connectivity between marine habitats and adjacent freshwater habitats has been reduced.		?		
Ecological processes	Most ecological processes remain intact and healthy on the Great Barrier Reef, but further declines in physical and chemical processes are expected to affect them in the future. There is concern for predation, as predators are much reduced in many areas. Populations of large herbivores (such as dugongs) are severely reduced, however populations of herbivorous fish remain intact.		◉		

GRADING STATEMENTS

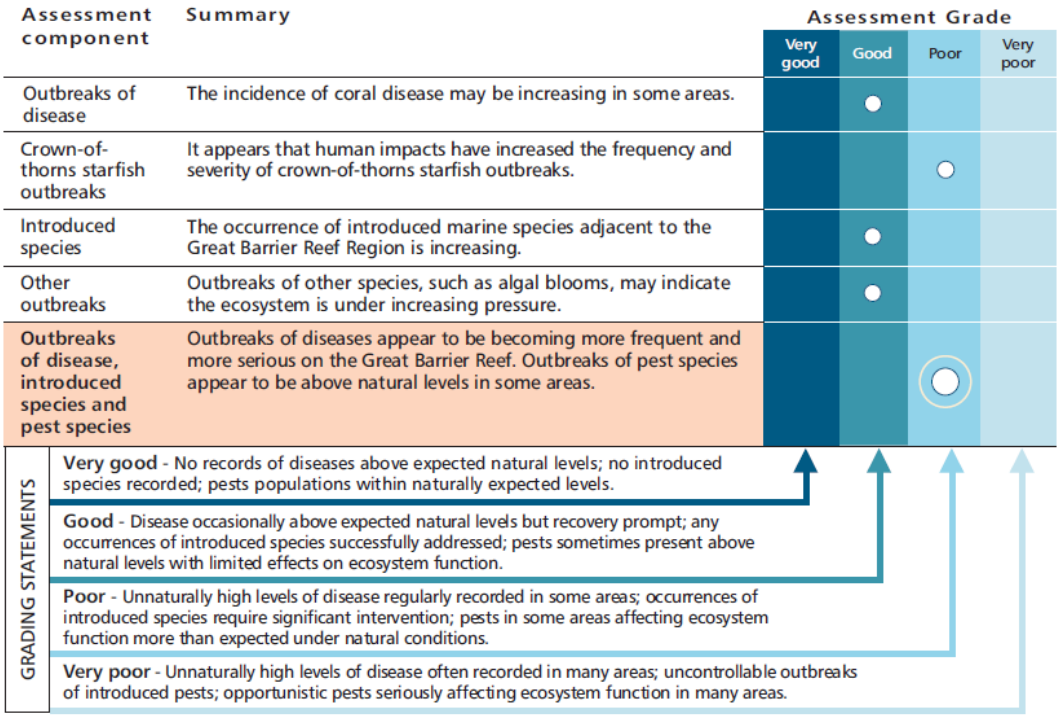
Very good - There is no evidence of significant change in ecological processes.

Good - Some ecological processes have changed in some areas, but not to the extent that the changes are significantly affecting ecosystem function.

Poor - Ecological processes have changed substantially in some areas to the extent that ecosystem function is significantly affected in some parts of the Region.

Very poor - Ecological processes have changed substantially and over a wide area. Ecosystem function is seriously affected in much of the Region.

Outbreaks of disease, introduced species and pest species



Overall summary of ecosystem health

Many of the key processes of the Great Barrier Reef ecosystem are changing and this is negatively affecting the health of the ecosystem.

Increased sedimentation and inputs of nutrients and pesticides to the ecosystem are affecting inshore areas, causing algal blooms and pollutants to accumulate in sediments and marine species, reducing light and smothering corals. Sea temperatures are increasing because of climate change, leading to mass bleaching of corals, and increasing ocean acidity is affecting rates of calcification. These processes combined are essential to the fundamental ecological processes of primary production and building coral reef habitats on the Great Barrier Reef.

It is considered that the overall food web of the Great Barrier Reef is being affected by declines in herbivory in inshore habitats because the urban coast dugong population is a fraction of its former population; in predation on reef habitats because of potential reef-wide differences in coral trout and shark numbers on reefs open and closed to fishing; and in particle feeding on reef habitats because of the reduction in at least one species of sea cucumber.

Combined with more frequent outbreaks of disease and pests and changes in other physical, chemical and ecological processes, declines in these processes mean that the health of the Great Barrier Reef ecosystem is reduced.

APPENDIX 4: ASSESSMENT SUMMARIES OF GBRR BENEFITS OF USE.

Adapted from GBRMPA (2009).

Assessment summary – Commercial and non-commercial use

Benefits of use

Assessment component	Summary	Assessment Grade: Very good	Good	Poor	Very poor
Commercial marine tourism	Tourism makes a significant contribution to the presentation, management and economic value of the Great Barrier Reef.	●			
Defence	Activities in the Great Barrier Reef directly contribute to the training and operations of Australia's defence services.		●		
Fishing	Fishing provides opportunities for recreation, resources for the seafood industry, and generates regional economic value.		●		
Ports and shipping	Adjacent ports and shipping through the Great Barrier Reef service central and northern Queensland industries and communities.	●			
Recreation (not including fishing)	Visitors to the Great Barrier Reef are consistently very happy with their visit and would recommend the experience.	●			
Scientific research	Research improves understanding of the Great Barrier Reef and allows management to be based upon the best available information.	●			
Traditional use of marine resources	Traditional use of marine resources provides environmental, social, economic and cultural benefits to Traditional Owners and their sea country.	●			
Benefits of use	Use of the Great Barrier Reef contributes strongly to the regional and national economy and local communities. Its economic value is derived almost exclusively from its natural resources, either through extraction of those resources or through tourism and recreation focused on the natural environment, and would be affected by declines in those resources. Millions of people visit the Great Barrier Reef every year and are very satisfied with their visit. The Great Barrier Reef is valued well beyond its local communities, with strong national and international scientific interest. The Great Barrier Reef is of major importance to Traditional Owner culture. Some users financially contribute to management.	◉			

GRADING STATEMENTS

Very good - Use of the Region makes a significant contribution to the environmental, economic and social values of the Region, in ways that sustain the fundamental value of the natural resource. The Region is strongly recognised, valued and enjoyed by catchment residents, the nation and the world community.

