March 2015

Report 10

2058 One Ocean

Principles for the stewardship of a healthy and productive ocean

MCGUINNESS INSTITUTE

Project 2058: Report 10

March 2015

One Ocean

Principles for the stewardship of a healthy and productive ocean

This report forms part of *Project 2058*, the Institute's flagship project

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About the Institute and Project 2058

The McGuinness Institute is an independently funded non-partisan think tank. The Institute's flagship project is *Project 2058*. The strategic aim of this project is to promote integrated long-term thinking, leadership and capacity-building so that New Zealand can effectively seek and create opportunities and explore and manage risks over the next 50 years. It is hoped that *Project 2058* will help develop dialogue among government, policy analysts and members of the public about alternative strategies for the future of New Zealand. *Project One Ocean* is a sub-project of *Project 2058* and follows on from the Institute's *Report 9: Science Embraced: Government-funded science under the microscope* (2012, February). To learn more about the Institute's projects please see the website: www.mcguinnessinstitute.org.

About James Tremlett

James Tremlett is a geographer and marine ecologist and holds a BSc and BA(Hons) from the University of Auckland. James has been employed at the Institute since May 2014 as a research analyst focused on ocean governance.

About Lionel Carter

Lionel Carter is Professor of Marine Geology at Victoria University of Wellington. Trained in geology and oceanography at University of Auckland and University of British Columbia, he has undertaken marine research in the North Atlantic, Pacific and Southern oceans. This work has helped predict potential environmental responses to the modern warming climate. Lionel's expertise is also applied to marine engineering projects, in particular to the protection of the global submarine telecommunication network that underpins the internet and international communications.

About Wendy McGuinness

Wendy McGuinness is the founder and chief executive of the McGuinness Institute. Originally from the King Country, Wendy completed her secondary schooling at Hamilton Girls' High School and Edgewater College. She then went on to study at Manukau Technical Institute (gaining an NZCC), University of Auckland (BCom) and the University of Otago (MBA), as well as completing additional environmental papers at Massey University. As a Fellow Chartered Accountant (FCA) specialising in risk management, Wendy has worked in both the public and private sectors. In 2004 she established the Sustainable Future Institute as a way of contributing to New Zealand's long-term future. Since 2012 the Institute has been known as the McGuinness Institute.

Acknowledgements

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From the Chief Executive

Reading James Tremlett's report made me increasingly aware of both the urgency and uncertainty that currently exists within ocean policy and, equally concerning, the extent that only a few voices are being heard from the pulpit. Underlying the discussion is a choice that needs to be made as to how we see our oceans going forward. Using scenarios tools to frame our future, there exist two issues that are most likely to shape long-term outcomes: (i) whether we decide as a society to view oceans in terms of a human asset or an ecosystem that we are part of and (ii) whether we want to give control to a few (autocratic) or develop an evolving, representative framework that responds to new information and guides decision-making (democratic). Put simply, together both of these issues form four overarching narratives about New Zealanders' future relationship with our oceans: treasure chest, national treasure, public treasure or planetary treasure.

	Autocratic	Democratic
Human-centric	Treasure chest	Public treasure
Ecosystems-centric	National treasure	Planetary treasure

Using another matrix, it is possible to explore how we might wish to operationalise our preferred view. If public policy is the result of a system of cogs, two of the key cogs would be institutions and instruments.

	One institution	Many institutions
One instrument	Simple framework	Organised framework (under an overarching strategic instrument)
Many instruments	Organised framework (under an overarching strategic institution)	Disorganised complex framework

Applying what we now know, it is clear that ocean policy currently exists in a disorganised complex vacuum. Disorganised complex systems are well recognised as being the enemy of transparency and certainty. If this is an uncomfortable state, it is timely to think about the direction we might want our current framework to move over time.

To help provide a public voice we have included perspectives from a diverse range of stakeholders in this report. We have not attempted to represent all parties, instead we sought out individuals who could provide an insight into their particular area of interest and expertise. By presenting these various viewpoints, from the broad to the specific, the complex nature of thinking surrounding ocean management in New Zealand can be seen.

Together the perspectives identify both the challenge and the opportunity for ocean management going forward. The challenge is to find ways to apply core principles for the stewardship of a healthy and productive ocean. The opportunity is to build a broader and deeper understanding of how existing and emerging stressors might together impact our marine estate and then design an effective public policy framework that aligns policy with good practice. Considering scenarios on the future of our oceans is one practical way New Zealanders might gain a shared understanding of both the challenge and the opportunity that lies ahead.

This report was written to explore the past, present and future of oceans governance in New Zealand. I hope it will prove to be a valuable resource for the wider ocean constituency, acting as an important stepping stone to a more certain and sustainable New Zealand.

Wendy McGuinness
Chief Executive

Foreword

One Ocean is not just another report on the marine environment. It is an opportune and informative discussion paper produced at a time of heightened interest in the world's ocean. Around 2008, nations began to formulate policies to meet the challenge of increasing human offshore activities and the need to maintain a healthy ocean: a challenge that is interwoven with the influences of modern climate change.

Arthur C. Clarke noted: 'How inappropriate to call this planet Earth when it is quite clearly Ocean.' He was referring to the fact that the planet's surface is 71 percent ocean. From size alone, it is not surprising the ocean is such a powerful environmental influence through its interaction with the atmosphere, weather and climate. For example, the ocean has ameliorated the full impact of climate change through the uptake of 93 percent of the heat and 30 percent of the carbon dioxide associated with the burning of fossil fuels. From a 'human use' perspective, we rely on the oceans for food, non-living resources, international trade, communications and, more recently, renewable energy. As a small island nation in a vast ocean, we also have a strong cultural affinity with the marine realm.

So how do we reconcile ocean use and environmental protection? That question is partly answered by a guiding vision expressed in the report as working towards:

A collective commitment to the stewardship of a healthy and productive ocean.

The effectiveness of any framework is only as good as the information it receives. Such information is likely to be variable in quality, coverage and availability. There is also the general perception that there is a lack of marine scientific data. That is true for some disciplines, but physical sciences generally have better global coverage, thanks to technological developments that permit large-scale observations both from space and the ocean itself – and this observational coverage is improving fast. It was only four months ago that a new chart was released showing the world's ocean floor in unprecedented detail. Based on satellite observations of gravity and sea surface height, the chart revealed literally thousands of new seamounts and geological structures. Those remarkable images will form the foundation for a new series of Google charts. Also, do not forget the data provided by industry and the Defence Force. The fishing industry and Royal New Zealand Navy have provided oceanographic data that continues to support postgraduate research.

For a nation with one of the largest exclusive economic zones in the world but a small population, collaboration is essential. In the case of marine science, there is roughly one full-time physical oceanographer (an expert on ocean waters and their circulation) for every 400,000 square kilometres of the EEZ. This is clearly an absurd ratio, hence the need to further extend collaboration between universities, crown research institutes, relevant government and non-government organisations and the international science community in order to tackle research questions of national and international significance. Given the rapidly changing seascape, it is essential that a management framework is durable to provide some certainty for the future. The effectiveness of any framework will also rely on the commitment of users and environmental and regulatory groups. Those prepared to positively engage through the exchange of information, frank discussion and a desire to reach a mutually agreeable outcome have a higher chance of success than those simply defending their interests.

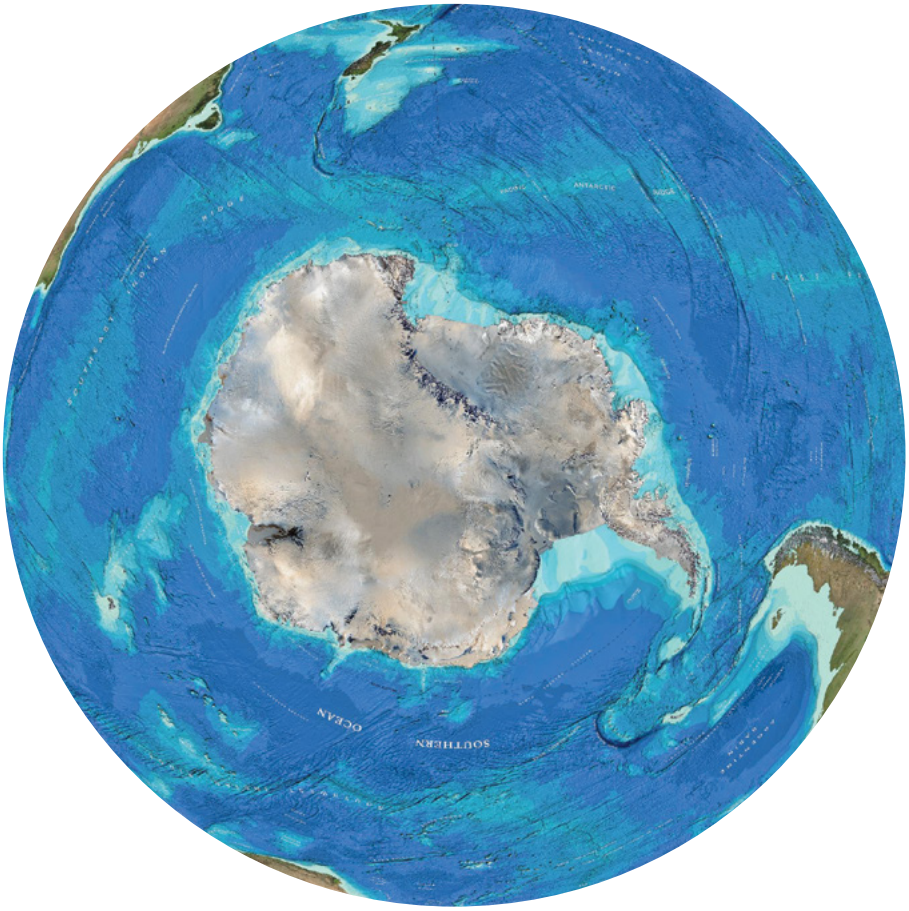
Is all this a utopian dream? Not really, going by recent deliberations between the Sargasso Sea Commission (SSC), government experts from Bermuda, Britain and America and the submarine telecommunications cable industry. Concern about the Sargasso Sea in the face of human activities and climate change led to the establishment of the SSC 'to encourage and facilitate voluntary collaboration towards conservation'.

Covering four million square kilometres, the Sargasso Sea resides on the high seas and hence is beyond the jurisdiction of coastal states. The absence of a framework for the management and protection of the high seas is an additional issue. On 23 October 2014 the SSC, cable industry representatives, environmental experts and government officials met for a workshop to exchange and discuss information regarding effects of submarine fibre-optic cables on the Sargasso Sea. The high quality of the largely peer-reviewed information exchanged between the SSC and cable industry provided confidence for the deliberations. The workshop was a success on several fronts: the SSC and cable industry became better informed of the importance of each others activities; there was general acceptance that cables had minimal impact on the Sargasso Sea; mutual benefits were gained via the exchange of data; and the workshop proceedings are scheduled for publication in a science journal. Of course, this was all made possible by the commitment of the workshop leaders and participants.

As well as outlining the problem, *One Ocean* also proffers ideas on the way forward. It sets out a vision of a healthy and productive ocean and puts forward three overarching principles to govern decisions on how we might protect and use our oceans in the future. That is not an easy task, but if a framework can be devised that provides well-informed guidance for ocean users, conservationists and other stakeholders, New Zealanders will benefit.

Lionel Carter

Professor Lionel Carter
Victoria University of Wellington



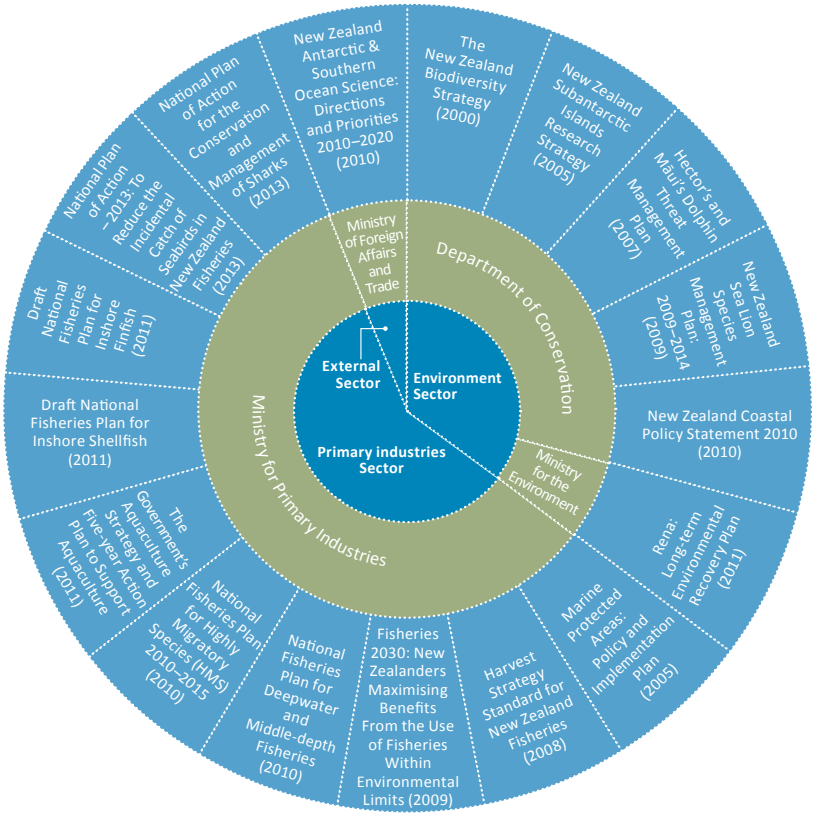
Imagery reproduced from the GEBCO 08-Grid, version 20100927
Source: General Bathymetric Chart of the Oceans (GEBCO), n.d.

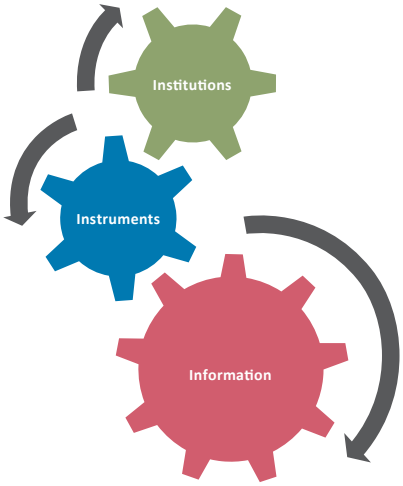
A graphical overview of New Zealand ocean policy, trends and outcomes

I. Policy

The ocean domain is large and complex, and developing a responsive public policy framework to guide decision-making is difficult. Pressures on the New Zealand marine estate are increasing, so there is a critical need for a well-designed package of instruments to govern ocean use and protection. This requires quality decisions, which in turn need access to timely, accurate and meaningful information. The following four pages illustrate this framework in terms of the three main 'cogs' of policy systems: institutions (green), instruments (blue) and information systems (red). Analysing public policy this way enables flaws in the system to be identified, weak linkages strengthened and alternative policy solutions examined.

The figure on the right illustrates the connection between central government institutions and instruments. Sources on these four pages are either noted in text or can be found in Appendices 1 to 4.

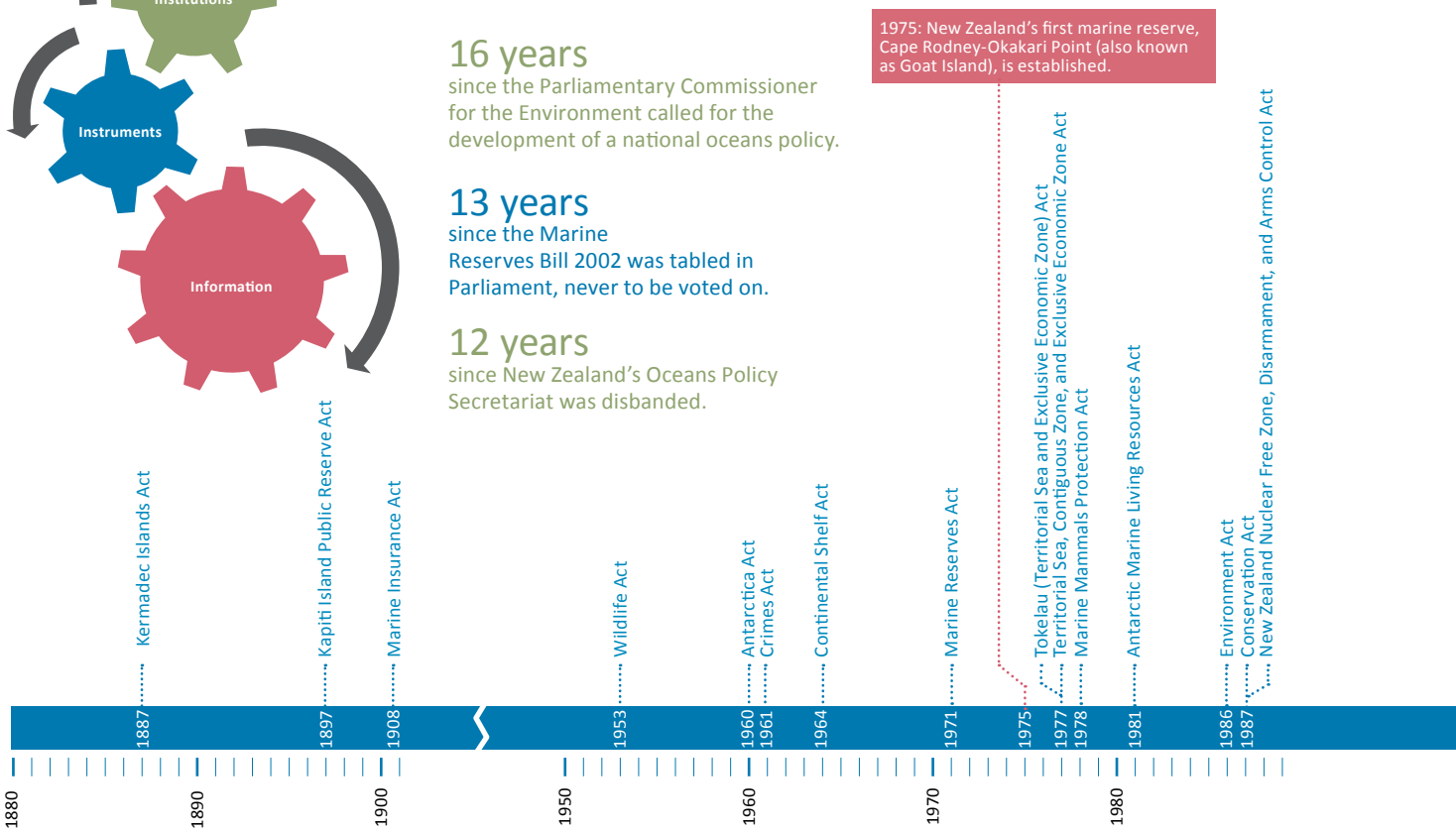




16 years
since the Parliamentary Commissioner for the Environment called for the development of a national oceans policy.

13 years
since the Marine Reserves Bill 2002 was tabled in Parliament, never to be voted on.

12 years
since New Zealand's Oceans Policy Secretariat was disbanded.



Above is a timeline of legislation relating to ocean management. The most prominent pieces of legislation are bold. Regulations are not included in this timeline; for more information see Appendix 1.

February 1998: A conference held by the Environment and Conservation Organisations of New Zealand (ECO) initiates a national conversation on ocean management.