Good - Use of the Region makes a valuable contribution to the environmental, economic and social values of the Region. The Region is valued by catchment residents, the nation and the world community.

Poor - There is a small and strongly declining contribution to the environmental, economic and social values of the Region. Many do not recognise the value of the Region and do not enjoy their visit to the Region.

Very poor - Use of the Region contributes little or nothing to the environmental, economic and social values of the Region. The Region holds little value for catchment residents, the nation or the world community.

Impacts of use

Assessment component	Summary	Assessment Grade: Very low impact	Low impact	High impact	Very high impact
Commercial marine tourism	Marine tourism extends throughout the Great Barrier Reef but its impacts are concentrated in a few intensively managed areas.	●			
Defence	The majority of routine defence training activities have negligible impacts.	●			
Fishing	There is limited information about many targeted species and of the survival success of discarded species resulting in a poor understanding of the ecosystem effects of fishing.			?	
Ports and shipping	Most routine shipping activities have negligible consequences. Dredging and construction of port facilities can have significant but localised impacts.		●		
Recreation (not including fishing)	The impacts of recreation (not including fishing) are mainly localised in inshore areas.		●		

Assessment component	Summary	Assessment Grade: Very low impact	Low impact	High impact	Very high impact
Scientific research	Impacts of scientific research are concentrated primarily around research stations.	●			
Traditional use of marine resources	Traditional use, mainly hunting, fishing and collecting, involves a range of marine species (some of conservation concern) but levels of take are unknown. Poaching by non-Traditional Owners is a concern for Traditional Owners and management agencies.			?	
Impacts of use	The impacts of different uses of the Great Barrier Reef overlap and are concentrated inshore and next to developed areas. There are some concerns about localised impacts and effects on some species. In particular, species of conservation concern such as dugongs, some bony fish, sharks, seabirds and marine turtles are at risk, especially as a result of fishing, disturbance from increasing use of coastal habitats, illegal fishing, poaching and traditional use of marine resources. There is evidence that fishing is also significantly affecting the populations of some targeted species. The survival success of non-retained species is not well understood, nor are the ecosystem effects of fishing.		◉		

GRADING STATEMENTS

Very low impact - Any impacts attributable to use of the Region are minor and localised, with no observable effects on overall ecosystem function.

Low impact - The impacts of use are observable in some locations or to some species, but only to the extent that limited additional intervention would be required for the ecosystem to be used sustainably. Enjoyment of some aspects or some areas is reduced.

High impact - The impacts of use are obvious in many locations or for many species to the extent that significant additional intervention would be required for the ecosystem to be used sustainably. Enjoyment is substantially reduced.

Very high impact - The impacts of use are widespread, to the extent that ecosystem function is severely compromised. Opportunities to enjoy the Region are limited.

Overall summary of commercial and non-commercial use

Almost all commercial and non-commercial uses of the Great Barrier Reef Region are dependent on the biodiversity and health of its ecosystem. Use occurs across the length and breadth of the ecosystem with most use and impact concentrated inshore, near developed coasts and on coral reef habitats. The current state and trends of most uses are known, with fluctuations largely determined by global factors such as fuel prices, human health issues and economic development. There are some concerns about localised impacts and effects on some species with potential flow on effects to some ecological processes.

Uses of the Great Barrier Reef are economically important to regional communities and tourism is economically important nationally. They provide income to and employment for local

industries and are an integral component of coastal communities. Traditional Owner aspirations are being increasingly recognised and formalised in law. However, they are also being increasingly impacted by other activities occurring in the Great Barrier Reef and along the adjacent coastal zone.

Declines in many coral reef ecosystems around the world are likely to increase the commercial and noncommercial value placed on components of the Great Barrier Reef and potentially alter use patterns in the future. Overall trends of use of the Great Barrier Reef are difficult to predict because each use is shifting at different rates and in response to different drivers. The future cumulative effects of all use and the ecosystem-level impacts are poorly understood.

APPENDIX 5: ASSESSMENT SUMMARIES OF GBRR FACTORS INFLUENCING THE REEF'S VALUES.

Adapted from GBRMPA (2009).

Assessment summary – Factors influencing the Reef's values

Section 54(3)(g) of the *Great Barrier Reef Marine Park Act 1975 requires '…an assessment of the factors influencing the current and projected future environmental, economic and social values…'* of the Great Barrier Reef Region. The assessment is based on three assessment criteria:

- impacts on environmental values
- impacts on economic values
- impacts on social values.

Impacts on environmental values

Assessment component	Summary	Assessment Grade: Very low impact	Low impact	High impact	Very high impact
Climate change	Almost all Great Barrier Reef species will be affected by climate change, some seriously. Coral reef habitats and seabirds are particularly vulnerable.				○
Coastal development	Increasing coastal development is resulting in the loss of both coastal habitats that support the Great Barrier Reef and connectivity between habitats.			○	
Catchment runoff	Increased concentrations of suspended sediments and agricultural chemicals are having significant effects inshore close to agricultural areas. Much continues to be done to improve water quality entering the Great Barrier Reef but it will be decades before the benefits are seen.			○	
Direct use	Direct use is impacting some species groups and ecological processes including fish populations, predation and herbivory. Some species of conservation concern continue to be impacted.		○		
Impact on environmental values	Climate change, particularly rising sea temperatures and ocean acidification, has already affected the Great Barrier Reef ecosystem and over the next 50 years it is likely to significantly affect most components of the ecosystem. The Great Barrier Reef, especially much of its inshore area, is being affected by increased nutrients, sediments and other pollutants in catchment runoff, mainly from diffuse agricultural sources, despite recent advances in agricultural practices. Coastal development is contributing to the modification and loss of coastal habitats that support the Great Barrier Reef. As the coastal population continues to grow there will be increasing use of the Great Barrier Reef and therefore the potential for further damage. Direct use of the Region is impacting on some environmental values.			◉	

GRADING STATEMENTS

Very low impact - Few or no impacts have been observed and accepted predictions indicate that future impacts on the Region's environmental values are likely to be minor.