December 1999: The Parliamentary Commissioner for the Environment releases a report detailing the need for a holistic national oceans policy.

July 2000: Cabinet delegates six ministers to develop a national oceans policy.

March–September 2001: The Ministerial Advisory Committee on Oceans Policy undertakes public consultation around public values and priorities for the marine environment.

October 2002: The Marine Reserves Bill is referred to the Local Government and Environment Committee at Parliament.

December 2002: The Oceans Policy Secretariat is formed and goes on to produce a series of working papers on the needs and priorities for a national oceans policy.

Late 2003: Development of a national oceans policy is put 'on hold' until ownership of the foreshore and seabed can be clarified. The Oceans Policy Secretariat is disbanded.

September 2014: MBIE launches the Sustainable Seas National Science Challenge.

February 2014: The Environmental Reporting Bill (189-1) is introduced. The purpose of this Bill is to create a national-level environmental reporting system; one of the five reporting domains is the marine domain.

December 2012: The first block offer for petroleum exploration is awarded, granting five-year exploration permits to a number of companies or consortiums. This replaces the previous first-in first-served (priority in time) approach.

December 2012: The Local Government and Environment Committee examines the Marine Reserves Bill and recommends that it not be passed. The Government announces that it intends to introduce a new Marine Reserves Bill to better align with government policy and EEZ legislation in the second half of 2013.

January 2011: The Regional Coastal Plan: Kermadec and Subantarctic Islands is publicly notified. As at March 2015 the plan is at Environment Court appeal stage.

November 2007: Benthic protection areas (BPAs) are established

March 2005: Ocean Survey 20/20 is launched, an oceanographic research programme coordinated by Land Information New Zealand.

April 2004: A hikoi in protest against proposed foreshore and seabed legislation travels to Parliament from around New Zealand.

1990: Defence Act

1991: Resource Management Act; Sugar Loaf Islands Marine Protected Area Act; Crown Minerals Act

1992: Ship Registration Act; Health and Safety in Employment Act; Treaty of Waitangi (Fisheries Claims) Settlement Act

1993: Biosecurity Act

1994: Maritime Transport Act; Antarctica (Environmental Protection) Act

1996: Fisheries Act; **United Nations Convention on the Law of the Sea Act**; Customs and Excise Act; Submarine Cables and Pipelines Protection Act; New Zealand Antarctic Institute Act

1997: Fisheries (Quota Operations Validation) Act

1998: Ngāi Tahu Claims Settlement Act

1999: Hauraki Gulf Marine Park Act

2001: Māori Fisheries Act; Aquaculture Reform (Repeals and Transitional Provisions) Act; Māori Commercial Aquaculture Claims Settlement Act; Maritime Security Act; Imports and Exports (Restrictions) Prohibition Order (No 2); **Foreshore and Seabed Act**

2002: Fiordland (Te Moana o Atawhenua) Marine Management Act; Ngāti Awa Claims Settlement Act

2007: New Zealand Geographic Board (Ngā Pou Taunaha o Aotearoa) Act

2011: **Marine and Coastal Area (Takutai Moana) Act**

2012: **Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act**

2013: Crown Minerals Amendment Act; Kaikōura (Te Tai o Marokura) Marine Management Act; Subantarctic Islands Marine Reserves Act

2014: Heritage New Zealand Pouhere Taonga Act

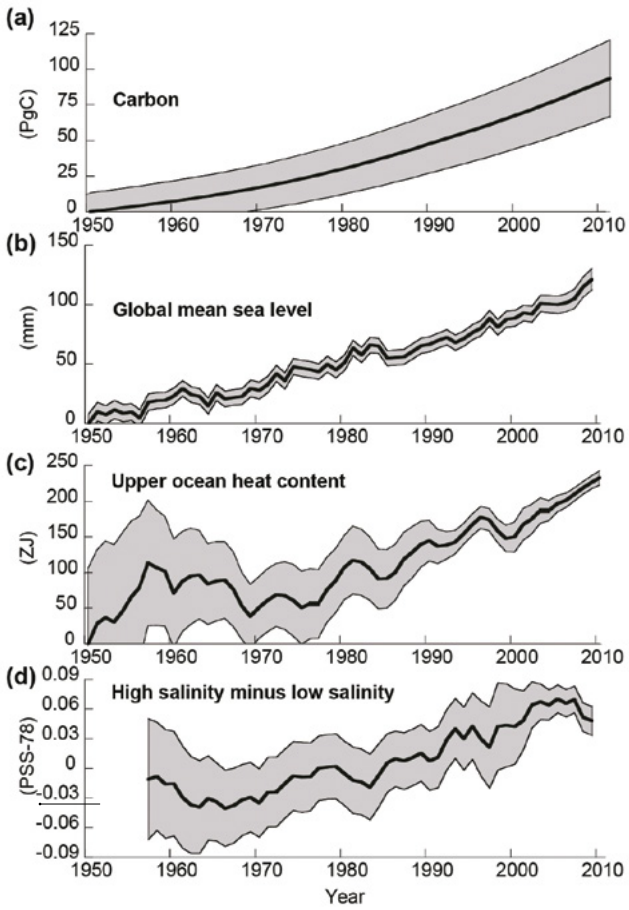
1990 — 2000 — 2010 — 2015

II. Trends

Time series of changes in large-scale ocean climate properties

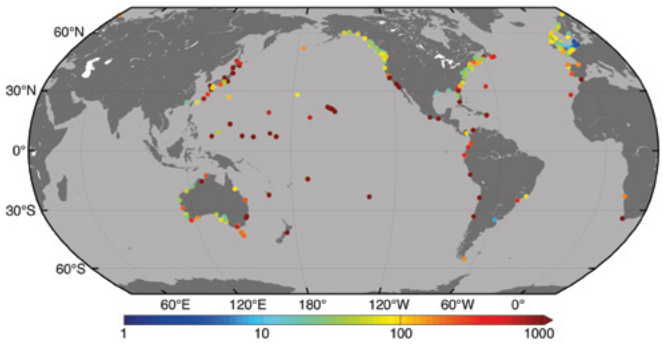
(a) global ocean inventory of anthropogenic carbon dioxide; (b) global mean sea level (GMSL); (c) global upper ocean heat content anomaly; and (d) the difference between salinity averaged over regions where the sea surface salinity is greater than the global mean sea surface salinity ('high salinity') and salinity averaged over regions values below the global mean ('low salinity').

Source: Rhein et al., 2013: 301



An estimate of the factor by which flooding events of a given height will increase for a mean sea level (MSL) rise of 0.5 metres by 2100

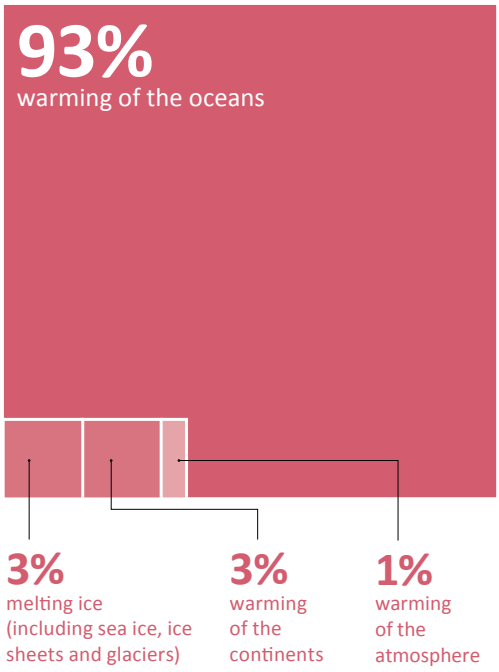
Source: Church et al., 2013: 1201



Climate change: where does the heat go?

Approximate proportions of global warming heat going into various components of the climate system. Figures refer to the global increase in thermal energy generated between 1971 and 2010.

Source: Rhein et al., 2013: 265

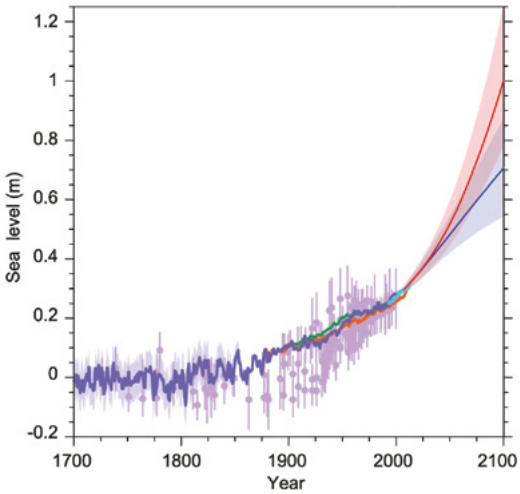


24 million tonnes of CO_2 absorbed by the oceans every day.

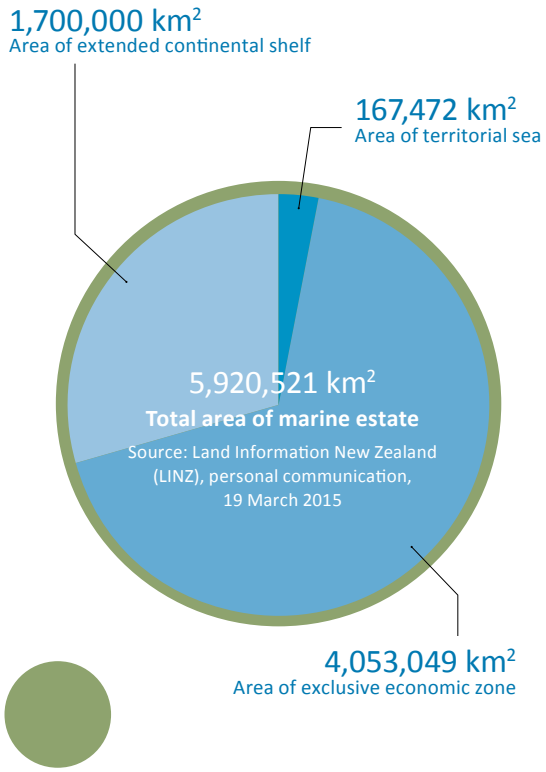
Source: International Geosphere-Biosphere Programme (IGBP) et al., 2013: 5

Historical data and IPCC predictions of sea level rise for the twenty-first century

Source: Church et al., 2013: 1204



III. Outcomes



Protected areas analysis

Source: See Appendix 4

Existing marine management tools in New Zealand's waters	Area (km²)	NZ waters where tool applies
Marine reserves*	17,430	Territorial sea
Marine mammal sanctuaries**	6180	Territorial sea
Marine parks	20,536	Territorial sea
Submarine cables and pipelines protection zones	1732	Territorial sea and Exclusive Economic Zone
Mataitai – closed areas	401	Territorial sea
Taiapure – closed areas	401	Territorial sea
Section 186 – temporary closures	769	Territorial sea
Benthic protected areas (BPAs)	1,134,207	Territorial sea and Exclusive Economic Zone
Seamount closures	85,459	Exclusive Economic Zone

*As at March 2015 there are 44 marine reserves. See list of all 44 in Appendix 4.
**As at March 2015 there are six marine mammal sanctuaries. See list of all six in Appendix 4.

Species analysis

Source: Gordon et al., 2010

Species	Number
Species recorded in New Zealand's EEZ	17,135
Species known but undescribed in collections	4,315
Species potentially existing within our marine estate	100,000

Coastline analysis

Sources: Walrond, 2015; Department of Conservation (DOC), personal communication, 25 March 2015; Statistics New Zealand et al., 2013: 38

Marine estate	Number
The maximum location from the sea at any point in New Zealand	130 km
Coastline	18,218 km
Amount of coastline directly exposed to the sea; 20% is sheltered in harbours and estuaries	80%
The number of regional coastal plans in operation that have been approved by the Minister of Conservation	16

Coastal and marine environment information gap analysis

Source: Statistics New Zealand et al., 2013
See Footnote 4 on page 43.

Assessing the level at which the official information in New Zealand currently informs the question: How is the quality and use of our marine environment changing, and what is the impact of human activity, including resource use, on the marine environment? This question was further broken down into six supplementary questions which are assessed below:	Level at which official data informs Supplementary questions
What are the spatial and temporal biophysical trends in the coastal and marine environment and how are these predicted to change in the future?	medium
What is the current use of natural resources in the coastal and marine environment, what is the intensity of this use, how is this use changing spatially and temporally, and how is it predicted to change in the future?	low
What ecosystem services are currently provided by New Zealand's coastal and marine environment and how are these predicted to change in the future?	low
What is the impact of human activity on the coastal and marine environment, including the cumulative effects on its resilience, and how is this changing over time?	low
What is the current relationship between Māori and the coastal and marine environment, how is this changing, and what is the impact of human activity, resource use, and climate change on this relationship?	low
What is the conservation and environmental protection effort for the coastal and marine environment?	low

1. Introduction

1.1 Purpose of this paper

This report perceives a need for a guiding vision for the oceans of Aotearoa New Zealand. It suggests the notion of collective stewardship to guide the development of ocean governance in New Zealand and to form a durable and inclusive basis for a sense of cultural guardianship over the oceans. Based on this vision, three principles to shape a future governance framework are suggested: *informed*, *integrated* and *durable*. The report goes on to make specific recommendations of management practices to make these principles operational.

This document forms part of the McGuinness Institute's *One Ocean* project, an ongoing research initiative into the management of New Zealand's oceans. An extended version of Section 3 was published in January 2015 as *Working Paper 2015/01: Ocean Management in New Zealand: Findings from a structured discussion*.

1.2 The challenges

Ocean governance in Aotearoa New Zealand suffers from a largely implicit but pervasive assumption that economic opportunity and ocean health are mutually exclusive. It is often assumed that pursuing one of these values is necessarily detrimental to the other. This promotes an adversarial rather than constructive relationship between government, ocean users and other stakeholder groups. It also inhibits the development of pragmatic, innovative steps towards marine activities that contribute to both economic and environmental values.

The oceans surrounding Aotearoa are subject to increasing large-scale change. At a global and regional scale, they are subject to the dynamics associated with climate change, including warming sea temperatures, rising sea levels, ocean acidification and changes to circulation patterns (Intergovernmental Panel on Climate Change [IPCC], 2013). Human pressures originating within New Zealand's marine estate are also increasing in both extent and intensity. Stressors such as high-impact fishing and the expansion of offshore petroleum and minerals exploration may affect both deep ocean and coastal seas. The latter are also subject to multiple land-based impacts such as nutrient pollution, sedimentation, overfishing and plastic debris (MacDiarmid et al., 2012b; McGinnis, 2012; Mulcahy et al., 2012).

The governance of New Zealand's oceans continues to be characterised by a 'single sector' approach: one that attempts to manage the multitude of marine activities and impacts separately, with little capacity to consider interactions or cumulative effects. Major users such as fisheries, minerals, aquaculture, science and conservation are managed in relative isolation by different government agencies under different pieces of legislation. This fragmentation of public policy impedes the development of management systems able to adequately regulate the diverse activities that take place in our seas (McGinnis, 2012).

An established body of scientific evidence emphasises the importance of well-planned marine protected areas (MPAs) in maintaining the health of a wider seascape (Secretariat of the Convention on Biological Diversity, 2004; International Union for the Conservation of Nature World Commission on Protected Areas [IUCN-WCPA], 2008). Despite this, New Zealand does not meet international targets for scientifically designed, representative networks of MPAs which are based on the best available knowledge (Day et al., 2012; Leathwick et al., 2008). Legislation for designating MPAs is currently constrained to the territorial sea and does not comprehensively extend to the Exclusive Economic Zone (EEZ), which constitutes the bulk of our marine estate (Mulcahy et al., 2012).

It should also be remembered that New Zealand's waters are simply one part of the wider Pacific and that our immediate marine environment is directly affected by a lack of international mechanisms to appropriately manage the high seas beyond national jurisdiction (i.e. the EEZ and legal continental shelf extension).

Effective ocean governance depends on detailed and robust scientific research into the dynamics of marine systems. New Zealand has a long history of marine research, but in order to manage ocean ecosystems effectively, we require a more multidisciplinary approach that integrates data on natural and social dynamics. Research in the physical, chemical and biological sciences remains largely separated by disciplinary boundaries and does not yet substantially engage with the social sciences or mātauranga Māori (Stephenson & Moller, 2009).

Lastly, there is an ongoing lack of public engagement in the processes of ocean governance and a widespread lack of understanding about some of the key threats to marine environments. Stewardship of the oceans can be written into policy, but in order to be durable or effective it must be grounded in a deep cultural appreciation of the relationship between New Zealand and the sea.

2. New Zealand – A natural marine laboratory

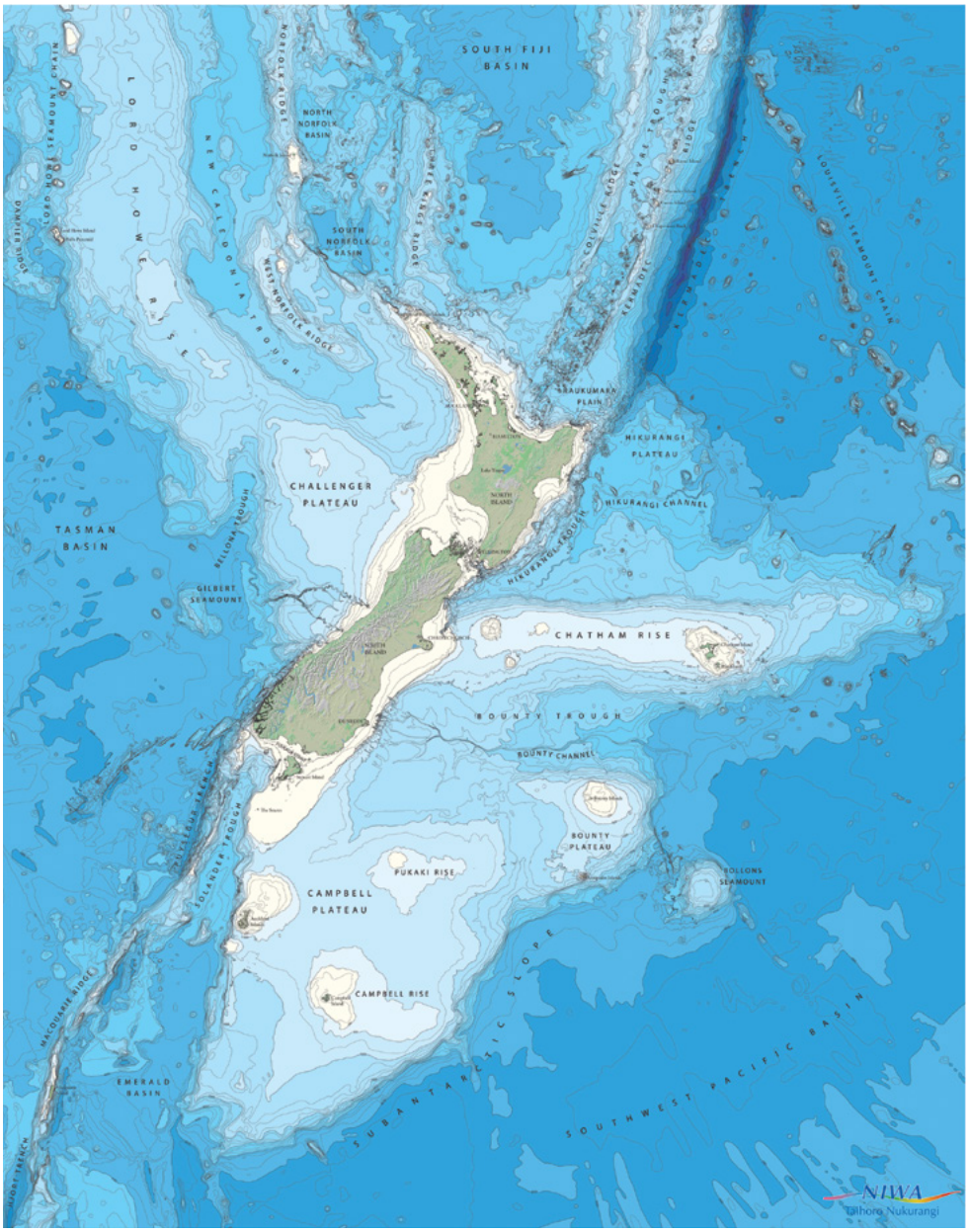
2.1 The New Zealand marine estate

2.1.1 Our ocean environment

Spanning more than 30 degrees of latitude and extending over 5.7 million square kilometres, New Zealand's marine estate is one of the largest in the world (MacDiarmid et al., 2013). Within this ocean space is an extraordinary variety of environments that reflect the influences of tropical and polar climates and oceans, in the presence of a highly active tectonic plate boundary. Aotearoa deservedly has the reputation as one of the Earth's 'natural laboratories'.

Figure 1: Undersea topography and feature names of New Zealand's marine environment

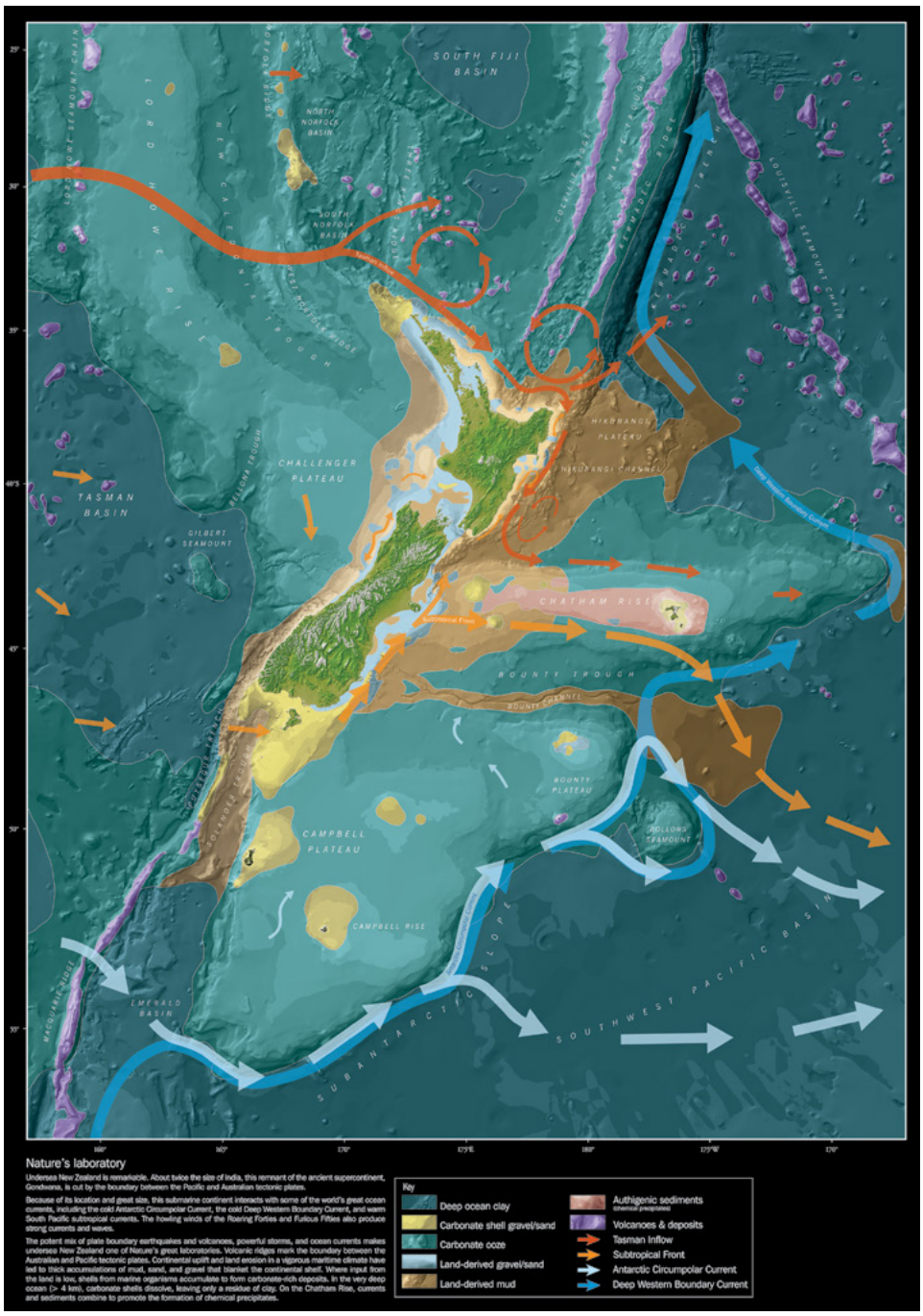
Source: Charting Around New Zealand (CANZ), 2008. Content, datasets and imagery provided by and copyright the National Institute of Water and Atmospheric Research (NIWA).



The New Zealand archipelago is made up of more than 700 islands across the largely submerged continent of Zealandia, where the Pacific tectonic plate meets its Australian counterpart. As these plates converge they produce earthquakes, volcanic activity and a diversity of seabed topography, including seamounts, wide underwater plains, hydrothermal vents and one of the world's deepest underwater trenches, as depicted in Figure 1. (Mitchell et al., 2012; Gordon et al., 2010). Our seas themselves consist of subtropical and subantarctic water masses that are swept by three major ocean current systems: the South Pacific Gyre, Antarctic Circumpolar Current and Pacific Deep Western Boundary Current. These are some of the largest flows of their type, as shown in Figure 2. Climatic conditions and the circulation of these currents are driven from the equator and from Antarctica (Bindoff et al., 2011; Gordon et al., 2010).

Figure 2: Seafloor sediments and major currents in New Zealand's marine environment

Source: Orpin et al., 2008. Content, datasets and imagery provided by and copyright NIWA.



2.1.2 What we know

Marine research in the Western scientific tradition has been undertaken in New Zealand waters for over 200 years, beginning with the voyages of James Cook and Dumont D'Urville in the late eighteenth and early nineteenth centuries. The first global oceanographic research expedition, by the British naval vessel HMS *Challenger*, surveyed the waters off the North Island in 1874 (Gordon et al., 2010). Subsequent research has been undertaken by universities, crown research institutes and their predecessors, museums, the New Zealand Navy and private research institutions, as well as through international initiatives. Reflecting the practical and financial difficulties of deepwater research, much of this scientific effort has been concentrated in coastal and continental margin environments.

From a physical perspective, scientists nonetheless have a reasonable knowledge of the deep seabed, at least at low resolution. This reflects an abundance of echo-sounding profiles, seabed mapping and satellite data, derived from global research efforts as well as the mapping programme of New Zealand's National Institute of Water and Atmospheric Research (NIWA, n.d.; Sandwell et al., 2014). Marine geologists have utilised this information, combined with geophysical data and seabed samples, to piece together the composition and structure of the deep ocean floor. Our knowledge of physical oceanography, such as the dynamics of global water masses and currents, is also developing rapidly as part of initiatives such as the worldwide network of underwater Argo floats that transmit oceanographic and climate data via satellite (Roemmich et al., 2015).

We know that New Zealand's marine biota is both abundant and diverse, with high levels of endemism. A 2010 review of data collected by scientists and government fisheries observers showed at least 17,135 species living in New Zealand waters, of which 4,315 are undescribed. On average, around 20 species of fish are discovered every year that were not previously known to occur in New Zealand's oceans; generally around half of these are totally new to science. Given that fish are only a small proportion of all marine species, the New Zealand EEZ could contain up to 100,000 species in total (Gordon et al., 2010: 9, 12). Nearly half of all species of cetaceans are found in our waters, and more species of seabird breed on our scattered islands than anywhere else in the world (Baker et al., 2010; Gordon et al., 2010; Taylor, 2000).

2.1.3 What we don't know

There are also many aspects of our oceans that are understood poorly. As mentioned previously, most research effort in New Zealand has been concentrated on coastal and continental margin marine systems, and our knowledge of less-accessible ocean environments remains limited. The deep ocean is under-represented in global patterns of research effort, at least partly due to the expense and technical difficulty of sampling at depth (Gordon et al., 2010; Webb et al., 2010). And while progress is being made (for instance, Chiswell et al., in press), an authoritative analysis of our oceans' response to recent climate change has yet to be realised.

Studies that do focus on the deep ocean are generally restricted to depths shallower than 2,000 metres. About half of New Zealand's EEZ is deeper than this, and relatively little is known about ecosystem dynamics or habitats in these regions or about the structure and composition of the seabed at scales of less than one kilometre (Gordon et al., 2010; Webb et al., 2010). Apart from a few spot samples, there is little knowledge of deep ocean chemistry, with poor understanding of the nutrients, pollutants and gases (including greenhouse gases) found at depth.

In the biological sciences, we lack empirical knowledge of ecological baselines, a measure of the composition and functioning of an ecosystem prior to human impacts. As the human transformation of New Zealand's marine ecosystems predates the systematic study of marine environments, it is difficult to measure the extent or severity of ongoing environmental change (Jackson et al., 2001). There is also little knowledge

of the spatial distribution of species diversity in New Zealand waters, with the presence of many species in particular regions only known as a result of single sightings rather than systematic studies of presence or absence (Gordon et al., 2010). Likewise, there has been insufficient empirical analysis of threats to New Zealand's marine environment: a recent review found that data on the spatial intensity of human-induced stressors was available for only 20 percent of major threats (MacDiarmid et al., 2012b).

2.2 New Zealand and the ocean: Society, culture and economy

2.2.1 Social and cultural context

The peoples of Aotearoa New Zealand have a deep historical relationship with the surrounding oceans that extends to the present day. The earliest stories of this archipelago speak of its origins in the sea, of Te Ika-a-Māui dragged from the depths and carved into habitable form. Traditional Māori whakapapa extend to the Pacific homeland of Hawaiki and tell of epic migrations through the world's most extensive ocean (Buck, 1938). The lives of these Polynesian voyagers were dominated by the seas as a mode of transport and a dependable source of food. Many of the earliest Māori settlements were located on hospitable harbours or near plentiful sources of kai moana (de Alessi, 2012).

All Polynesian cultures implemented a number of institutions and protocols to govern particular interactions with the ocean, and a number of these were adapted to the new environmental context of Aotearoa. For the Māori, these customary management tools came to include forms of spatial protection such as rāhui, whereby a fishing ground or other mahinga kai is designated tapu and harvest is prohibited or restricted for a period of time. Other management practices included controlling access to particular resources, depending on the season, tides or ecological dynamics such as the time and location of fish spawning (Parliamentary Commissioner for the Environment [PCE], 1999). Māori iwi and hapū (tribes and sub-tribes) exercised authority over, and identified with, areas of coastal sea and open ocean in similar ways to their relationship with the land; the marine space of a kinship group was known as its rohe moana (de Alessi, 2012; Jackson, 1993).

Following initial contact by Europeans, these islands were given the Latinate name Nova Zeelandia by Dutch cartographers after their own province of Zeeland. A direct rendering of this term into English would perhaps be 'New Sea-land' – a fitting name for an archipelago nation and the maritime peoples who inhabit it (McKinnon, 2012). During the process of colonisation, however, the mana moana of iwi and hapū, and associated communal access rights to the sea, was largely extinguished as the Crown followed European legal convention in assuming sovereignty over the oceans (de Alessi, 2012; Jackson, 1993).

The period since colonisation has seen the emergence of new and changeable relationships between New Zealanders and the ocean. As the population diversified, so did its collective views, beliefs and attitudes towards the natural environment. Fishing remains popular both as a leisure pursuit and a source of food, as does gathering shellfish. For stocks with high non-commercial fishing pressure (Snapper 1, Kingfish 1 and Blue Cod 7), this can equal or exceed the take of commercial fisheries (MPI, 2015). There is no total allowable catch (TAC) for non-commercial fisheries; rather the Ministry for Primary Industries (MPI) is obliged to estimate customary and so-called 'recreational' catches before setting commercial limits each year (Fisheries Act 1996, section 21).

The second half of the twentieth century saw the emergence of a nascent environmental movement that focused much of its effort on marine-related issues, including campaigns against nuclear testing in the Pacific and mobilisation for the cessation of whaling in New Zealand waters and internationally. This movement allied with marine scientists to support the establishment of some of the world's first marine reserves.

Throughout this period, the New Zealand coast has been and remains a favoured recreational space, and water sports contribute to the maintenance of both Māori and Pākehā cultural identities.

2.2.2 The marine economy

Calculating the economic benefit of New Zealand's marine estate is extraordinarily difficult. One way of addressing this challenge is through the valuation of ecosystem goods and services; this approach attempts to represent as a monetary value the benefits that societies receive from particular natural systems. Recent estimations of the total ecosystem goods and services provided by the New Zealand marine estate range between NZ$403 billion and NZ$482 billion per year, roughly equivalent to twice New Zealand's gross domestic product (MacDiarmid et al., 2013; van den Belt & Cole, 2014). Evaluating environmental systems in purely economic terms should certainly be done with caution and with the caveat that there are inherent values and meanings associated with the natural world that cannot be encapsulated in such a figure. Nonetheless, the size of this figure may help emphasise to policy-makers, industry and the wider public the economic irrationality of continuing to degrade or neglect our marine estate. The remainder of this section summarises the economic contribution of New Zealand's major marine industries.

Transport and shipping

Maritime transportation of trade goods is a major use of our ocean space. In 2013 approximately 99.7 percent of New Zealand's exports by volume, and 86.7 percent by value, occurred via sea. In the same year, marine transport accounted for 99.5 percent of imports by volume and 79.5 percent by value. International sea trade is concentrated in ports at Whangarei, Auckland, Tauranga, New Plymouth, Nelson, Lyttelton, Dunedin and Bluff as well as a number of smaller ports throughout the country (Ministry of Transport, 2014: 4,19).

Commercial fisheries

Commercial fisheries in New Zealand are governed by the Quota Management System (QMS). This is a market-based system that aims to keep the harvest of individual fish stocks within sustainable limits. When the QMS was introduced in 1986, fishers were allocated quota for particular stocks, based on their levels of catch at the time (Mace et al., 2014). Quota can be bought and sold, and in the period since the introduction of QMS a large proportion of quota has been bought by large fishing companies to the exclusion of smaller independent operators (Yandle & Dewees, 2008).[1]

The historical exclusion of Māori from the fishing industry was addressed in the Fisheries Settlement Act 1992, which allocated almost 30 percent of the total commercial quota to Māori, along with a controlling share in the fishing company Sealord, the largest fishing company in the country. Although this has generally been a financial success in terms of monetary returns to iwi, the enclosure of communally owned fisheries resources within individual property rights has had questionable effects on Māori identity, traditions and institutions relating to their rohe moana (Day, 2004; de Alessi, 2012).

Non-commercial fisheries

Several attempts have been made to quantify the economy of recreational and customary fisheries, with varying results. In the late 1990s the Ministry of Fisheries estimated the total value of recreational fishing expenditure in New Zealand at $973.5 million per annum for the five most popular species: snapper, kingfish, blue cod, kahawai and rock lobster (South Australian Centre for Economic Studies, 1999). More recently the New Zealand Marine Research Foundation (2015) has scoped a project to determine the economic

1 Concern over the distributional impacts of fishing quota systems has been felt in other parts of the world. Between 1996 and 2004 the United States placed a moratorium on the expansion of individual transferable quota systems, largely due to concerns around consolidation effects like those experienced in New Zealand (Yandle & Dewees, 2008).

contributions of marine recreational fisheries to New Zealand's economy, with results expected mid-2016.

Aquaculture

Aquaculture is a fast-expanding and particularly lucrative use of the coastal marine environment. Shellfish aquaculture began with the cultivation of the native green-lipped mussel in the early 1970s, following the overexploitation of mussel beds by dredging in Tasman Bay and the Hauraki Gulf. Cultured shellfish now comprise a major export industry focused on green-lipped mussels and introduced Pacific oysters, with smaller numbers of pāua and scallops (Wassilieff, 2009).

Finfish aquaculture in New Zealand developed in the 1970s and 1980s, with the first sea-cage salmon farm becoming operational in 1983 in Big Glory Bay, Stewart Island. Salmon farming has since expanded to Akaroa (Banks Peninsula) and the Marlborough Sounds. Due to the high environmental impact of finfish farming, the expansion of these activities has been contested (Wassilieff, 2009).[2]

Petroleum and minerals

The continental crust that lies beneath much of New Zealand's EEZ contains rich deposits of petroleum (oil and natural gas) as well as commercially valuable minerals. Offshore drilling for petroleum began in New Zealand in the 1960s. Of more than 200 offshore wells drilled in New Zealand, only 10 have been at depths greater than 300 metres; all of these have been located in the Taranaki Basin (New Zealand Petroleum and Minerals [NZPAM], 2014a). Offshore mining is a globally emerging industry that has not yet become operational in New Zealand despite recent applications for exploration permits. Minerals found on the seabed with potential for commercial extraction include ironsands off the west coast of the North Island, phosphate on the Chatham Rise, gas hydrates off the Wairarapa coast, ferro-manganese nodules along the flanks of Campbell Plateau and metal-rich massive sulphides on the Kermadec Arc and Colville Ridge (NZPAM, 2014b).

Others

International tourism in New Zealand largely depends on the beauty of our natural environment and our reputation for environmental sustainability. Access to coastal and marine areas is an essential part of this tourist experience; this is reflected in the popularity of marine reserves as tourist destinations as well as common tourist activities such as whale and dolphin cruises. Interaction with charismatic marine megafauna such as marine mammals is a popular component of this industry, particularly in the Bay of Islands and Kaikōura (PCE, 1999). Other components of the marine economy include boatbuilding and marine manufacturing as well as emerging industries such as marine biotechnology (Statistics New Zealand, 2006).

2.2.3 Rights and responsibilities in the marine estate

Under both international and domestic law, the oceans are divided into zones where states have particular rights and responsibilities. The most important and widely accepted international agreement regarding the oceans is the 1982 United Nations Convention on the Law of the Sea (UNCLOS). The Convention came into force in 1994 and was ratified by New Zealand in 1996 (Wood et al., 2003). New Zealand's rights and obligations in the different zones defined in UNCLOS and other international and domestic laws are presented in Figures 3 and 4. Further details on these rights and obligations can be found in Appendix 2.