Low impact - Some minor impacts have already been observed and there is concern that, based on accepted predictions, there will be significant but localised impacts on the Region's environmental values.

High impact - Current and predicted future impacts are likely to significantly affect the Region's environmental values. Concern about serious ecosystem effects within next 20-50 years.

Very high impact - Current and predicted future impacts are likely to irreversibly destroy much of the Region's environmental values. Widespread and serious ecosystem effects likely within next 10-20 years.

Impacts on economic values

Assessment component	Summary	Assessment Grade: Very low impact	Low impact	High impact	Very high impact
Climate change	Climate related changes to the ecosystem are expected to seriously affect Reef-based industries and communities.			○	
Coastal development	An increasing coastal population is likely to increase the economic worth of recreational activities and Reef-dependent industries.		○		

Assessment component	Summary	Assessment Grade: Very low impact	Low impact	High impact	Very high impact
Catchment runoff	The impact of catchment runoff on inshore areas is expected to continue to affect the economic value of associated Reef-based industries.			○	
Direct use	Direct use directly contributes to the economic value of the Great Barrier Reef, mainly derived from its natural resources.	●			
Impact on economic values	Changes to the Great Barrier Reef ecosystem are likely to have serious economic implications for reef-dependent industries, such as tourism and fishing, and for adjacent communities. Perceptions about the health of the ecosystem also affect its attractiveness for tourism and recreation and, thus, its marketability. An increasing coastal population is likely to increase the economic value of Reef-based activities. The economic benefits of direct use will be affected by the impacts of external factors.			◉	

GRADING STATEMENTS

Very low impact - Few or no impacts have been observed and accepted predictions indicate that future impacts on the Region's economic values are likely to be minor.

Low impact - Some minor impacts have already been observed and there is concern that, based on accepted predictions, there will be significant but localised impacts on the Region's economic values.

High impact - Current and predicted future impacts are likely to significantly affect the Region's economic values. Concern about serious effects on the Region's economic values within next 20-50 years.

Very high impact - Current and predicted future impacts are likely to irreversibly destroy much of the Region's economic values. Widespread and serious effects on the Region's economic values likely within next 10-20 years.

Impacts on social values

Assessment component	Summary	Assessment Grade: Very low impact	Low impact	High impact	Very high impact
Climate change	Climate-related changes to the ecosystem could affect patterns of use of the Great Barrier Reef and visitor satisfaction.			○	
Coastal development	Increasing coastal population is resulting in greater use of the Great Barrier Reef (this has not yet affected visitor satisfaction).		●		
Catchment runoff	A decline in inshore habitats will have social implications for coastal communities.		●		
Direct use	Direct use of the Region provides strong social benefits to regional communities and Traditional Owners. Future increasing use may diminish these benefits.		●		
Impact on social values	An increasing coastal population is likely to increase recreational use of the Region and change people's experiences of the Great Barrier Reef with increased congestion at popular recreation locations and competition for preferred sites. A decline in inshore habitats as a result of polluted water will have social implications for dependent industries and coastal communities. Traditional Owners are concerned about rising temperatures altering the seasonality and availability of marine resources as well as the potential loss of totemic species.		◉		

GRADING STATEMENTS

Very low impact - Few or no impacts have been observed and accepted predictions indicate that future impacts on the Region's social values are likely to be minor.

Low impact - Some minor impacts have already been observed and there is concern that, based on accepted predictions, there will be significant but localised impacts on the Region's social values.

High impact - Current and predicted future impacts are likely to significantly affect the Region's social values. Concern about serious effects on the Region's social values within next 20-50 years.

Very high impact - Current and predicted future impacts are likely to irreversibly destroy much of the Region's social value. Widespread and serious effects on the Region's social values are likely within next 10-20 years.

Overall summary of factors influencing the Reef's values

Factors external to the Great Barrier Reef itself are playing an increasing role in determining its condition. Impacts from climate change have already been witnessed and all parts of the ecosystem are vulnerable to its increasing effects with coral reef habitats the most vulnerable. Coastal development, primarily driven by mining, industry and population growth, is still significantly affecting coastal habitats that support the Great Barrier Reef and the water quality of the Great Barrier Reef. Despite improvements in local land management, the quality of catchment runoff entering the Great Barrier Reef continues to cause deterioration in the water quality in the Great Barrier Reef Region.

Currently, changes in the use made of the Great Barrier Reef Region are mainly driven by external factors such as global economic conditions plus regional economic development and population growth. As many uses of the Region are based on the resources of the Great Barrier Reef ecosystem, the health of that ecosystem may become an increasingly important determinant of use.

Many of the threats from both the external factors and those from direct use within the Great Barrier Reef are combining to cause serious impacts on the ecosystem. All these factors are significant to the ecosystem's future functioning and resilience.

APPENDIX 6: ASSESSMENT SUMMARIES OF GBRR PROTECTION AND MANAGEMENT.

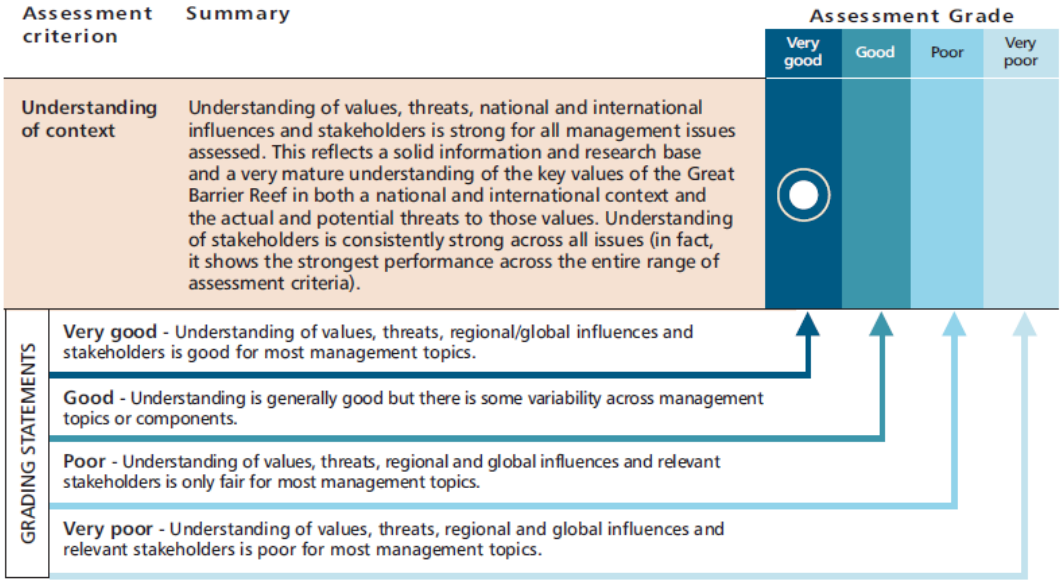
Adapted from GBRMPA (2009).