2 Disclaimer: Wendy McGuinness was involved in the New Zealand King Salmon hearing on their application to establish nine new salmon farms in the Marlborough Sounds, presenting a submission on behalf of the McGuinness Institute, as an economic expert, and cross-examining witnesses. This provided an excellent opportunity to gain a deeper understanding of the new RMA process, in which hearings are no longer heard by regional councils. In this case the Minister of Conservation considered a national board of inquiry the best option. As part-owner of a property on the western side of Arapawa Island, Wendy also has an understanding of the Queen Charlotte Sound, the community that lives within the Sound and the diverse range of bird and marine life that co-exists there. For the submission made by the McGuinness Institute, please see: http://www.mcguinnessinstitute.org/Site/Publications/Submissions.aspx

Figure 3: Boundaries in the New Zealand marine estate

Source: Ministry of Business, Innovation and Employment (MBIE), n.d.-b

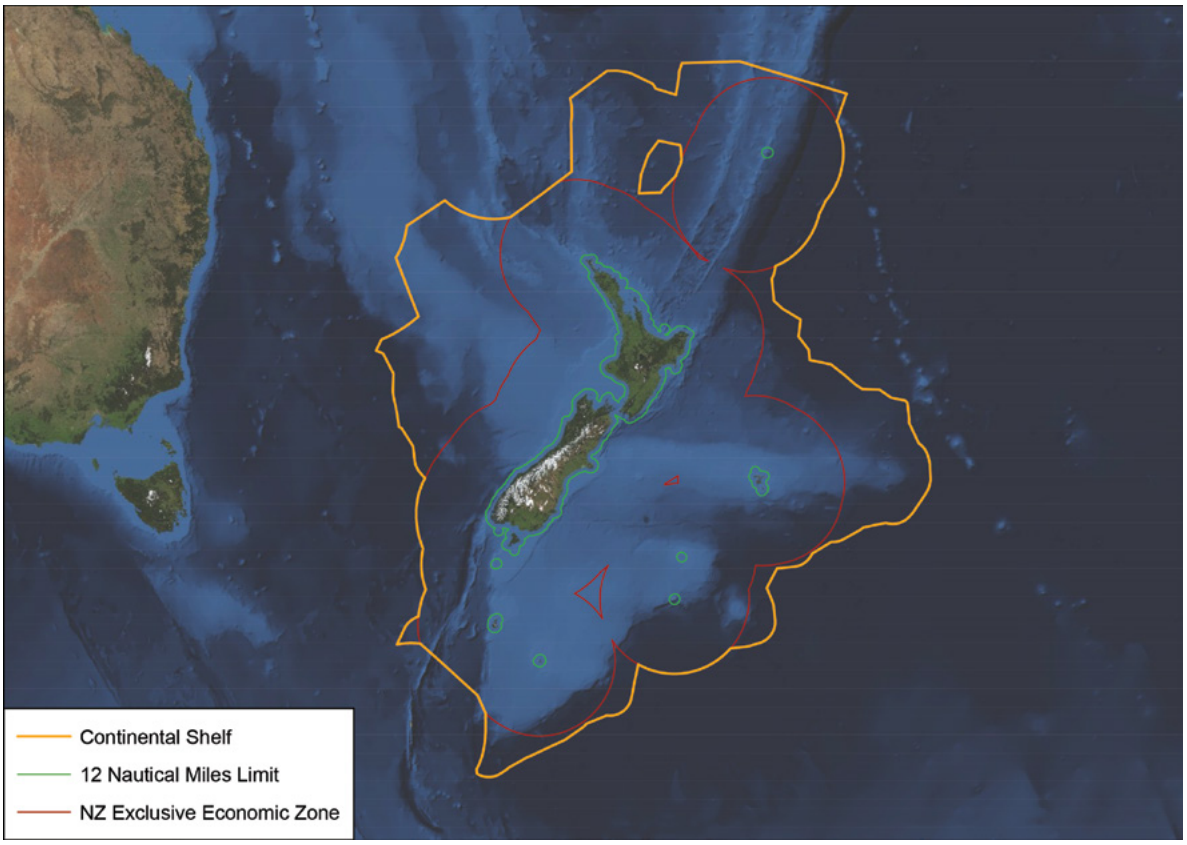
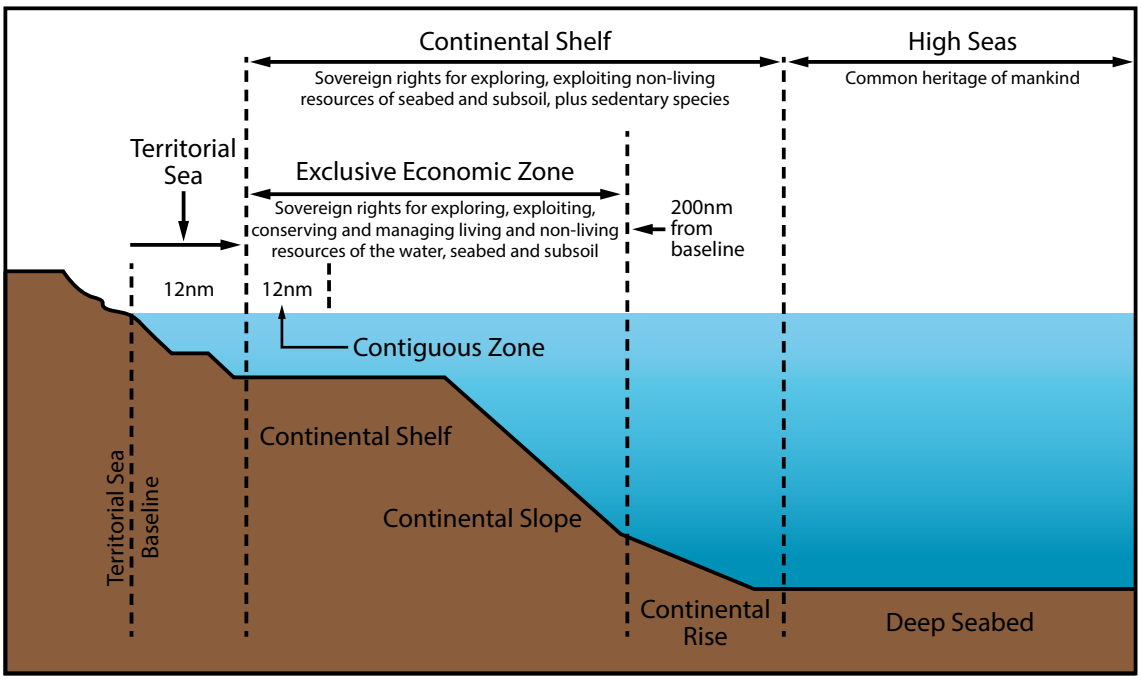


Figure 4: Rights and responsibilities in the different areas of New Zealand's marine estate

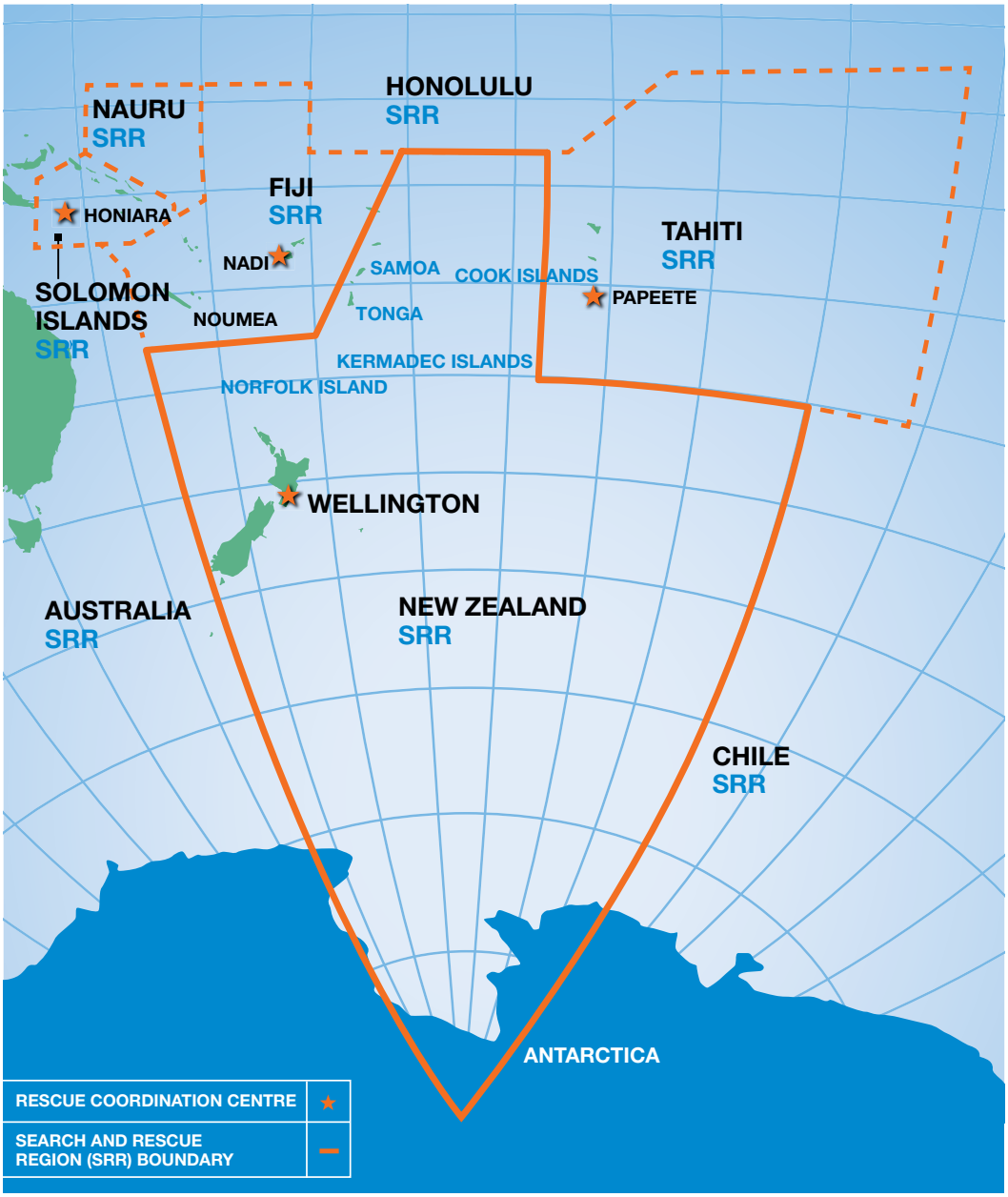
Adapted from Environment Guide, n.d.



New Zealand's marine estate comprises both the territorial sea, which extends to 12 nautical miles from the coast, and the EEZ, which reaches to 200 nautical miles offshore to encompass an area of 4.2 million square kilometres. We also have certain limited rights to non-living resources on and below the ocean floor of the legal extended continental shelf, an area that encompasses a further 1.7 million square kilometres beyond the EEZ; in this report this area is also considered to be part of New Zealand's marine estate (Mulcahy et al., 2012). New Zealand also has a form of stewardship over the Ross Sea through its unratified claim under the Antarctic Treaty System (Waterhouse, 2001).

Another, partly overlapping, oceanic area where New Zealand has responsibility is the New Zealand search and rescue region (NZSRR). The NZSRR extends over more than 30 million square kilometres, as shown in Figure 5 – an area far larger than the EEZ and legal continental shelf. It covers one-twelfth of the surface of the Earth, from Samoa to the South Pole (New Zealand Search and Rescue [NZSAR], 2011).

Figure 5: The New Zealand search and rescue region (NZSRR)
Source: Maritime New Zealand, n.d.



2.3 Change in the marine estate

2.3.1 Global and regional change

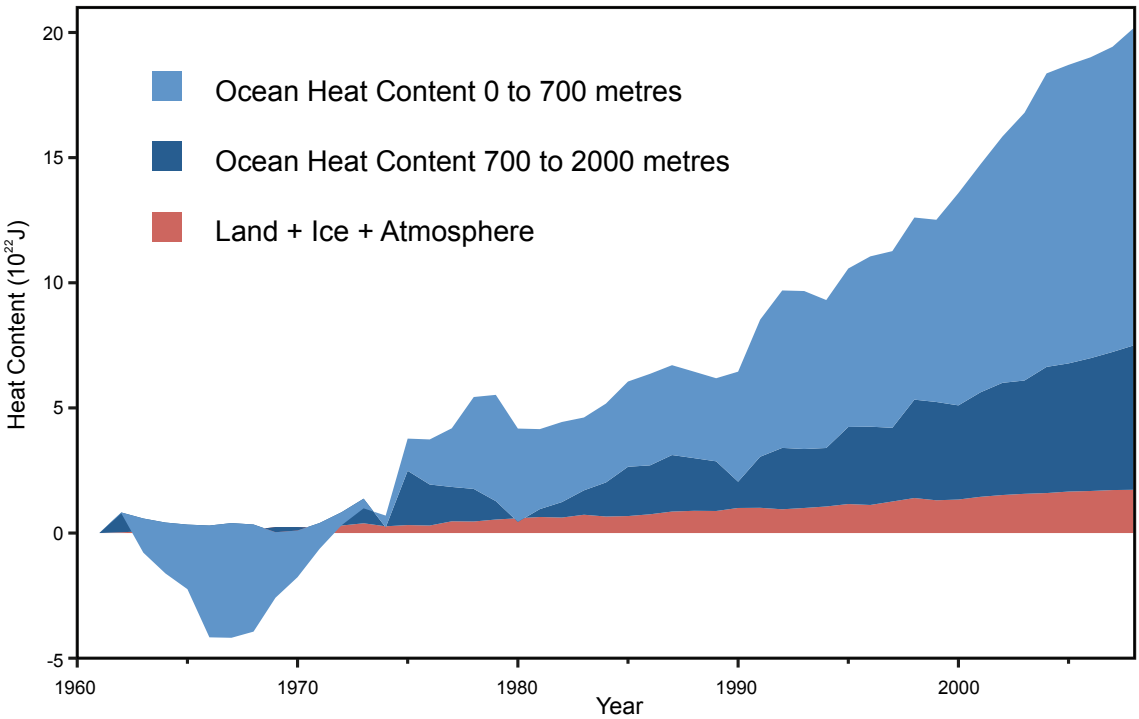
> In the coming century, life in the ocean will be confronted with a suite of environmental conditions that have no analogue in human history. (Harnik et al., 2012: 608)

Climate change as a result of increasing greenhouse gas emissions, largely carbon dioxide (CO_2), may be the most severe impact on the natural world as a result of human activity. The oceans play a major role in the uptake of heat generated by global warming, with the Intergovernmental Panel on Climate Change (IPCC) reporting that ocean warming accounts for 90 percent of the increase in energy in the climate system between 1971 and 2010 (IPCC, 2013: 8). As a result of ice melt and the thermal expansion of ocean waters, mean global sea level may rise by as much as a metre by the end of this century (IPCC, 2013: 25).

Although the majority of warming occurs in the surface waters, about 30 percent of this excess energy is stored in the deep ocean below 700 metres (IPCC, 2013: 8). In the coming century, the global ocean will continue to warm, and the penetration of this heat from the surface to the deep ocean will affect ocean circulation (IPCC, 2013: 24). Associated changes to the distribution of heat, nutrients and dissolved gases are likely to have significant consequences on primary production, local climate and marine ecological dynamics (Hoegh-Guldberg & Bruno, 2010).

Figure 6: Land, atmosphere, and ice heating (red), 0–700 meter ocean heat content increase (light blue), 700–2000 meter ocean heat content increase (dark blue)

Source: Nuccitelli et al., 2012



Ocean warming is most intense at the poles. The Antarctic Circumpolar Current, which circulates from west to east and is sometimes called the 'powerhouse' of global climate regulation, is known to be strengthening and shifting to the south. At the same time, there is greater upwelling of deep water across the Antarctic

continental margin, which enhances the melting of coastal ice and affects ice shelf stability. The resulting increases of meltwater make the oceans less salty and hence less dense – a change that reduces the ability of coastal waters to sink into the deep ocean and feed abyssal currents such as the Pacific Deep Western Boundary Current that passes along easternmost Zealandia (Rignot & Jacobs, 2002; Carter et al., 2008; Bindoff et al., 2008; Schmidtko et al., 2014). These changes are significant for New Zealand, as the changing climate of the Antarctic region will shape regional climate shifts in the Pacific (Rhein et al., 2013). At the same time, the New Zealand ocean is being influenced from the equator. There is scattered evidence that the ocean off eastern New Zealand is warming in response to an increased subtropical inflow (for instance, Fernandez et al., 2014).

The global ocean functions as a sink not only for excess planetary heat but also for the CO_2 emissions which are the primary driver of human-induced climate change (IPCC, 2013). Carbon dioxide dissolves naturally in seawater, and this process occurs most effectively in cold temperatures at the poles. It is also taken up during photosynthesis by phytoplankton in the surface waters (MacDiarmid et al., 2013; Rhein et al., 2013). One of the consequences of increased CO_2 in the atmosphere is therefore its increasing concentration in marine systems, with approximately 48 percent of all CO_2 released into the atmosphere to date having been dissolved in the oceans (Sabine et al., 2004). A proportion of this dissolved CO_2 reacts with seawater to form carbonic acid; as a result, the pH of the oceans is currently falling at a measureable rate in a process known as ocean acidification (Bates et al., 2014; Turley et al., 2010).

Acidification represents a major threat to life in the sea. Many marine organisms, including corals, molluscs, crustaceans and many groups of plankton, secrete shells and exoskeletons from calcium carbonate; under more acidic conditions calcium carbonate becomes more difficult to produce, and affected biota either die or become more susceptible to other stressors during vulnerable stages of their life cycle (Turley et al., 2010). Scientists predict detrimental effects on the globally important biota that support ecosystem functions, such as nutrient cycling, as well as on the interactions between species within ecosystems that have already been subject to disturbance (Godbold & Calosi, 2013).

Many drivers of change in the oceans operate over wide geographic areas, and as a result the degradation of entire ecosystems in the oceans is more pervasive than on land (Knowlton & Jackson, 2008). Although there have been relatively few complete extinctions of marine species as a result of human activities (at least compared to terrestrial extinction rates), there have been drastic declines in the abundance of both large and small marine biota. The ecological shifts occurring throughout marine food webs as a result of these changes are affecting both the structure and functioning of ocean ecosystems. As human pressure on the oceans increases, there is danger of a major marine 'extinction pulse' corresponding to the mass extinction that began in terrestrial ecosystems during the Industrial Revolution (McCauley et al., 2015).

Within the Pacific region, changes in ocean circulation, such as the southward extension of the subtropical East Australian Current, are changing the distribution of marine species (Ridgway & Hill, 2009). It is likely that the ecological effects of ocean warming, sea level rise and acidification will be compounded by interactions with local stressors such as pollution, eutrophication, sedimentation and overfishing (Bijma et al., 2013). Overfishing occurs at all scales: from the ocean-wide exploitation of highly migratory pelagic species to very localised intensive harvests of more sedentary stocks. In nearly every marine ecosystem the removal of biomass through fishing preceded all other human disturbances and in many cases remains the primary driver of ecological change (Jackson et al., 2001: 635).

2.3.2 New Zealand

Despite the broad scientific understanding of global changes in the climate and oceans, we have a poor knowledge of how these changes affect New Zealand's marine environment. This is in stark contrast to countries such as Australia, which produces regular 'report cards' on the impacts and adaptation needs relating to ocean and climate change (see Poloczanska et al., 2012). Such a lack of understanding is deeply concerning, especially given the nature of the changes observed in Australia. Recent studies off the east coast of Tasmania, for instance, have reported sea surface temperatures increasing at almost four times the global average, with associated changes in the range of several dozen marine species (Robinson et al., 2015). There is no reason to assume that change on a similar scale may not be happening in parts of New Zealand's marine jurisdiction (e.g. Fernandez et al., 2014), but this remains unknown in the absence of a comprehensive national programme of monitoring and reporting.