Assessment summary - Existing protection and management

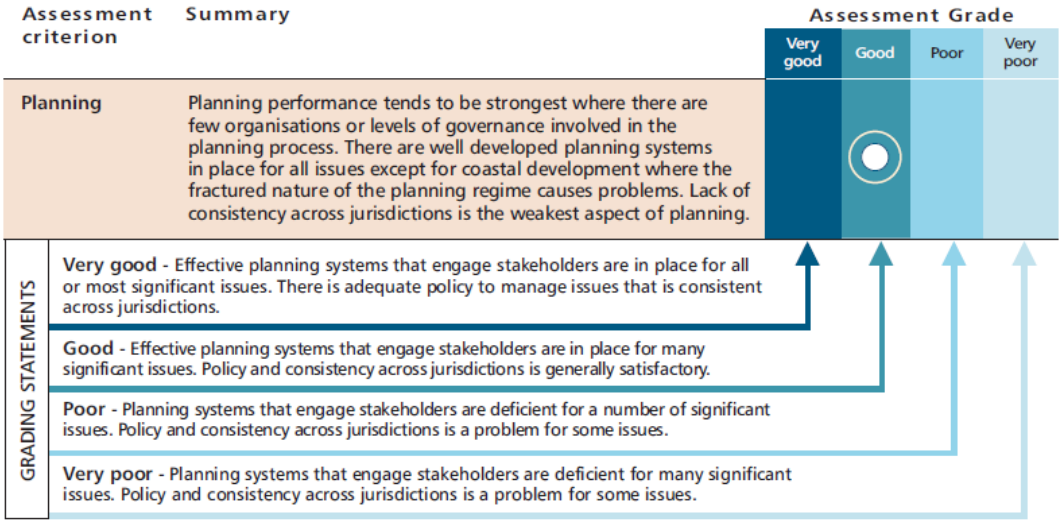
Section 54(3)(f) of the *Great Barrier Reef Marine Park Act 1975* requires '*…an assessment of the existing measures to protect and manage the ecosystem …*' within the Great Barrier Reef Region. The assessment was undertaken by two independent external expert assessors based on six assessment criteria:

- understanding of context
- planning
- financial, staffing and information inputs
- management systems and processes
- delivery of outputs
- achievement of outcomes.

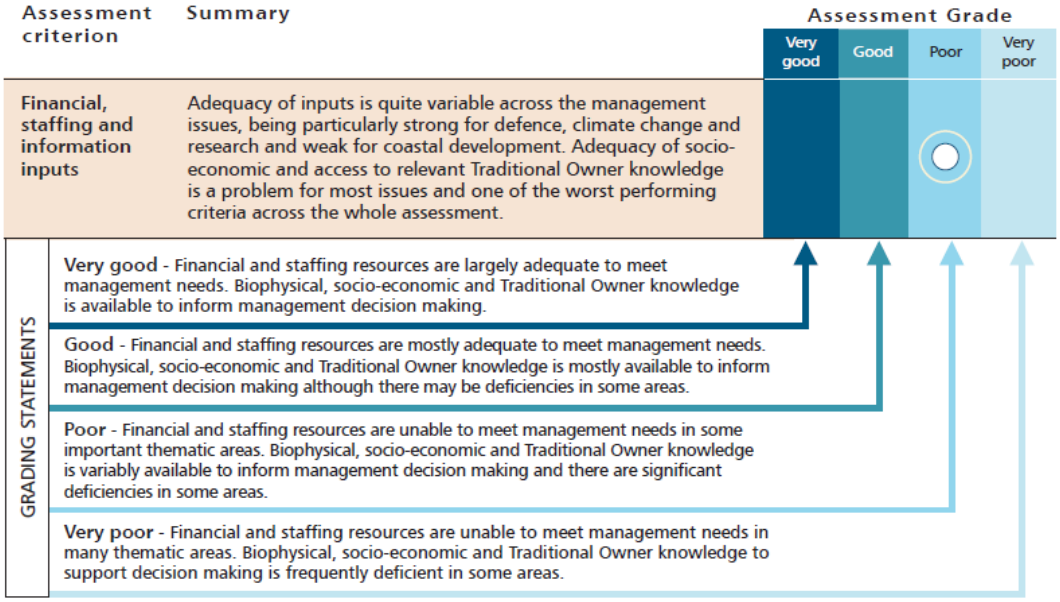
Understanding of context



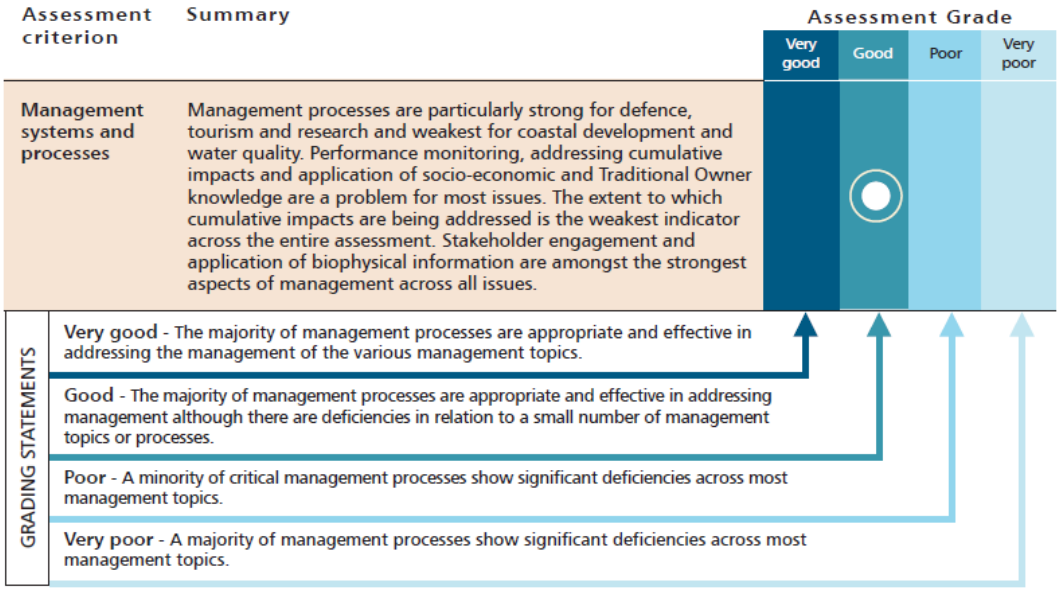
Planning



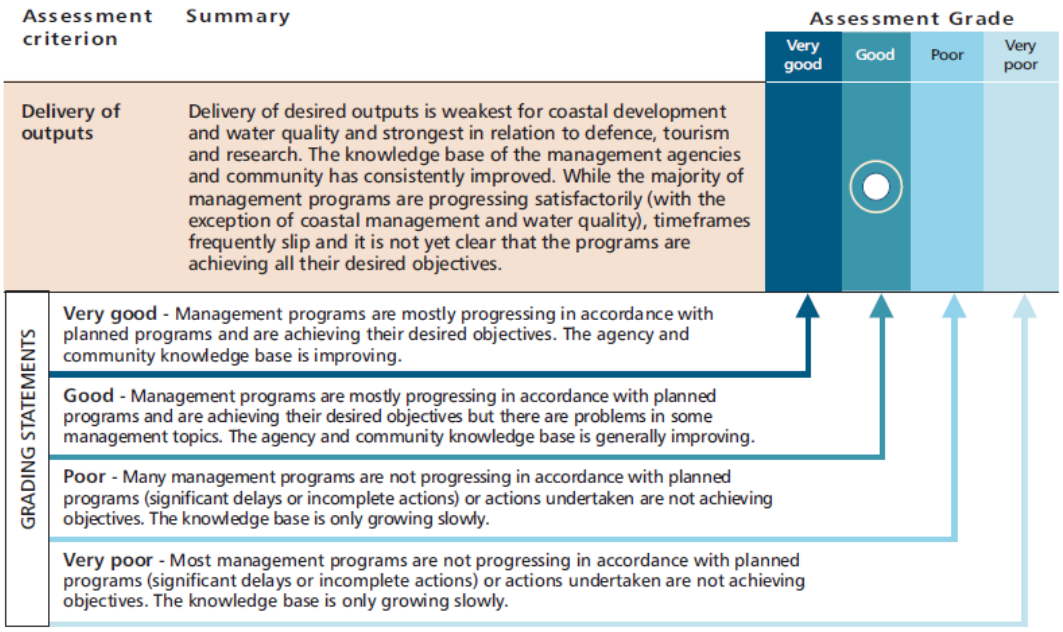
Financial, staffing and information inputs



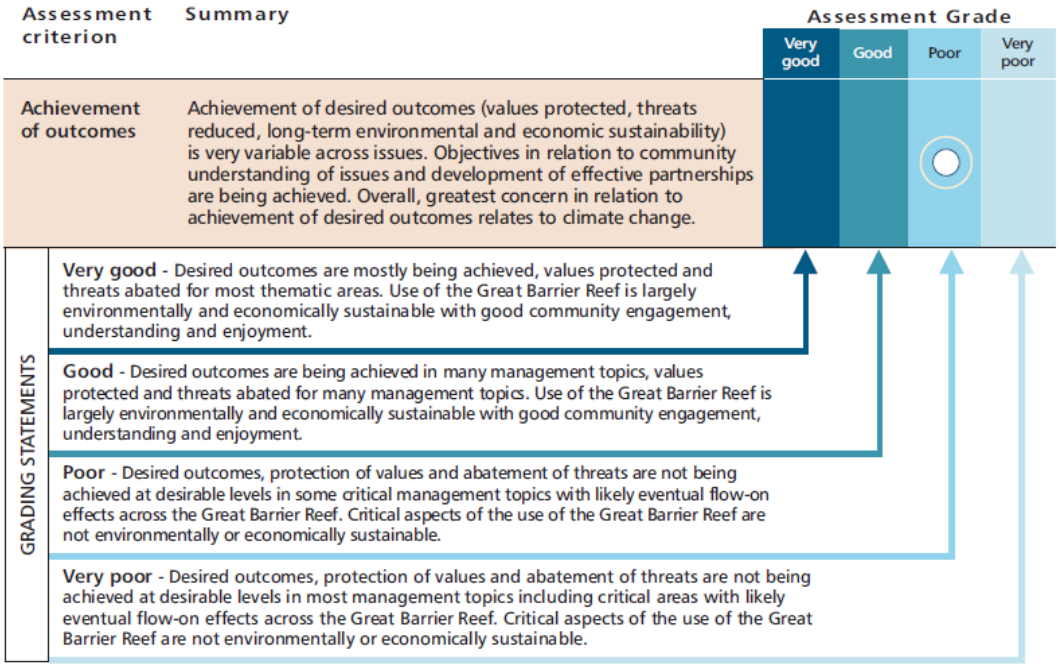
Management systems and processes



Delivery of outputs



Achievement of outcomes



Overall summary of existing protection and management

The effectiveness of existing measures to protect and manage the Great Barrier Reef ecosystem was independently assessed for 12 broad management topics, ranging from biodiversity protection to fishing, coastal development and ports and shipping (Table 4).

Management effectiveness challenges are evident for those management topics which are broad in scale and complex socially, biophysically and jurisdictionally (for example climate change, coastal development, water quality and fishing). Effectiveness is strongest on issues that are limited in scale, intensity or complexity (for example defence and scientific research).

The outcomes for each of the six Assessment Criteria examining all of the broad management topics combined are summarised in Table 4.

APPENDIX 7: ASSESSMENT SUMMARIES OF GBRR ECOSYSTEM RESILIENCE.