Nonetheless, it is possible to identify a broad complement of changes that are either currently impacting on our oceans or are likely to do so in the near future, even if these have not been comprehensively measured or quantified:

- Ocean warming, sea level rise and ocean acidification have the potential to impact every marine ecosystem within New Zealand's jurisdiction (MacDiarmid et al., 2012b).
- Commercial and recreational fisheries have major effects on the biological components of marine ecosystems. In particular, fishing methods such as bottom trawling and dredging have direct impacts on both target species and bycatch and are highly destructive to seabed habitats (Mace et al., 2014; MacDiarmid et al., 2012b).
- Aquaculture of both shellfish and finfish in areas of the coastal zone has a number of impacts, including the accumulation of debris on the seabed, the pollution of the water column by food and faeces (in the case of finfish) and the spread of disease to wild populations (Forrest et al., 2007; Keeley et al., 2009).
- Seismic surveying associated with prospecting for seabed petroleum and minerals resources has impacts on marine mammals and other marine species, as do some sonar systems used by the military. Physical disturbances to the seafloor and its biological communities also occur during the exploratory drilling process, although this is generally restricted to a small area (MacDiarmid et al., 2012a).
- Extraction of petroleum has direct impacts on the seabed, but these are also highly restricted in area. There is risk of spillage during transport of oil and gas from the production platform to the shore (MacDiarmid et al., 2012a).
- Invasive species are an ongoing problem associated with international shipping traffic in New Zealand, largely associated with hull fouling and the discharge of ballast water in ports (Hayden et al., 2009).

In 1999 the Parliamentary Commissioner for the Environment identified various 'upstream uses' with influence on the wider marine environment. These are largely land-based activities and processes that impact on the oceans, particularly in the coastal zone. Such uses include:

- discharges from industrial facilities into waterways;
- discharge of sewage into waterways (mostly at least partially treated);
- runoff of effluent from livestock, particularly from dairy farms, releasing nutrients such as nitrogen and phosphorus;
- other agricultural and horticultural runoff such as pesticides and fertilisers;
- dredging of harbours and the disposal of dredge waste at sea;
- stormwater runoff containing sediment, organic matter and road surface pollutants: these may include large concentrations of heavy metals, PCBs, organochlorines and hydrocarbons, all of which bioaccumulate in marine ecosystems;
- sedimentation from forestry clearance, urban development and other large-scale changes in land use; and
- hydroelectric dams that alter the rate and timing of freshwater flows into the coastal zone (PCE, 1999: 19–20).

3. Public perspectives

3.1 Findings from a dialogue on ocean governance

In May 2014 the McGuinness Institute hosted a 'structured discussion' on ocean management. This was attended by around 60 guests, representing a broad range of scientific, governmental, industrial and environmental interest groups. The event was designed to explore the current priorities and areas of concern of New Zealand's professional 'oceans community' and to identify ways that the Institute's *One Ocean* project could best contribute to improving ocean governance. Detailed conclusions from this event were published in January 2015 as *Working Paper 2015/01: Ocean Management in New Zealand: Findings from a structured discussion*.

Prior to this event, Institute staff and invited guest speakers composed an aspirational goal for ocean governance in New Zealand. This was framed as a deliberately generalised statement intended to generate discussion and explore ideas:

> A management framework that is informed, collaborative and durable, based on a collective commitment to a healthy and productive ocean.

In relation to this goal, event attendees were asked to contribute written responses to three questions:

1. What aspects of the current framework are working effectively towards this goal?

2. What aspects of the current framework are working ineffectively towards this goal?

3. What research, processes, instruments and institutions might best inspire and inform progress towards this goal?

Each response was categorised under the one theme that was judged to best reflect its content. The frequency of themes for each question were compared, to arrive at a rough approximation of the most common perspectives and priorities of respondents. These frequent themes are graphed and further discussed in the following pages.[3]

Question 1: What aspects of the current framework are working effectively towards this goal?

The most common responses to this question related to the significance that many New Zealanders place on the ocean, with one respondent explaining that 'regardless of level of knowledge or experience many NZers [*sic*] want to engage in the use and future value of our oceans'. The other common theme related to the potential for existing legislation such as the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) to develop into the basis of more comprehensive governance; one comment, for instance, referred to the EEZ Act as 'one limb of a regime that could include marine protection'. The frequency of occurrence of these themes is plotted in Figure 7 in comparison with those aspects considered to be ineffective.

3 See the Institute's *Working Paper 2015/01* for details of this methodology and a full analysis of responses. The appendix to this working paper contains a complete list of attendee responses to all questions.

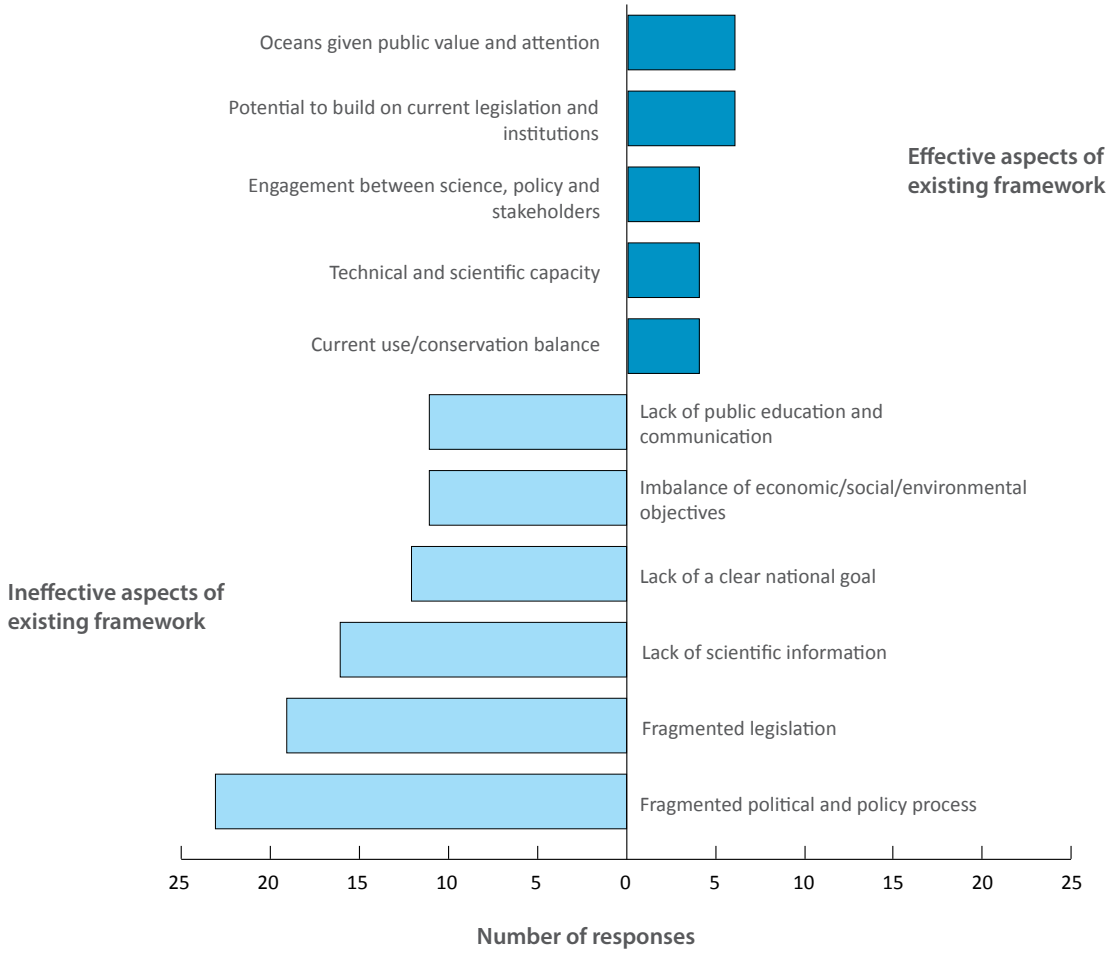
Question 2: What aspects of the current framework are working ineffectively towards this goal?

A wide range of ineffective aspects of the current framework were identified in response to this second question, with the most common responses also represented in Figure 7. The primary theme of responses related to the fragmentation of legislation and policy into sector-based interests and the siloing of management responsibilities amongst government departments. Many attendees considered there to be no 'mechanism for collaborative approaches', resulting in 'adversarial approaches to oceans issues'. One response summed up many of the comments in this category by stating: 'government agencies have a narrow focus; none is willing to take leadership of ocean management, fragmented responsibility.'

A lack of baseline scientific information and the perceived lack of financial and institutional resources necessary in order to undertake such research were also highlighted as major problems. A key response posed the question, 'How can we know how effective we are when the data is so fragmented and the agencies and industries cannot really share information?' Attendees also identified the absence of a clear, nationally relevant goal or vision for New Zealand's marine environment and an inappropriate balance (or lack of balance) between current economic, social and environmental objectives in our marine space.

Figure 7: Aspects of New Zealand's existing ocean governance considered by discussion participants to be working effectively or ineffectively

Source: McGuinness Institute, 2015b



Question 3: What research, processes, instruments and institutions might best inspire and inform progress towards this goal?

This third question had a very broad scope and received a large number of diverse suggestions. The most frequent responses are graphed in Figure 8, indicating which themes are best classified as research, processes, instruments and institutions. The most common theme related to the need for a process of public education and engagement around oceans issues. There was an emphasis on both the need to 'raise general public consciousness ... and ownership of the decisions and objectives' relating to the ocean. There was also the idea that this could be done by encouraging public 'understanding [of] the indivisibility of the health of the environment, and the health of society, of individuals'. Some respondents took this further, stressing that education should be 'not just for the public ... but for industry and policy-makers'.

Respondents also identified the need for a collaborative, integrated system of governance that cuts across sectoral interests. This was stated in different ways: some comments referred in a very broad sense to 'an ocean policy framework that integrates "conflicting" legislation to deliver better conservation and economic outcomes'; others had a more specific call for 'marine protection legislation that has a graduated approach to protection and works in an integrated way with the Fisheries Act'. Many responses had a general recognition of the need to 'place questions in a wider social context: science and policy do not exist in a vacuum.'

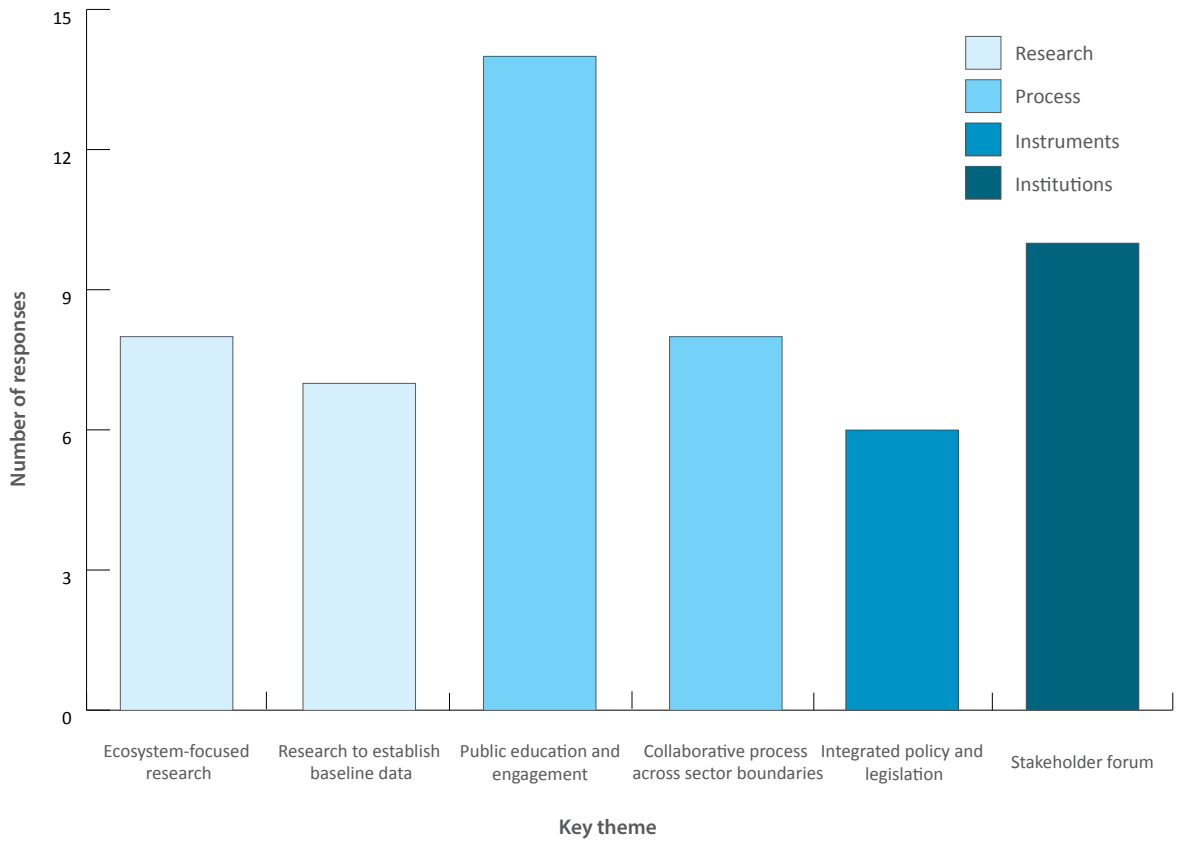
Participants specified that ocean management should be grounded in an overarching ecosystem approach to scientific research, with 'recognition that an ecosystem approach is made up of many smaller parts, and specific research needs to be small scale but structured to build up the jigsaw puzzle'. Numerous comments also mentioned that this approach should include bottom lines for a range of biophysical indicators in the marine environment.

Although there were a number of proposals relating to institutional change that could improve ocean governance, the most common suggestion was a stakeholder forum modelled on the Land and Water Forum. One comment envisaged that this would be 'like the Land and Water Forum with a secretariat: to structure engagement, develop objectives and actions to achieve them.' Another respondent described the potential of such a forum as follows:

> One of the best ways towards collaboration is getting all the interested parties (scientists, industry, NGOs, government) in the same room to discuss the issues. The challenge is then to move the discussion towards an agreement on knowledge gaps, user conflicts, shared interests and requirements – disseminating this agreement into recommendations that can be used to make real change and be discussed by the broader public to ensure what is agreed reflects what the public wants.

Figure 8: Research, processes, instruments and institutions considered most important by participants for progressing towards more desirable ocean management

Source: McGuinness Institute, 2015b



3.2 Ocean governance in the public eye

As with many areas of policy, New Zealand's system of ocean governance has not in itself had a high public profile. There are certain marine issues, however, which have become the subject of intense and controversial focus by both the media and the general public. Corresponding to the importance of the oceans in the cultural and economic life of New Zealand, recent highly visible issues have included:

- ongoing controversies over seabed mining, aquaculture and the conservation of the Māui's dolphin;
- disputes over the right of Māori to claim title to areas of the foreshore and seabed, based on customary and historical occupancy;
- actual and perceived conflict between recreational, commercial and customary fisheries over catch allocation;
- controversies related to labour conditions on foreign charter vessels (FCVs) utilised in commercial fisheries; and
- widespread public opposition to whaling activities in the Southern Ocean.

This is of course not a comprehensive list of high-profile controversies, but it does illustrate the types of issues around which public and media attention tends to coalesce. As noted in Section 2.2, recreational fishing is one of the primary interactions of many New Zealanders with the ocean. Perceived threats to these fisheries, whether to fish stocks or in terms of fishers' access to these stocks, are a recurring theme. Likewise, customary claims by Māori have been interpreted by some non-Māori as threatening public access to coastal marine areas. As elsewhere in the world, charismatic megafauna such as cetaceans also tend to draw considerable attention.

It is perhaps useful to reflect on the kinds of issues that have not attracted such attention in the popular media or amongst the general public. Research commissioned by WWF-New Zealand in 2005 and repeated in 2011 found that overall levels of perceived threat to the marine environment increased in the intervening period. The same survey found that the top threats were considered to be commercial fishing, pollution/sewerage and recreational fishing, in that order (Colmar Brunton, 2011: 13). An analysis of public attitudes by the Department of Conservation (DOC) attributes awareness of these factors to the observation that they are relatively visible, tangible stressors that often occur close to shore (Arnold, 2004).

Publicly visible issues do not necessarily correspond with the major marine threats identified in Section 2 or with those prioritised by scientists. Serious macro-scale threats such as climate change were perceived to be a 'top threat' by only three percent of respondents to the 2011 survey (Colmar Brunton, 2011: 13). Further research is needed to determine whether this reflects a more general lack of knowledge about the seriousness of climate threats or whether campaigns to raise awareness of climate change have had insufficient focus on its marine impacts. When asked about spatial protection, 95 percent of respondents overestimated the percentage of New Zealand's oceans currently designated as marine reserves (Colmar Brunton, 2011: 21). Such discrepancies between public perceptions and the reality of our marine governance again suggest an urgent need for greater public engagement and education.

Thirty unique perspectives

Introduction

Ocean governance is evolving, and if we want to develop policy that will last, we need to listen to the people of New Zealand. To this end, we invited 30 people to share their perspectives.

Contributors:

Attendee responses following the discussion event, held on 27 May 2014 at the McGuinness Institute. The results from this event are published in the Institute's *Working Paper 2015/01: Ocean Management in New Zealand: Findings from a structured discussion*.

Ocean research institutions in fifty years' time

Dr Susan Avery
President and Director, Woods Hole Oceanographic Institution, Massachusetts, United States

Our planet is a complex, dynamic system of interactions between the atmosphere, ocean, land, snow, ice, and everything that lives here.

In that planetary clockwork, the ocean is a key cog. It drives heat, water and nutrients around the globe. It maintains essential ecosystems. In short, it makes our planet habitable.

We know the ocean is changing rapidly. It is warming, becoming more acidic and losing sea ice. Sea levels are rising. It is overfished and more polluted by chemicals and noise. At the same time, industries are expanding into the ocean for resources.

These changes will have impacts on agriculture, fisheries, water, food, energy supplies, coastal infrastructure, transportation and natural events such as tsunamis and extreme weather – all of which profoundly affect our economy, health, welfare and national security.

The future of the ocean is uncertain, which means our future is uncertain. But technology advances are allowing Earth scientists better access to the ocean to make observations and gain knowledge. Networks of instruments and of people are poised to tackle larger questions about how the Earth system operates. In many ways, the ocean community is positioned to do what atmospheric scientists began in the 1950s – to dramatically expand our understanding and predictive capabilities for weather.

If we expand our ocean exploration and observations, we will make new discoveries, increase understanding, reduce uncertainties and produce better projections about future conditions for the ocean and our planet. As a result, we will inform adaptation policies for governments, resource managers, businesses and people. We will improve governance of the ocean and the entire planetary commons and help ensure our survival.

Ocean acidification (OA): Challenges and opportunities for New Zealand and Pacific island countries

Dr Todd Capson
Science and Policy Advisor,
Washington D.C., United States

Ocean acidification (OA) is a consequence of rising CO_2 levels, which are increasing the acidity of seawater. OA removes carbonate ions needed by organisms such as corals, shellfish and small organisms that underpin key marine food webs. Rising acidity has been shown to have profound impacts in some fishes. In effect, humans are conducting an unprecedented experiment in the Earth's history, and unless decisive measures are taken soon, the impacts will likely be profound and irreversible on time frames relevant to human societies. Globally, OA is driven by CO_2 emissions, but in coastal areas, local drivers such as nutrients from agriculture, can contribute to acidification. The successful management of these drivers can reduce local acidification and strengthen the natural resilience of coastal ecosystems against stressors such as climate change, overfishing and pollution.