Adapted from GBRMPA (2009).

Assessment summary – Ecosystem resilience

Section 54(3)(e) of the *Great Barrier Reef Marine Park Act 1975* requires "*…an assessment of the current resilience of the ecosystem …"* within the Great Barrier Reef Region. This overall assessment of ecosystem resilience is based on the information provided in earlier chapters of this Report, namely the current state and trends of the Great Barrier Reef ecosystem's biodiversity and health as well as the trends in direct use, the factors influencing future environmental values and the effectiveness of protection and management arrangements. It is supplemented by a series of case studies addressing:

- recovery after disturbance.

Recovery after disturbance

Assessment component	Summary	Assessment Grade: Very good	Good	Poor	Very poor
Coral reef habitats	Coral reef habitats are recovering from multiple short-term disturbances. Predicted increases in frequency and severity of disturbances will likely reduce the capacity for coral reefs to recover.		●		
Lagoon floor habitats	Some lagoon floor habitats previously at risk are recovering from disturbances. Full recovery will take decades.		●		
Black teatfish	Populations of black teatfish are low and are not recovering.				○
Coral trout	The number and size of coral trout is increasing rapidly in zones closed to fishing.		●		
Loggerhead turtles	Trawl turtle excluder devices have arrested the decline in loggerhead turtles but other pressures will influence their recovery.			○	
Urban coast dugongs	The urban coast dugong population may take more than a century to recover and is subject to many continuing pressures.				○
Humpback whales	Humpback whales appear to be recovering at their maximum population growth rate 45 years after whaling stopped.	●			
Recovery after disturbance	Some disturbed populations and habitats have demonstrated recovery after disturbance (for example coral reefs, lagoon floor, coral trout, humpback whales). For some species recovery has been very slow (for example loggerhead turtles) or not evident (black teatfish, dugongs) and is dependent on the removal of all major threats. Increasing frequency and extent of threats are likely to reduce the resilience of species and habitats.		◉		

GRADING STATEMENTS

Very good - Under current management, throughout the ecosystem, populations of affected species are recovering well, at rates close to their maximum reproductive capacity. Affected habitats are recovering within expected natural timeframes, following natural cycles of regeneration.

Good - Populations of affected species are recovering at rates below their maximum reproductive capacity. Recovery of affected habitats is slower than naturally expected but structure and function are ultimately restored within a reasonable timeframe.

Poor - Populations of affected species are recovering poorly, at rates well below their maximum reproductive capacity. Recovery of affected habitats is much slower than expected natural timeframes and the resultant habitat is substantially different.

Very poor - Affected species are failing to recover and affected habitats are failing to recover to their natural structure and function.

Overall summary of ecosystem resilience

At the scale of the Great Barrier Reef ecosystem, most habitats or species groups are in good condition; however there have been declines in species that play key ecological roles. These

declines have been mainly due to direct use of the ecosystem, land management practices in the catchment, or declining environmental variables because of climate change.

There are concerns about aspects of the ecosystem's health. Sea temperature, sea level and sedimentation are all expected to increase because of climate change and catchment runoff,causing deterioration to the ecosystem. Changes in the chemical processes of ocean acidity, nutrient cycling and pesticides now affect large areas of the ecosystem. At the same time, reductions in some predator and herbivore populations may have already affected ecological processes, although the specific effects remain unknown. Outbreaks of diseases appear to be becoming more frequent and more serious.

The vulnerabilities of the ecosystem to climate change, coastal development, catchment runoff and some aspects of fishing mean that recovery of already depleted species and habitats requires the management of many factors. In some instances, the ecosystem's ability to recover from disturbances is already being compromised with either reduced population growth or no evidence of recovery.

The independent assessment of existing protection and management found that management is most challenging for those topics which are broad in scale (often well beyond the boundaries of the Great Barrier Reef) and complex. For example addressing climate change impacts requires global responses; coastal development and water quality require coordinated actions throughout the catchment. The management of fishing is socially and biophysically complex. The assessment indicated that addressing cumulative impacts is one of the least effective areas of management.

Notwithstanding these challenges, many of the management measures employed in the Great Barrier Reef Region and beyond are making positive contributions to resilience (as evidenced by recovery of some species and habitats). The Zoning Plans for both the Great Barrier Reef Marine Park and the adjacent Great Barrier Reef Coast Marine Park that were introduced in 2004 are the most significant action taken to enhance biodiversity protection. They provide a robust framework for management and are already demonstrating positive results. Compliance with and public support for these and other measures is a critical factor in building the resilience of the ecosystem.

Taken together, available information indicates that the overall resilience of the Great Barrier Reef ecosystem is being reduced. Given the effectiveness of existing protection and management in addressing the most significant pressures on the ecosystem (principally arising from outside the Region), this trend is expected to continue.

APPENDIX 8: ASSESSMENT SUMMARIES OF GBRR OVERALL THREAT TO THE ECOSYSTEM

Adapted from GBRMPA (2009).

Assessment summary – Risks to the Reef

Overall threat to the ecosystem

Assessment components	Summary	Assessment Grade: Low risk	Medium risk	High risk	Very high risk
Climate change	The threats of increasing sea temperature, ocean acidification and sea level rise are very high risks to the ecosystem.				○
Catchment runoff	The threats of nutrients, pesticides and sediments from catchment runoff are high and very high risks to the ecosystem.			○	
Coastal development	Clearing of coastal habitats is a high risk to the ecosystem, as is the threat of ingestion of marine debris by species of conservation concern.			○	
Direct use – extractive	There are a number of threats associated with fishing and traditional use. Extraction of top predators is a very high risk to the ecosystem, others are of either high (such as illegal fishing) or medium risk.			○	
Direct use – non-extractive	There are a number of threats from non-extractive use, generally of low to medium risk. Large chemical and oil spills, although unlikely, could be of major consequence.		○		
Overall threat to ecosystem	The ecosystem is at serious risk from the compounding impacts of climate change, catchment runoff, coastal development and extractive use. Of the many other threats to the Great Barrier Reef ecosystem, most present a small risk individually, but combine to further reduce ecosystem resilience. Other threats are effectively managed and are now assessed as a much reduced risk.			◎	

GRADING STATEMENTS

Low risk - Given current management arrangements, any threats considered likely or certain to occur are predicted to have no more than insignificant consequences for the ecosystem. There may be minor or moderate consequences for the Region's ecosystem for other less likely threats.