New Zealand waters are acidifying at a rate consistent with global averages and studies confirm potential impacts on food webs, habitats and species of great ecological and commercial importance. While OA does not yet appear to have impacted New Zealand's coastal ecosystems, some in government, industry and academia are taking a proactive approach to monitor and address OA. On a regional scale, New Zealand is working in partnership with the U.S., Samoa and the Cook Islands to build a network dedicated to OA monitoring and adaptation in the Southwest Pacific. This programme will strengthen capacity to monitor and respond to OA, help future-proof vulnerable industries and provide a model for other countries. The information obtained will inform management decisions on local, national and international levels and add influential voices to the calls for reduced CO_2 emissions.

Submarine cables

Professor Lionel Carter
Professor at the Antarctic Research Centre,
Victoria University of Wellington

If you send an international email, use a search engine or make an overseas phone call, there is a 95 percent probability the communication will be via the global network of subsea fibre-optic cables. Why cables and not satellites? Put simply, cables transfer enormous amounts of data and voice traffic more rapidly, economically and securely than satellites. Such is society's reliance on the global network, it is classed as *critical infrastructure*.

The United Nations Convention on the Law of the Sea (UNCLOS) foresaw this importance, and specified freedoms to lay and maintain cables with due regard to rights and laws of coastal states. Cables have minimal environmental impact and are primarily about the size of a garden hose in diameter. Thus the physical footprint is small. Glass fibres and electrical components are encased in marine-grade polyethylene that is chemically inert. These systems are laid on the seabed in water depths exceeding 1,500 metres, where they remain for up to 25 years unless they require repair. In shallower waters, cables are wrapped in wire armour and buried under the seabed for protection against fishing and shipping activities, which account for 70 percent of all breaks.

Deep-ocean fibre-optic cable with (outside to in) its black/white polyethylene sheaths, copper conductor, steel strength member and glass fibres.

Image source: Lionel Carter, personal communication, 9 March 2015

The impacts of fishing

Dr Malcolm Clark
Principal Scientist (Deepwater Fisheries),
National Institute of Water and Atmospheric Research (NIWA)

Internationally, commercial fishing has a poor environmental reputation. Overfishing of target species, seabird bycatch on longlines, drowning of marine mammals near the surface in nets, bycatch of unwanted species in trawl fisheries and damage to the seafloor by heavy bottom trawl gear are often in the media. The nature and extent of these types of impacts can be severe and the effects long lasting. In New Zealand the Quota Management System (QMS) introduced in 1986 has done much to reduce the impact of overfishing on target and bycatch species. However, there are still valid concerns about wider environmental impacts, such as from the extensive use of bottom trawls in regions where fish aggregate over sensitive habitats or from where fisheries interact with vulnerable or protected species.

New Zealand fisheries legislation underpins efforts to manage significant adverse impacts and to adopt an 'ecosystem approach' to fisheries. Over the last 15 years, government and industry cooperation, increasingly informed by science, has resulted in progressive development of mitigation measures, codes of practice and no-fishing areas. However, fishing remains one of the main human activities utilising New Zealand's ocean space, and much more research is required to improve our understanding of fisheries effects on the structure and function of marine ecosystems. Given the size of the EEZ, the required commitment is large and will take time. Ultimately, for the long-term sustainability of our oceans, a comprehensive ecosystem approach, including tools like spatial management, is needed to ensure that resource uses (such as those of recreational and commercial fishing, mining and tourism) are integrated and balanced with conservation objectives.

Enabling responsible deepwater fishing

George Clement
Chairman, Seafood New Zealand Ltd

New Zealand's reputation is built on conservation – on the wise use of our natural resources. We have the fourth-largest marine zone in the world, of which 90 percent is pristine. We have huge opportunities ahead of us.

All forms of food production necessitate changes to pristine environments – organic farming requires wholesale removal of natural ecosystems. Marine food production is less damaging but still requires great care. Our quota system is emulated around the world. Over half of our wild seafood harvest is independently certified as sustainable, assessed against the best global scientific standards.

Marine biodiversity in 30 percent of our zone is conserved under a network of marine protected areas. These conservation measures are internationally recognised by the International Union for Conservation of Nature (IUCN). Amongst OECD countries, New Zealand has the largest area and proportion of our zone under marine protection. We need to further strengthen our marine conservation through broad discussion and new legislation.

New Zealanders can stand proud on the global stage for our conservation successes, particularly in our oceans. There is still work to be done. We might have the fourth-largest zone, but we do not have the fourth-largest economy. To paraphrase Lord Rutherford: we have to think!

The challenges we face are to not only inventory the biodiversity and resources within our zone but to also develop new technologies that enable New Zealanders to benefit from these resources with minimal environmental impacts. New challenges will require new ways of thinking. The future of New Zealand's oceans requires continued efforts from all and relies upon our ability to understand the true value to our children, our culture, our environment, our economy and to the world.

Customary and legal rights in oceans governance

Jamie Ferguson
Partner, Kahui Legal

The ocean presents a myriad of jurisdictional complexities and challenges, including the 12-nautical-mile mark which signifies the jurisdictional boundary of the Resource Management Act 1991 (RMA), the coastal and marine area under the Takutai Moana Act 2011 and the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act). However, in Te Ao Māori, there are no such jurisdictional divisions. To Māori, Tangaroa is an interconnected and indivisible whole comprising all its elements and ecosystems (both physical and metaphysical). Māori have customary rights and interests in, and corresponding responsibilities as kaitiaki to, Tangaroa. In Aotearoa, the lens through which the ocean is viewed should therefore have a strong impact on how regulation is developed and implemented.

New Zealand has seen much change in this space during the past five years, including RMA reforms, the establishment of the Environmental Protection Authority (EPA) and the enactment of the EEZ Act. However, it is highly questionable that these mechanisms have strengthened Māori involvement in relevant frameworks or provided recognition of Māori rights and responsibilities.

In 2011 the Waitangi Tribunal's *Ko Aotearoa Tenei* report considered the RMA in detail and found, among other things, that the RMA did not provide appropriately for Māori. *Ko Aotearoa Tenei* recommended a new legal framework through which Māori could exercise a level of involvement in environmental regulation that recognises appropriately their rights and corresponding responsibilities. That framework proposes Māori involvement in terms of values recognition, participation in governance and management and partnership. Neither the RMA nor the EEZ Act currently reflect this approach.

Lines in the ocean

Bronwen Golder
Director of the Kermadec Initiative,
The Pew Charitable Trusts

In her December 2014 Rutherford Lecture Dame Anne Salmond spoke of the impact of early cartographers on our impressions of the ocean. The map lines they drew, she suggested, were a simplification – a kind of imperialism that partitioned and measured our abundant ocean within boundaries that allow us to dominate it.

Since the time of Cook's naval charts, lines have defined our ocean. A line at 12 nautical miles marks out New Zealand's territorial sea. New Zealand's EEZ is delimited by a line in the ocean 200 nautical miles from shore (including our outlying islands). A line defining New Zealand's continental shelf lies yet further out.

There are lines on maps that define how government manages our ocean. Ten straight lines divide our EEZ into 10 fisheries management areas. On other maps large lego-block-shaped areas overlay our EEZ, showing modern explorers for oil, gas and minerals where they may go to pursue economic returns.

However, you will struggle to find maps that profile the important and sensitive areas of our ocean, the pathways of migrating whales and turtles or indeed the final refuges of endangered species. On a map of our vast ocean territory you would struggle to find the almost invisible 0.5 percent bounded by lines that define areas that we are protecting.

Since Cook's first maps the lines that have been drawn across New Zealand's ocean have defined ownership and access. The time has long since passed for New Zealand to draw new lines that respect the connectedness, unique character and vulnerabilities of its habitats, species and processes – lines that protect it.

Recreational perspective

Nolan Hodgson
Recreational fisher and diver

As a fisher and free-diver I am incredibly fortunate to live in Aotearoa and enjoy such easy access to swathes of spectacular coastline. Unfortunately, I feel there is a growing perception that commercial interests in our oceans take precedence over recreational users and the intrinsic worth of ocean ecosystems themselves.

The plight of the Māui's dolphin exemplifies this disconnect, with the seafood and fossil fuel industries continuing to operate within its known habitat in ways that risk the extinction of the species. Regulations which allow commercial operators to take fish smaller than those allowed for recreational fishers also undermine public trust and support for the Quota Management System.

While recreational lobby groups such as 'Pāua to the People' in Otago can successfully fight to delay the expansion of commercial operations, it requires a significant commitment by hundreds of volunteers. Similarly, in relation to seabed mining operations that have been declined resource consents recently, it is hard to believe that this reflects anything more than the strength of the commercial fishing lobbyists who oppose them.

I also lament the fact that fresh kai moana is still prohibitively expensive for many New Zealanders, yet we catch unimaginable amounts of it every day in our territorial waters. This makes catching it ourselves all the more attractive, yet this does not appear to be getting easier. The fishing stories of our parents and grandparents tell of an ocean in which more species were easier to come by (using less advanced technology).

Recreationally, the ocean is so much more than the 'resource' it is perceived to be within the quota management system. The ocean is where we spend time with our whānau and friends – where we encounter majestic cetacean creatures, reclusive pelagic seabirds and exquisitely beautiful benthic communities.

The UN Convention on the Law of the Sea (UNCLOS)

Colin Keating
Former Ambassador to the United Nations and UNCLOS negotiator

In 1996 I had the honour of presenting to the UN New Zealand's ratification of UNCLOS. That convention allowed New Zealand to extend its jurisdiction into the ocean for 200 miles and beyond and to gain control over ocean resources worth billions of dollars.

Additionally, UNCLOS established rules for drawing boundaries in the oceans – a source of conflict between states for generations. Environmental protection and sustainable fishing rules were agreed, and access to the sea-lanes that are critical for our exports was legally protected.

When UNCLOS came into force in 1994, it was during a time of optimism at the end of the Cold War. The same year, the World Trade Organisation negotiations were concluded, bringing a similar innovative framework of rules to international trade.

Twenty years later the optimism has faded. The WTO is deadlocked. The US Senate has blocked ratification of many multilateral treaties, including UNCLOS. Non-state actors, including flag-of-convenience fishing pirates, are finding loopholes in UNCLOS and other treaties. The global environment is also increasingly uncertain. On land in Crimea, in the South China Sea and with the renewed use of vetoes in the Security Council, nationalism, exceptionalism and power seem to be undermining the great law-making treaties of the last 60 years.

It is too soon to say that what New Zealand has gained from UNCLOS is now at risk. But the warning signs are clear. We are in a period of history where the small need to be very nimble and resourceful. We will indeed be at risk if we fail to reinvest in our diplomatic, scientific and defence force capabilities.

UNESCO World Heritage sites, biosphere reserves and MPAs

Captain Paul Keating
Chair, Guardians of the Sounds

At the recent World Parks Congress in Australia in 2014, a recommendation was made to urgently increase the extent of marine protected areas (MPAs) with no extractive activities to at least 30 percent of each marine habitat. This is an increase on the Convention on Biological Diversity's target set in 2010 for just 10 percent of marine areas to be conserved in MPAs by 2020, of which New Zealand is also currently falling well short. Marine reserves, which are MPAs with no extractive activities, currently constitute 0.4 percent of the EEZ and New Zealand's territorial sea.

Recent pronouncements by the New Zealand Government of a possible recreational fishing park for the Marlborough Sounds will do little, if anything, to help reach these essential targets. With 20 percent of the New Zealand coastline at our door, Guardians of the Sounds (GOS) believe New Zealand should make greater use of the international legislation that we have already signed up to.

To this end, as well as seeking a significant increase of marine reserves in the Sounds, GOS is championing and actively seeking funds for the region to be nominated as New Zealand's first UNESCO biosphere reserve (New Zealand remains one of the few developed nations that still has none). This nominated area would include two World Heritage sites: the first would be at Ship Cove, where Captain Cook spent 171 days from 1770–1779, signifying the start of New Zealand culture through sustained interaction between Māori and European; the second would be at Wairau Bar, where the oldest Māori artefacts are found and Māori culture within New Zealand began.

Sustainability in coastal ecosystems

Associate Professor John Leader
Honorary Associate Professor,
University of Otago

Until very recently, humans have viewed the oceans as an infinite and inexhaustible resource to be plundered at will for its products and used as a sink for all the detritus and effluent of modern living. However, we are now becoming aware that this is not the case.

Within the Marlborough Sounds, for example, a wide range of interests seek to maximize their individual returns from mussel farms, fish farms, scallop trawling and recreational fishing, against a background of tourism, dairy runoff, forestry and sewage disposal. There is plenty of evidence that these competing uses are incompatible. The productivity of the Sounds depends broadly upon provision of nutrients from current flow, combined with the input of energy from the sun. The efficiency with which this input can be conveyed up the food chain to manifest itself as 'useful' product is hindered or reduced by habitat destruction, sedimentation and ecological imbalance resulting from selective exploitation of particular species.

Can the steady state known euphemistically as 'sustainability' ever be achieved? Perhaps, but there are several prerequisites. Fundamental to reaching a quasi-equilibrium is knowledge of the Sounds, the ecology of the living things present and the dynamics of their interrelationships. To gain that will take time, money and expertise, all of which are presently lacking. Armed with the knowledge of the flow of energy through the system and its pressure points, it will then be possible to seek cooperation and collaboration between competing interest groups for all parties involved to mutually enjoy the resource for the indefinite future. That will involve concessions by all concerned, but a failure to achieve this will result in loss of this invaluable resource for everyone.

Enabling responsible petroleum exploration and production

Cameron Madgwick
Chief Executive Officer,
Petroleum Exploration & Production Association
New Zealand (PEPANZ)

Every New Zealander has an affinity with the ocean. For some, the abundance of kai moana means it is like their local supermarket; for others, it is a place where summertime memories are made.

This is what is at the forefront of the minds of New Zealand's oil and gas industry when operating on or near New Zealand's oceans. Coupled with a tough regulatory regime, we have our own world-class standards that we operate to, whether undertaking seismic surveys of the rock types and locations beneath the seabed or extracting hydrocarbons from those rocks. We take the protection of our oceans seriously and don't just look to mitigate risk but to eliminate it where we can. Science, logic and decades of experience operating in the ocean environment guide our operations – a good plate of fish and chips, swims in the sea and decades of great summertime memories guide our determination to protect our oceans for future generations of Kiwi ocean users to come.

Image source: Petroleum Exploration & Production Association New Zealand, personal communication, 16 March 2015

Marine protection protects our future

Ann McCrone
New Zealand Marine Advocate,
World Wide Fund for Nature New Zealand

Once viewed as vast and inexhaustible, our oceans are experiencing unprecedented human disturbances. Globally, we are witnessing a significant decrease in habitat quality and major declines in the abundance of marine fauna, with profound implications for people as well as nature. Are we prepared to accept this as the new norm?

The better option is to adapt our practices so that humanity can live in harmony with the marine environment. We know that functional ecosystems are the foundation for social and economic development. Well-managed protected areas, especially networks of fully protected areas, are considered a cornerstone of conservation. Their efficacy is enhanced substantially when they are representative of the biodiversity of a region.

In New Zealand our marine protection levels are woefully inadequate. Only 0.4 percent of our marine environment is in full protection. We have a responsibility to move away from the piecemeal case-by-case approach to decision-making and instead embark on marine planning, so as a nation we can determine what areas should be protected and what areas are more appropriate for economic activity. A marine protected area network in New Zealand is essential; it won't solve all problems and resolve all conflicts (there will still be a need for sustainable land and water management), but it will go a long way to creating greater certainty and transparency.

Decisions we make today will have deep implications for future generations. Will we be judged as responsible custodians? We can leave a lasting legacy if we seize the opportunity to create an effective network of fully protected marine reserves that includes the establishment of the Kermadec Ocean Sanctuary.

Comparing apples with apples – Matching public benefits against public costs and risks

Wendy McGuinness
Chief Executive,
McGuinness Institute

'Cleaning up' our fresh water has been costly; New Zealand has already committed $450 million over 20 years to clean up Lake Taupō, the Rotorua lakes and the Waikato River. But when it comes to the water in our oceans, are we learning from our mistakes or simply repeating them? According to April 2013 Treasury figures, the *Rena* disaster cost the government $46.8 million – far greater than the $27.6 million paid in compensation by the ship's owners and insurers. This does not include the ongoing costs to the environment or the many New Zealanders who helped clean up the coastline. If cleaning a lake or river is hard, how hard would it be to clean an ocean?

The Institute was involved in the application by New Zealand King Salmon to establish nine salmon farms in the Marlborough Sounds. What surprised and concerned me was the inadequate level of economic expertise required from the applicant in terms of public benefits. I believe that because hearing decisions usually take a middle ground, somewhere between the applicant and those questioning the application, applicants in these cases seem to be incentivised to overestimate economic benefits to the public. Critical economic assessment of public benefits must not be left to third parties; it is an expensive and specialised area of expertise that must be embedded into the governance system.

New Zealand King Salmon farms continue to have high mortality, meaning many fish are dying in the waters of the Marlborough Sounds. The latest mortality event is estimated to cost the company millions. But what about costs to the community and the environment? Public risks should be calculated and balanced against their likelihood of delivering public benefits. Anything less is poor stewardship.

Toitū te marae a Tāne, toitū te marae a Tangaroa, toitū te iwi

Dr Ocean Mercier
Pukenga Matua/Senior Lecturer at Te Kawa a Māui,
Victoria University of Wellington

My nana loved bubus, but after losing a leg she couldn't gather them herself. So Mum and I went out scrambling over rocks and tide pools to collect some for her (and her cat, Hikurangi). Twisting the sea snails off the rocks, they chink-chinked into the flax kete along with our kōrero and laughter – and only the incoming tide brought us in.

In 2011 World Wildlife Fund's *Ocean: Views* creative writing and media contest invited 'New Zealanders from all walks of life to reflect on their own connection to the sea', and the poems and stories were so beautiful that my own love for our oceans was widened and deepened. But whether we live 50 metres, 50 kilometres or 2,500 kilometres from a beach, we all connect to the sea. Visiting Sakej Youngblood Henderson in Saskatchewan, Canada, I asked him 'How do you live so far from the ocean?' He responded: 'We are not far from it; we are in the sea. It doesn't stop at the coast. It is all around us.'

What a powerful notion, that we all live in and breathe the sea. The whakatauki above carries this idea too: Tangaroa's domain (sea) is connected to Tāne's domain (land), and only by their mutual health will we thrive. So when I think of governance, I think of it as all our responsibility, and I am encouraged by the personal encounters of locals with seas, like Nana, her bubus and her bubu collectors.

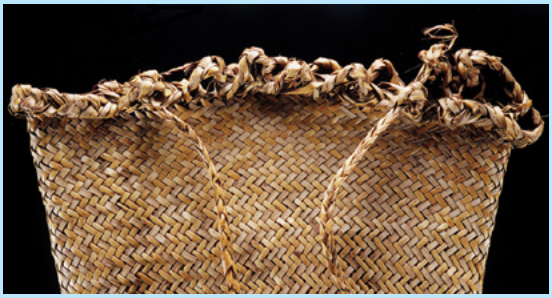


Image source: Museum of New Zealand Te Papa Tongarewa, n.d.