Medium risk - Given current management arrangements, few of the threats considered likely or certain to occur are predicted to have moderate consequences for the Region's ecosystem and none will have catastrophic consequences. Some unlikely threats may have major consequences for the Region's ecosystem.

High risk - Given current management arrangements, many of the likely or almost certain threats are predicted to have moderate or major consequences for the Region's ecosystem.

Very high risk - Given current management arrangements, there are likely or almost certain threats that are predicted to have catastrophic consequences on the Region's ecosystem.

Overall summary of risks to the Reef

This risk assessment combines the knowledge presented in earlier chapters of the Report to provide an assessment of current and potential threats to the Great Barrier Reef and is an important step in predicting the future of the ecosystem.

The greatest threats facing the Great Barrier Reef ecosystem are from climate change. The individual threats of increasing sea temperature, ocean acidification and rising sea level are assessed as very high risk to the ecosystem and they will act across the entire Region. Their impact will be compounded by each other and by other existing regional and local threats.

The most serious, regional-scale risks are catchment runoff, coastal development and some aspects of extractive use. These threats have the potential to work in combination to weaken the resilience of the Great Barrier Reef and therefore its ability to recover from serious disturbances (such as major coral bleaching events) that will become more frequent in the future.

While climate change will affect all parts of the Great Barrier Reef, the compounding effects of threats associated of catchment runoff, coastal development and some extractive use means that the nearshore environment next to developed areas is the most at risk.

APPENDIX 9: EC HABITATS DIRECTIVE AND REGULATIONS.

Considerations that are required to be met by UK conservation agencies in their development of conservation objectives are listed in Table 13. Table 14 summarizes the various practical considerations for the development of conservation objectives. Table 15 lists the various components of favourable conservation status, as defined in the Habitats Directive. (EN, SNH, CCW, EHS (DoE(NI)), JNCC & SAMS. 2001.) The left hand column shows the characteristics of a habitat or species population, that comprise the concept of its "conservation status", while the right hand column shows the state or "value" for each of these characteristics which equate "to *favourable* conservation status".

Table 13. Legal requirements for conservation objectives on marine Natura 2000 sites

Statutory context	**Implications for conservation objectives**
Aims of the Habitats Directive	
Conservation of biodiversity (Article 2.1) Maintenance or restoration of favourable conservation status of the habitats and species in Annexes I and II of the Directive (Article 2.2) Natura 2000 network to enable the achievement of favourable conservation status (Article 3.1)	■Conservation objectives must represent a site's appropriate contribution to the achievement of favourable conservation status, and the wider goal of biodiversity conservation, based on the features for which it has been selected
Obligations towards individual SACs	
Maintenance or restoration of the favourable conservation status of the habitats and species for which the site is designated (Article 1.L)	■Conservation objectives must establish what is required for the conservation of the habitat or species population on the individual site. For this reason, and others, conservation objectives need to be prepared specifically for individual sites.
Establishment of the necessary conservation measures corresponding to the ecological requirements of the habitats and species on the site (Article 6.1)	■Conservation objectives must guide the determination of the necessary conservation measures, including the identification of the ecological requirements for a habitat or a species population on a site. Thus, it is necessary to interpret the term 'ecological requirements'. At its simplest level, it means the physical and biological factors that are required for the habitat or species population to be maintained [or restored] to favourable conservation status.
Avoidance of deterioration or significant disturbance (Article 6.2)	■Conservation objectives must enable determination of what types of change to a habitat or species population would constitute 'deterioration' or 'significant disturbance' ■These judgements can only be made on a site-, and feature-specific basis, although must clearly be guided by the overall aims of the Directive.
Appropriate assessment 'in view of' the conservation objectives, of any plan or project likely to have a significant effect, and determination of whether it will adversely affect the integrity of the site (Article 6.3)	■Conservation objectives must usefully support the judgement of whether a plan or project is likely to have a significant effect, and must usefully inform decisions on whether site integrity will be adversely affected. ■The precise role that conservation objectives play in making these decisions is not prescribed in the Directive, and therefore open to different approaches: - Comprehensive conservation objectives, covering all important aspects of a feature, could provide the standard against which to judge the (un)acceptability of a plan or project's impact, but it would be difficult to prepare; - Simplified conservation objectives which do not purport to be comprehensive are easier to prepare, and can guide the scope of an appropriate assessment, but may not assist greatly in the decision on whether the plan or project should proceed.
Monitoring and reporting	
Member states to monitor the conservation status of habitats and species, and report the results to EC (Articles 11 and 17)	■Conservation objectives must provide the standard against which monitoring of the habitat or species will take place.

Table 14. Practical considerations for conservation objectives on marine Natura 2000 sites