Big ocean nation, surviving with the waves

Tevita Motulalo
Deputy Editor,
Kele'a Newspaper

The Kingdom of Tonga, an archipelago in the South Pacific, is a 'big ocean state' rather than a 'small island nation'. While its land area is around 700 square kilometres, its maritime exclusive economic zone is a hundred times that, at around 700,000 square kilometres. Survival on the islands is a serious everyday struggle against nature and the oceans, with the rising seas and the surging storms. Yet the ocean, collectively known as the great Moana, is the life-giver that has sustained Pacific cultures for millennia.

The Tongan Constitution states any citizen is free to fish anywhere in the waters of Tonga. This Constitutional clause might potentially be tested by modern Tongan innovations in maritime stewardship. For example, the Tongan Government has put in place eight innovative 'special management areas' where the local community has the authority to grant fishing licensing to interested parties. The Tongan Government has also enacted a groundbreaking 'Seabed Mining Act' in light of the possibly lucrative deposits sitting at the trenches of the Lau Basin, demarcated by the ridges stretching from the North Island of New Zealand through Tonga and Fiji.

As the sea is a medium of communication, globalisation didn't only bring waves of prosperity to the shores of Tonga. It also brought waves of transnational crime. Drugs aren't just hidden on freighters; traffickers have chartered their own vessels. And illegal trawlers have netted life out of the waters, collapsing whole ecosystems. Tonga always looks to defend against these sinister efforts.

While the Kingdom staggers on to pursue more open-market capitalisation of its resources, it is always besieged with the reality that its oceans are its closest help – and greatest obstacle.

Global warming is ocean warming

Professor Timothy Naish
Director of the Antarctic Research Centre,
Victoria University of Wellington

The oceans provide an enormous and effective heat sink that is suppressing the rate and magnitude of the Earth's surface warming. The IPCC reports that 93 percent of the heat generated by anthropogenic global warming has been stored in the ocean, three percent into melting ice, three percent into warming of continents and only one percent into the atmosphere. In other words, global warming is for now ocean warming!

Around the Antarctic the deep, well-mixed Southern Ocean has warmed at 0.05°C per decade since 1971 – a greater rate than the global ocean average, and faster than the deep ocean anywhere else on the planet. Southern Ocean heat uptake is suppressing surface warming and as a whole, Antarctica is warming no faster than the global average.

Then why do satellite observations of the West Antarctic Ice Sheet show a doubling in the rate of mass loss over the last five years? Changes in ocean circulation linked to global warming are bringing filaments of warm circumpolar deep waters into contact with the West Antarctic Ice sheet. These 1–2°C warmer waters are melting and destabilising ice shelves and causing coastal glaciers to retreat back into deep basins where large volumes of ice sitting well below sea level are vulnerable to rapid collapse.

So, while ocean warming may be suppressing the pace of global surface warming for now, the built-in heat content of the ocean represents a significant commitment to future changes. Some scientists argue that collapse of large parts of the West Antarctic Ice sheet contributing one to three metres of sea level rise may already be unstoppable no matter how we limit future greenhouse gas emissions.

Enabling responsible seabed mining

Bernie Napp
Policy Manager, Straterra

Seabed mining has become controversial, with the Trans-Tasman Resources iron sands and Chatham Rock Phosphate projects' marine consent applications being declined by the Environmental Protection Agency. These decisions of June 2014 and February 2015 have sent a strong signal to investors that New Zealand is an unfair and unreasonable place to do business.

The issues are how the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) regime deals with uncertainty and risk concerning the likely environmental impacts of seabed mining, how much that matters in the broader context and how to apply adaptive management.

Over time, the aforementioned projects would have affected 0.5 percent of the area of the South Taranaki Bight and the Chatham Rise respectively. Each project would cost more than $500 million upfront and turn over more than $100 million a year. They would produce iron sands for steel-making and phosphorite for agricultural fertiliser – both of which are vital to modern life. The operators would adjust their operations if environmental conditions were breached (as occurs on land) using adaptive management.

The question for society is whether or not that is acceptable. We in industry think it is and that the EEZ Act regime must be changed to achieve it. We seek a pragmatic approach to assessing environmental effects, understanding and managing uncertainty and risk, setting consent conditions and providing for adaptive management.

Industry supports marine protection legislation for the EEZ to protect important biodiversity when appropriate. Areas must be identified via an informed and consultative process. Abolishing the Benthic Protection Areas is a necessary first step for good process and for fair and constructive public debate.

Experiencing the Kermadec

Gregory O'Brien
Poet, artist, 2015 Stout Memorial Fellow,
Victoria University of Wellington

I imagine commercial interests will be given a good chance to pick over the Kermadec waters and seabed, north of New Zealand, before we are allowed to seriously consider the prospect of a 620,000 square kilometre Kermadec marine sanctuary. It makes me wonder if, back in 1953, New Zealand would have gained the Aoraki/Mount Cook National Park if the mineral-rich alps had first been opened up to commercial interests. Luckily, a national park based around the nation's highest landmark was achieved without having to go down that path. So why not declare a reserve around New Zealand's deepest territory: the Kermadec Trench?

In 2011 Niuean-born artist John Pule and I were among a group of artists who sailed the Kermadec waters on HMNZS *Otago*. Upon our return, we collaborated on this etching – *What I did and did not have* – reflecting on our immersion in the life-giving, munificent, yet currently threatened, ocean environment.

As Pacific peoples, our lives are defined and shaped by the ocean; its waters permeate our being. The ocean is our identity – our pride and inspiration. Diving into the precious Kermadec waters, we realised we were, to borrow from Janet Frame, 'entering the human heart'. In a responsible world, such an immeasurable resource would be nurtured, cherished and raised up, far above the forces of rampant monetarism and the wholesale exploitation of material resources.

Image credit: John Pule and Gregory O'Brien, *What I did and did not have*, etching

Image source: Gregory O'Brien, personal communication, 23 March 2015

Durable ocean policy

James Palmer
Deputy Secretary, Sector Strategy,
Ministry for the Environment

Aotearoa New Zealand is more isolated and bounded by ocean than any other developed country on Earth. Our remoteness from population centres of the world and the footprint of civilisation is both our greatest challenge and greatest opportunity.

The ocean played a defining role in creating our nation, carrying the many peoples, and more than a few pests, to our shores. We are a seafaring people for whom the sea remains central to our identity. And yet our oceanic responsibilities vastly exceed what we know and understand; we are servant to it much more than master. As with our lands, we face choices about development for prosperity today and tomorrow, balancing broad societal values as well as preserving ecosystems for as much their own sake as our own.

Our main challenge is to provide for diverse uses and values from a changing marine environment in a considered, coherent and durable way, with all the inherent limitations of knowledge and certainty and with meagre resources. This will undoubtedly take greater investment, much participation and dialogue and a willingness to explore and experiment in the face of uncertainty. There are no perfect institutional arrangements for governing our marine environment, just like there is no perfect information waiting to be uncovered. We need to accept that governing our marine environment will be an ongoing voyage of discovery, with some risk and reward, in the same spirit of those who first sailed to our shores. But we are not without a compass; the unbridled transformation of our lands provides important lessons of mistakes we must not repeat and signposts for improvement.

Marine spatial planning

Raewyn Peart
Policy Director,
Environmental Defence Society (EDS)

New Zealand's marine jurisdiction is vast and enormously rich in life and resources. Managed well, it will remain highly productive and sustain future generations of New Zealanders. But managed poorly, its riches will be diminished. Unfortunately, we are struggling to achieve effective management of our marine environment with fragmented, case-by-case decision-making being the norm.

Marine spatial planning offers a promising solution. It provides a strategic approach to proactively planning for the future use of our marine environment. At its heart is a concern to protect the underlying 'ecological backbone', or productivity, of the marine area. But it also seeks to reduce conflict and maximise synergies, providing greater certainty on where marine activities can and cannot locate.

The first marine spatial planning project in New Zealand has been under way for over 15 months. *Seachange – Tai Timu Tai Pari* is breaking new ground in New Zealand and internationally. The project is taking a fully integrated catchment-to-the-sea approach, with a focus on addressing the key drivers of ongoing degradation of the Hauraki Gulf marine area. It has adopted a co-governance model, with half the membership of the governance group consisting of mana whenua. *Seachange* has also embraced collaboration, with the plan being developed by an independently chaired stakeholder working group operating on a consensus model.

The impacts of the Hauraki Gulf initiative are likely to be wide reaching. We could see a strengthened governance model to deliver the promise of the spatial plan in the Hauraki Gulf as well as legislative change to provide for marine spatial planning in other parts of our marine space.

Internationalising New Zealand's ocean opportunity

Stuart Prior
Honorary Consul of the Republic of Belarus in New Zealand, Prior Group

Antarctica, the Southern Ocean around it and the South Pacific Ocean are of immense importance to our planet. New Zealand's unique geography positions us as a focal point for the collection, study and dissemination of authentic information about Earth's last frontier. It is both an opportunity and a responsibility for us to take the initiative, with vision and imagination, to create opportunities for international scientists and educationalists and the 'tellers of tales' to work here in New Zealand on oceans and polar issues of planetary significance.

The vastness of the oceanic environment which shapes our country and our lives is difficult to grasp. Oceans are to us what land is for Russia. Remarkably, the vertical north–south distance from Suwarrow Atoll in the Northern Cook Islands to Scott Base in the Ross Sea Region (7,370 kilometres) is almost identical to the horizontal west–east distance of the colossal continent of Russia, from Kaliningrad to the Commander Islands (7,449 kilometres).

New Zealand has, as never before, new opportunities to inform the international debate about the future of our oceanic environment and polar regions and, thereby, the future of mankind. To do this requires an emphasis on international science, education and communications, and it requires outreach based on the most rigorous principles of authenticity and integrity.

Virtual access is an extraordinary new tool for informing and engaging. Today's most trusted international intermediaries may not be politicians and diplomats but the researchers and creative storytellers hosted and nurtured in New Zealand, who can bring personality and therefore life to Earth's life-giving oceans.

New visions for our oceans

Professor Dame Anne Salmond
Distinguished Professor of Māori Studies,
University of Auckland

In recent times what we have seen is the high seas, *mare liberum*, formerly an expanse free to all nations but belonging to none, shrinking as nation states expand their sphere of influence out from their coastlines – a kind of oceanic enclosure. Such cartographic visions of the sea embody particular assumptions about the world and an abstract, quantifying, controlling and commodifying logic that is still unfolding.

In New Zealand, as elsewhere, a radical division between nature and culture, born of the 'order of things' out of the Enlightenment and the belief that nature is there for human beings to exploit without limit (and that they can fix any damage they do, because they rule the cosmos) is fundamentally destructive to maritime ecosystems. Contemporary scientific models with their fragmented partitions and the split between nature and culture, with its deep separation between people and other phenomena, are failing to adequately grasp the cascading dynamics of complex systems in which people are implicated at every scale, putting the future of many marine species and coastal human communities at risk simultaneously. Until we grasp that our being and that of oceanic ecosystems are bound together ... we won't demand that the human activities that put our futures at risk are conducted within survivable limits.

So just as Marcel Mauss reflected on the Māori idea of the *hau* to imagine alternatives to a commodified world, cross-philosophical experiments may give us the freedom (and I think New Zealand is a perfect place to do this) to generate more adaptive ways of being and of ordering our relations with each other and with the ocean.

Excerpt from 'The Sea', presented in October 2014 in Tauranga as part of the Royal Society of New Zealand's 2014 Rutherford Lectures (Salmond, 2014)

An eye on ocean governance and seabed mining

Katherine Sammler
PhD candidate,
School of Geography and Development,
University of Arizona, United States

As a researcher of marine territories and ocean governance, I have focused my investigations on New Zealand's developing seabed mining legislation and the marine consent process. Several factors make this an ideal case study of the national foray into this experimental industry. The Exclusive Economic Zone is a territory that is still being defined and written by nations in different ways across the Pacific – and indeed around the world. Gaps in both regulatory and environmental knowledge within this zone are being filled in, even as exploration activities and permit hearings occur.

The recent denial of the Chatham Rock Phosphate permit was watched very closely across the South Pacific. It was also watched from as far away as Namibia, where phosphate is also abundant off its shores. In the denial of this permit, as well as the Trans-Tasman Resources project, it is in the eye of the beholder whether the governance of these activities has been a success. From a researcher's perspective, further developments in New Zealand will continue to draw my observations.

Image credit: Lily House-Peters
Image source: K. Sammler, personal communication, 12 March 2015

Cetacean conservation

Professor Liz Slooten
Department of Zoology,
University of Otago

Nearly half of the world's 80 whale and dolphin species are found in our waters. The top conservation priority is the endemic New Zealand dolphin (*Cephalorhynchus hectori*), which is declining due to mortality in fishing nets. The North Island subspecies, Māui's dolphin, is worst off, with approximately 55 individuals remaining.

The solution is simple. Thirty years of research on New Zealand dolphins shows they do much better when fishermen don't use gill-nets or trawl nets. For example, the Banks Peninsula population was declining six percent per year and is now almost stable (declining 0.1 percent per year). The bad news is that protected areas are still far too small. The Māui's dolphin population is declining at nine percent per year. Several South Island populations are also still declining.

We are a long way from achieving the goals in the *Department of Conservation Marine Mammal Action Plan for 2005–2010*, which include 'species recovery' for New Zealand dolphin and 'self-sustaining' populations 'within its natural range'. To make progress, we will need to set much more specific targets and timelines (e.g. to make fisheries mortality below 10 New Zealand dolphins per year by 2020).

Critical for achieving sustainability will be a rapid transition to dolphin-safe fishing methods and avoiding new activities that threaten marine environments, such as marine mining and tidal turbines.

Knowledge and use of the deep sea

Dr Vaughan Stagpoole
Head of the Marine Geoscience Department,
GNS Science

The islands of New Zealand are not merely ramparts on the sea; they are the summits of a sunken continent of submarine plateaus, ridges and valleys. In 2008, with the endorsement of New Zealand's extended continental shelf submission under the United Nations Law of the Sea, our rights over more than 5.8 million square kilometres of marine estate were confirmed. This vast marine area potentially makes New Zealand one of the most resource-rich countries on Earth.

Over the last 50 years the marine economy has been boosted by significant offshore petroleum discoveries; however, 90 percent of New Zealand's deep-sea territory remains essentially unexplored. We still lack knowledge to address basic questions. For example:

- What is the distribution and quantity of offshore hydrocarbons and minerals and how are they formed?
- How do ecosystems respond to rapid environmental change?
- How do geological processes affect Earth's surface environment?
- What are the underlying mechanisms of marine geologic hazards?
- How can we improve risk assessment and prediction of catastrophic events?

Under the Law of the Sea, all sovereign rights to exploit natural resources are contingent on a duty to protect and preserve the marine environment. Balancing economic development and preservation of the environment requires a management regime that is underpinned by scientific observations and analysis. Research to address knowledge gaps will enable careful planning and coordination and ensure that wealth from our oceans can be sustainably grown to benefit all New Zealanders. There is still much to learn about the deep sea, and the task is both exciting and challenging.

The Navy and the ocean

Rear Admiral Jack Steer
Chief of Navy,
Royal New Zealand Navy

The role of your navy is to contribute to the security of our nation and the people of New Zealand. Our area of expertise is the maritime environment – ocean.

New Zealand is surrounded by the sea, and we depend on it for our livelihood. Trade keeps our country functioning, and the harvesting of the abundant resources in the ocean provides a livelihood for many New Zealanders. Your navy operates in this environment to do its part in keeping the oceans that form the bridges between nations safe.

Your navy is also a protector of the ocean and the sea life in it. We work especially hard to reduce the impact your navy has on the ocean itself. Garbage is compacted on-board before being landed ashore, non-toxic hull coatings are used, spills of fuel and other contaminants have been reduced significantly and there are set plans to deal with them if they do occur. Non-toxic cleaners are used wherever possible and wastewater is treated on-board before being discharged. We are conscious of the impact ships can have on marine life and are especially careful when operating in the vicinity of sea creatures to avoid harm where possible.

A large part of our work is working with those who obtain their livelihood from the sea to assist in monitoring catch sizes and helping where we can to sustain the life in our oceans. We also provide platforms for numerous organisations to better enable them to conduct research and studies.

Your navy is a guardian of New Zealand; we also work hard to be a guardian of the oceans. They are so very important to us all.

Ecosystem-based management

Cath Wallace
Vice-Chairperson, Environment and Conservation Organisations of Aotearoa New Zealand (ECO)

Oceans are vitally and dynamically connected to each other, the earth and the atmosphere, and these are foundations for society, culture and the economy. Attempts to manage impacts, activities, public access and private benefits regarding oceans are difficult. Some private uses of oceans are incompatible with other uses, and these can be damaging to the dynamics, health and functions of oceanic systems and ecosystems and to the broader public good.

Internationally, ecosystem-based management began in 1981. New Zealand needs to catch up – we are well behind international best practice. Climate change, damaging fishing, spreading alien species, pollution and marine mining all make ecosystem-based management essential.

Ecosystem-based management recognises that natural systems are closely connected but easily damaged and destabilised. It helps control our uses and impacts to keep the systems healthy, functioning and productive. Key principles for ecosystem-based management include information sufficiency requirements to understand impacts and ecosystem functions and relationships before decisions are made. There are many other essential facets of ecosystem-based management: considering cumulative impacts, regulating incompatible and damaging uses and using precautionary approaches, spatial management, science independent of industrial interests, responsive management and public participation.

The EEZ and Continental Shelf Act doesn't achieve integrated ecosystem-based management. It preserves existing, largely extractive interests and fragmented management. It has not generated integrated precautionary and spatial management. Our challenge is to adopt proposals, such as Mike McGinnis's, for an ocean health index, a public trust approach, independent public trust science and spatial-based, well-informed, integrated ecosystem management. To fail to do so is to fail the future.

Marine management in the Southern Ocean

Barry Weeber
Co-Chair, Environment and Conservation Organisations of Aotearoa New Zealand (ECO)
Advisor, Antarctic and Southern Ocean Coalition

The Southern Ocean around Antarctica is principally managed by a unique series of agreements called the Antarctic Treaty System (ATS). The Antarctic Treaty put on hold sovereignty claims, made the area nuclear free and demilitarised and enabled country cooperation. In 1998 the Antarctic Environmental Protocol designated the area 'a nature reserve for peace and science' and included a 50-plus-year moratorium on mineral activity.

The Commission on the Conservation of Antarctic Marine Living Resources (CCAMLR) introduced ecosystem-based management in 1981. The Protocol and CCAMLR both enable the establishment of marine protected areas (MPA). In 2009 CCAMLR designated the first MPA near the South Orkney Islands. Subsequent major proposals to protect part of the Ross Sea (promoted by New Zealand and the US) and East Antarctica (by Australia, France and the EU) have stalled for lack of consensus.

The International Maritime Organisation (IMO) governs complementary measures including marine pollution control. It has banned the use of heavy fuel oil and designated the Southern Ocean a special area, and it is developing a 'polar code' for vessels. Fishing vessels are yet to be fully covered, but negotiations for this are hoped to occur. The Torreliminos Agreement and the more recent Durban measures apply, but New Zealand has yet to ratify these.

New Zealand's failure to ratify several IMO agreements cost taxpayers many millions when the MV *Rena* ran aground near Tauranga. The International Whaling Convention's (IWC) Southern Ocean Whale Sanctuary attempts to protect whales, but Japan has largely ignored such protective zoning, despite an International Court of Justice decision upholding protection.