Practical requirement	**Implications for conservation objectives**
Habitats and species populations are naturally dynamic and many types of change would not be considered unfavourable in conservation terms	■Conservation objectives need to accommodate types of change to a feature that are acceptable in conservation terms (e.g. ecological succession, natural seasonal fluctuations), while identifying the types of change that are considered unacceptable (e.g. feature loss or degradation due to identifiable human activities).
Decisions are needed on whether current status is favourable or unfavourable	■For most marine habitats and species, it is assumed that the condition at time of SAC identification is favourable. In many cases, baseline surveys are needed to establish current condition, and for highly dynamic features, establishing "current condition" may require time series data.
Conservation objectives must guide the preparation of management schemes (15)	■Conservation objectives need to be based on a sound understanding of the sensitivity of features to particular types of activity and impact, and the likelihood of them being exposed to those factors. Regulation 33 also requires the UK conservation agencies to advise the bodies that manage European marine sites on operations that may cause deterioration or disturbance to the habitats and species. So for both legal and practical reasons, the conservation objectives are accompanied by information on the factors and activities that are likely to affect their achievement. ■For many ☐stake management of the site) the conservation objectives (and the accompanying information on operations) will be the only information they have access to which sets out what the Directive requires. Therefore the conservation objectives need to be a clear and informative expression of the purpose of the site. ■The timing of the development of the conservation objectives, and their presentation, e.g. in terms of level of detail and technical language, need to meet the needs of site managers, and these needs vary over time and between different stakeholders. In general, they should be as short as possible without sacrificing their other requirements.
Monitoring of the achievement (or not) of the conservation objectives is required for: - reviewing the appropriateness of management - reporting (to Government and EC)	■Conservation objectives need to include 'performance indicators', i.e. clear, unambiguous standards that can be monitored economically and reliably in order that reports can be made to UK government and EC on whether or not favourable conservation status is being achieved, and to enable those managing the sites to determine whether any changes to management are required. ■These performance indicators must be expressed in ways that enable results from different sites to be aggregated in order that meaningful reports can be made on the conservation status of habitats and species at a UK level.16
There should be a single, integrated set of conservation objectives for a site covering all interest features, otherwise a coordinated and consistent approach to management decisions will be very difficult to achieve.	■The UK Habitats Regulations do not expressly establish that the conservation objectives produced by the nature conservation agencies under Regulation 33 are the conservation objectives that should be used in the appropriate assessment of plans and projects. However conservation objectives should contribute to this function, enhanced by further advice from the conservation agencies on a specific basis.
Intertidal areas of marine SACs and SPAs are subject to provisions of the UK Regulations dealing with implementation of the Habitats Directive on land as well as in marine areas. The conservation objectives need to take account of this.	■The main mechanism for implementing SACs and SPAs on land in the UK is through notification and management of SSSIs (ASSIs in Northern Ireland) designated through national legislation, which is supplemented by the Habitats Regulations. Throughout the UK, the conservation of SSSIs/ASSIs is typically guided by management plans or statements which include objectives.17 Therefore for intertidal areas of European marine sites which are designated as SSSIs, the approach to conservation objectives needs to be the same as, or at least compatible with, both the marine and terrestrial frameworks.

Table 15. 'Targets' in Favourable conservation status

Characteristics which comprise conservation status	**'Targets' equating to favourable conservation status**
Habitats	
natural range and areas covered within that range	stable or increasing
structure and functions necessary for long term maintenance	exist and are likely to continue to exist
conservation status of typical species	favourable as defined below
Species	
population dynamics	species is maintaining itself on a long term basis as a viable component of its natural habitats
natural range	neither being reduced nor is likely to be reduced for the foreseeable future
supporting habitat	is, and will probably continue to be, sufficiently large [and, by implication, of appropriate quality] to maintain the populations on a long term basis

Favourable condition

In establishing conservation objectives for sites, the UK conservation agencies have developed the term 'favourable' condition' as the condition of a feature on a site which management of that site should aim to achieve. The concept of favourable condition can be thought of as a means of bridging the gap between the statutory context for conservation objectives (namely ensuring that they contribute to favourable conservation status), and their practical use (such as meaningfully describing interest features, conceptually dividing them into manageable 'units', and enabling monitoring and reporting).

Favourable condition is defined as:

"The target condition for an interest feature in terms of the abundance, distribution and/or quality of that feature within a site, that we aim the feature to attain"

This definition is intended to apply to all designated sites, and is not limited to Natura 2000 sites. English Nature also use the following definition of favourable condition for Natura 2000 sites, which corresponds closely to the notion of favourable conservation status at a site-level:

"A range of conditions for a natural habitat or species at which the sum of the influences acting upon the habitat or species are not adversely affecting its distribution, abundance, structure or function within an individual Natura 2000 site in the long term. The condition in which the habitat or species is capable of maintaining itself on a long-term basis."

APPENDIX 10. LIST OF ACRONYMS

ABNJ	Areas beyond National Jurisdiction
ASEAN	Association of Southeast Asian Nations
AS/NZS	Australian/New Zealand Standards
ASSI	Area of Special Scientific Interest
BAP	Biodiversity Action Plan
B2B	Baja California to the Bering Sea
BDC	Biodiversity Committee
BRTF	Blue Ribbon Task Force
BSPA	Baltic Sea Protected Area
CAR	principles of comprehensiveness, adequacy and representativeness
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSR	Central Coast study region
CINMS	Channel Islands National Marine Sanctuary
CMAR	Tropical Eastern Pacific Marine Corridor Network
COP	Conference of the Parties
DEA	Department of Environmental Affairs
DSE	Department of Sustainability and Environment
DWFN	Distant Water Fishing Nation
EAME	Eastern African Marine Ecoregion
EBSAs	Ecologically and Biologically significant areas
EC	European Commission
ECC	Environment Conservation Council
EEZ	Exclusive Economic Zone
EMS	European Marine Site
EU	European Union
GBRMP	Great Barrier Reef Marine Park
GBRR	Great Barrier Reef Region
GES	Good Environmental Status
HELCOM	Baltic Marine Environment Protection Commission - Helsinki Commission
IMCRA	Integrated Marine and Coastal Regionalisation for Australia
IUCN	International Union for the Conservation of Nature
JNCC	Joint Nature Conservation Committee
MASH	Marine Protected Areas, Species and Habitats
MCM	Marine and Coastal Management branch

MCPAs	Marine and Coastal Protected Areas
MLMA	*Marine Life Management Act*
MLPA	*Marine Life Protection Act*
MLRA	Marine Living Resources Act
MPA	Marine Protected Area
MSFD	European Marine Strategy Framework Directive
NRSMPA	National Representative System of Marine Protected Areas
NSBA	National Spatial Biodiversity Assessment
NTAs	No-take areas
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
Pas	Protected Areas
PERSGA	Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
PIPA	Phoenix Island Protected Area
SMCA	State Marine Conservation Area
SAC	Special Areas of Conservation
SAT	Science Advisory Team
SCI	Sites of Community Importance
SMP	State Marine Park
SMR	State Marine Reserve
SMRMA	State Marine Recreational Management Area
SPA	Special Protection Areas
SSME	Sulu-Sulawesi Marine Ecoregion
SSSI	Site of Special Scientific Interest
TNC	the Nature Conservancy
ToR	Terms of Reference
UKDMOS	UK Directory of Marine Observing Systems
UKMMAS	UK Marine Monitoring and Assessment Strategy
WCPA	World Commission on Protected Areas
WWF	World Wildlife Fund