How we see the sea: Diverging world views

Dr Morgan Williams
Chair of the Board of Trustees, World Wide Fund for Nature New Zealand

Fifteen years ago, when Parliamentary Commissioner for the Environment, I published a report: *Setting Course for a Sustainable Future: The management of NZ's marine environment*. It delved into many aspects: our values (Māori and Pākehā), state of our knowledge, research investment, economic importance, Treaty implications, legislation and more.

We identified knowledge gaps, legislative complexities and opportunities for improvement and recommended that a task force facilitate crafting a new course for sustainable marine stewardship. Why such a recommendation? It was my belief that changes would only be possible though building consensus and promoting widespread understanding of many values, interests and rights at risk. A collective understanding of how we see the sea – how we value all its attributes and not simply its extractive ones – was needed.

Despite some progress towards better marine stewardship, such as more small marine reserves and Aotearoa Fisheries Ltd developing a sustainability strategy, a collective understanding is still lacking.

Ecological systems management is increasingly becoming an arena where values clash. In New Zealand's case that has been well illustrated by the foreshore and seabed saga, a difference held so deeply it contributed to the birth of a new political party! In contrast, recent protests against offshore oil drilling were an expression of wider citizen concerns (not just Te Whānau-ā-Apanui) while the Act to limit protests highlighted the growing citizen/government gap. It was one more example of people deeply concerned about how our endless pursuit of resource fuelled economic growth would affect future generations. Can our marine ecologies really cope? Probably not, but 15 years on we urgently need a process that crafts a more sustainable relationship with our seas.

4. Into the future

4.1 Ocean stewardship: A collective commitment

The history of human interactions with the natural environments of Aotearoa – terrestrial and marine – can be read in many ways. What is common to these narratives, however, are themes of disruption and upheaval. The rapid transformation of both natural environments and human cultures has created a disjunction in our societal priorities for the oceans and for the socio-cultural and economic activities which depend on marine ecosystems. In light of this disruption there is a need for a collective commitment to the stewardship of our oceanic environment: this could take the form of an aspiration for the marine world that is held in common by users, regulators and communities.

To articulate this vision is challenging. As the peoples of Aotearoa New Zealand move towards new modes of interaction with our marine environment, we should not pretend that it is an easy task to consolidate and unite the various ways of relating to the oceans. Some may contend that the notion of collective stewardship is overly idealistic, to which Douglas Johnston responds: 'Even the concept of ocean governance is an expression of idealism, if it conveys the hope that all ocean uses and users can be made subject to reasonable considerations of equity and rational considerations of efficiency or effectiveness' (1993: 471).

A far-sighted and holistic relationship with the marine world is not new to New Zealand and has long been articulated in Māori understandings of the ways in which societies are embedded in their environments. Moana Jackson expands on this in his discussion of indigenous legal systems relating to the oceans:

> For the Māori people, te tikanga o te moana, or the law of the sea, is predicated on four basic precepts deeply rooted in Māori cultural values. First, the sea is part of a global environment in which all parts are interlinked. Second, the sea, as one of the taonga, or treasures of Mother Earth, must be nurtured and protected. Third, the protected sea is a koha, or gift, which humans may use. Fourth, that use is to be controlled in a way that will sustain its bounty. (1993: 46)

Such an understanding must form the basis for any enduring system of ocean governance in New Zealand. The notion of collective stewardship likewise draws on the concept of kaitiakitanga, a framework of environmental guardianship founded in the recognition of kinship between human and non-human elements of the natural world (Kawharu, 2000).

Drawing on these various understandings, this report proposes the following as a 'guiding vision' for New Zealand's governance of its marine estate:

A collective commitment to the stewardship of a healthy and productive ocean.

4.2 Principles for governance

As a reflection of the vision articulated above there is a need for a framework of ocean governance that is acceptable across the wide community of ocean stakeholders. Too often environmental protection and resource exploitation are presented or perceived as polar opposites which are mutually exclusive. The key recommendations of this report centre on the need to reconcile these two forms of use into a governance framework that provides a sense of certainty around all actual or potential activities in our marine estate. Such a system of governance must not only be inclusive for marine professionals, but must also engage and resonate with the general public.

This report presents three key principles to shape and guide the governance of New Zealand's marine estate, based on the vision of 'A collective commitment to the stewardship of a healthy and productive ocean'. It proposes that any future system of governance must, as preconditions to its effectiveness, be *informed and collaborative*, *integrated* and *durable*. These principles draw largely on the findings discussed in Section 3, research undertaken on existing information gaps by Statistics New Zealand et al. (2013)[4] and research by the McGuinness Institute into existing government strategies relating to the oceans.[5]

Principle 1: Informed and collaborative community

Effective governance of the oceans must be based on the best available information. This requires ocean users to have a robust understanding of environmental, social, cultural and economic dynamics in regard to the marine estate. To facilitate such understanding, scientific and policy information should be accessible to all regulators, businesses, NGOs and other stakeholders (the entire oceans community) in a comprehensive and meaningful manner. Likewise, all users should know how to access, assess and request additional research in order to support the quality of their own decisions relating to their activities in the oceans. Information on any potential risks in or to the marine environment should be assessed and evaluated using a precautionary approach, with these risk analyses also being made publicly available.

Principle 2: Integrated governance

Decision-making should occur in a coordinated and collaborative way across sectors, interests and government departments. Trade-offs and conflicts between the different interests and values associated with the oceans should be recognised and dealt with in a transparent and informed manner. As a result of shifting environmental and social contexts, our marine governance framework must have the capacity to become more dynamic and responsive to new information (Principle 1).

Principle 3: Durable policies and processes

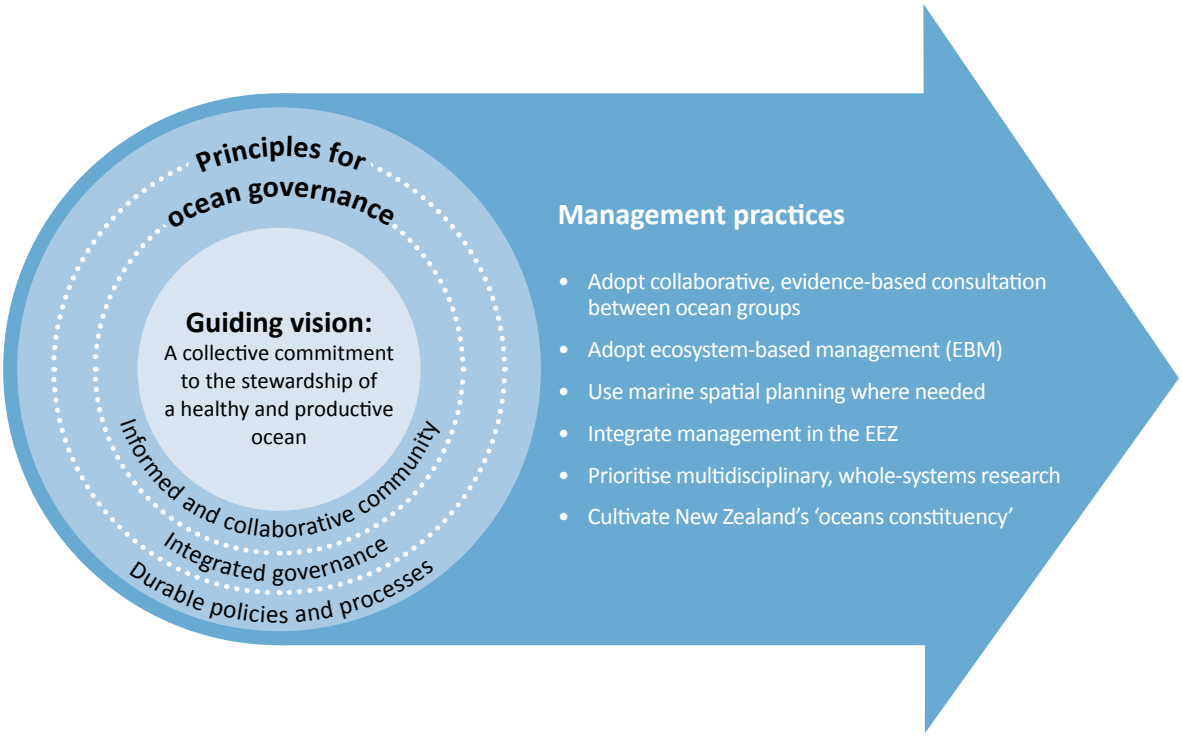
This refers to a system of governance that can withstand environmental, political and social perturbations. To achieve this ocean users and the wider public must have reason for confidence in the instruments, institutions and information systems that constitute the ocean governance regime. Secondly, the durability of a system of governance is also a function of its political viability; it must be palatable to users and the wider public, as well as the government by which the system will be implemented and regulated. At the same time, it must be able to be realised without undue compromise of its underlying principles (Sivas & Caldwell, 2008). Processes must be based on quality information (Principle 1) and well-integrated institutions and instruments (Principle 2), so that they deliver consistent decisions in a well-explained and independently verifiable manner.

These principles are not specific recommendations but are envisaged to shape and inform management practices in New Zealand's oceans. Figure 9 below illustrates the relationship between the guiding vision, governance principles and management practices.

4 See table on page 7 of the results of the *Coastal and marine environment information gap analysis*. This study analysed existing knowledge of 10 'environmental domains' and identified knowledge gaps within each domain. Two of the domains with the widest knowledge gaps are the coastal and marine environment and mineral resources. Both these domains relate directly to urgent governance challenges in the marine estate and such lack of knowledge is concerning. The other eight environmental domains are: atmosphere; climate change; ecosystems and biodiversity; energy; freshwater; land; Māori environmental statistics; and materials and waste (Statistics New Zealand et al., 2013).

5 See Appendix 3.

Figure 9: Framework for One Ocean: Collaborative governance within the community of ocean users, government, conservationists and the public



4.3 Management practices

This section makes specific recommendations regarding management practices for the marine estate. These reflect the guiding vision for ocean governance in New Zealand and the three principles for governance as expressed in the preceding sections.

4.3.1 Adopt collaborative, evidence-based consultation between ocean groups

Perhaps the primary outcome of the series of public events discussed in Section 3 was the observation of the value of collaborative interaction between different members of the oceans community. This community comprises government, scientists, industry and NGOs, as well as the broader public. Many of the participants in these discussion events observed that a very pragmatic approach to management is needed in the oceans: one that makes allowance for different forms of use and protection. Reflecting on these conversations, it may be that one of the most practical and easily-achieved ways of bettering New Zealand's ocean governance is in encouraging greater interaction and cooperation between different groups with interests or values associated with the same marine space.

In his preface to this report Lionel Carter emhasises the importance of managing the oceans in ways that emphasise this collaboration, such as the approach taken by the Sargasso Sea Commission. The proposal for a guiding vision as expressed in this report is an effort to build on the idea of collaboration through identifying a collective goal that the entirety of the oceans community can share, despite any differences in their immediate values or priorities. Collaboration reflects the principle of durability, as long-term systems of ocean governance cannot be established without the cooperation of the many groups with interests

in the oceans. This collaborative approach is reflected thoroughout the remaining management practices discussed in the rest of this section; it is expected that all the following practices would be carried out in a collaborative manner.

4.3.2 Adopt ecosystem-based management (EBM)

In the years preceding the United Nations Conference on the Human Environment and Development (UNCED) in 1992, international scientific attention began to focus on 'ecosystem-based' approaches to environmental management. The intent of EBM is that human activities should be managed in the context of all the ways they interact with ecosystems rather than only the interactions relevant to a particular sector or mode of use. Given the highly sectoral approach that has historically characterised marine governance both in New Zealand and internationally, these approaches are especially applicable to the management of the oceans (Agardy et al., 2011; Ehler & Douvere, 2009).

The United Nations Environment Programme (UNEP) defines EBM as management where:

> The associated human population and economic/social systems are seen as integral parts of the ecosystem … [It is] concerned with the processes of change within living systems and sustaining the services that healthy ecosystems produce. Ecosystem-based management is therefore designed and executed as an adaptive, learning-based process that applies the principles of the scientific method to the processes of management. (2006: 5)

One result of such an approach is that multiple activities and interests must be managed for a common outcome (Agardy et al., 2011). This movement towards a common goal is consistent with the priorities identified for New Zealand's ocean governance in Section 3.1.

What is an ecosystem?

Ecosystem-based management recognizes that plant animal and human communities are interdependent and interact with their physical [and chemical] environment to form distinct ecological units called ecosystems. Ecosystems are transboundary in character, typically cutting across existing political and jurisdictional boundaries and are subject to multiple management systems. Likewise, many human actions and their consequences extend across jurisdictional boundaries and impact the functioning of important ecosystems shared by multiple jurisdictions.

Source: UNEP, 2006: 4

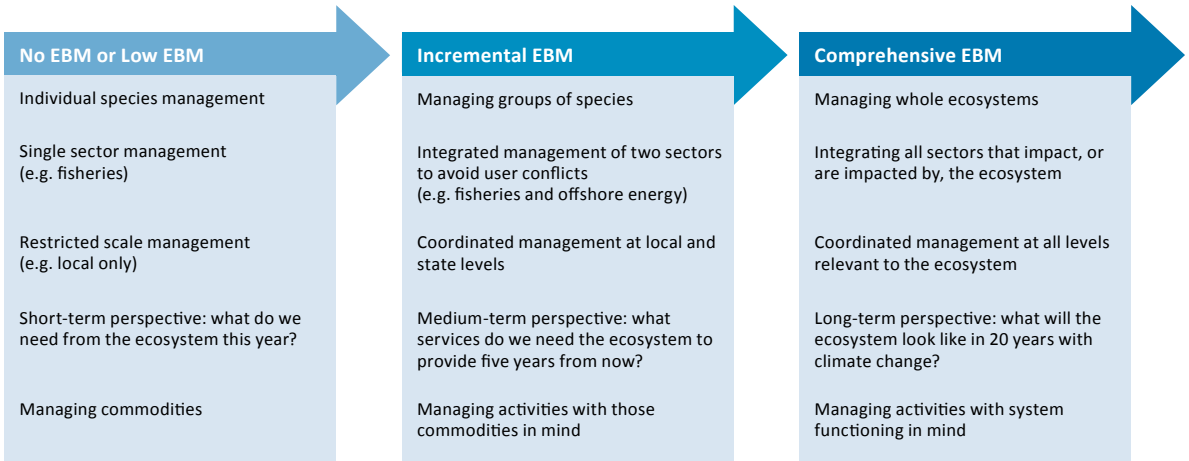
It is important to note the distinction between fully cross-sectoral EBM and the application of 'ecosystem-based' initiatives within individual sectors and industries. Progressive fisheries management tools, for instance, may incorporate consideration of the biological and physical components of ecosystems that interact with a particular fish stock; an example is the management regime operated by CCAMLR in the Southern Ocean since 1982 (Agardy et al., 2011; Ruckelshaus et al., 2008). Ruckelshaus et al. describe six key steps which help to ensure that an EBM framework is *integrated* within multiple components of an ecosystem:

1. Define the spatial boundaries of the marine ecosystem to be managed.
2. Develop a clear statement of the objectives of ecosystem-based management (EBM).
3. Include humans in characterizations of marine ecosystem attributes and indicators of their response to change.

4. Use a variety of strategies to hedge against uncertainty in the ecosystem response to EBM approaches.
5. Use spatial organizing frameworks such as zoning for coordinating multiple management sectors and approaches in EBM.
6. Link the governance structure with the scale of the ecosystem elements to be managed under an EBM approach. (2008: 55)

For pragmatic reasons, it is likely that the movement towards EBM will have to be one that evolves from existing sectoral management. It has been suggested that existing single-sector or single-species models can be *integrated* into a wider ecosystem-based approach that is *informed* by available data generated across multiple sectors and disciplines, including the social sciences (Kittinger et al., 2014; Ruckelshaus et al., 2008). In New Zealand the recently launched Sustainable Seas National Science Challenge references EBM as a guiding principle, but at the time of writing very little information has been released about how this may be implemented (MBIE, n.d.-a). Figure 10 depicts a generalised process by which EBM can be adopted in an incremental fashion, which may be appropriate to the New Zealand context.

Figure 10: A spectrum of ecosystem-based approaches to management
Adapted from Agardy et al., 2011



Ecosystem-based management is sometimes critiqued as being an all-encompassing but vague conceptual model with little practical applicability to the management of human activities in the oceans. A major theme of this critique is that often there is simply not time to investigate all possible ecosystem dynamics prior to making management decisions. This is indeed often the case, as there are urgent problems in the marine environment that need addressing immediately. However, no pragmatic approach to EBM would suggest that perfect ecological knowledge is necessary for decision-making nor that the adoption of EBM requires managing all aspects of a social-ecological system immediately (Agardy et al., 2011). Rather, an ecosystem-based approach would argue that we need ways of integrating all available environmental information when making these decisions but that the policy and management mechanisms to do so are currently lacking in New Zealand.

Attempting to govern the oceans on whole-ecosystem principles is an enormous challenge. Nonetheless, it does provide a long-term end to work towards, and in this sense EBM functions as an aspirational goal to guide progress in towards the *durable* long-term governance of our oceans, as well as a practical mode of management. In the New Zealand context, EBM may be most useful in the short term as a way of catalysing a shift in perspective towards consideration of the wider oceanic context in which uses of the marine environment take place (Lotze, 2004). It is this shift in perspective that will allow *durable* ocean governance to emerge.

4.3.3 Use marine spatial planning (MSP) where needed

Marine spatial planning is one means of progressing towards EBM that is gaining significant traction internationally. It is best characterised as a process for deciding 'what goes where' in the oceans, whereby particular activities and uses are assigned to specific areas. This is done through a participatory public analysis of the distribution of these activities in time and space, followed by the collaborative allocation of activities to areas in a way that best fulfils cultural, environmental, social and economic objectives for a particular marine space (Ehler & Douvere, 2014). It has been called an 'integral, participatory and political process to plan and manage the uses of the sea, balancing ecological objectives with economic and social ones' (Jiménez, 2013: 17). The collaborative and *integrated* nature of MSP allows it to be *informed* by the knowledge and priorities of different users, sectors and interest groups.

Marine spatial planning arose from the recognition that actual and perceived conflicts of interest in the marine environment often have spatial components that are difficult to deal with through traditional sector-based management. Writing about the experience of many countries, Ehler and Douvere (2014) articulate this problem below, describing a situation very familiar in New Zealand.

> Most countries already designate or zone marine space for a number of human activities such as maritime transportation, oil and gas development, offshore renewable energy, offshore aquaculture and waste disposal. However, the problem is that usually this is done on a sector-by-sector, case-by-case basis without much consideration of effects either on other human activities or the marine environment. Consequently, this situation has led to two major types of conflict:
>
> - Conflicts among human uses (user-user conflicts); and
> - Conflicts between human uses and the marine environment (user-environment conflicts).
>
> These conflicts weaken the ability of the ocean to provide the necessary ecosystem services upon which humans and all other life on Earth depend.
>
> Furthermore, decision-makers in this situation usually end up only being able to react to events, often when it is already too late, rather than having the choice to plan and shape actions that could lead to a more desirable future of the marine environment. (2014: 19)

New Zealand is currently undertaking its first real experiment with MSP in the territorial sea. In the waters of the Hauraki Gulf, a group of local and central government agencies are currently working with a diverse group of stakeholders including mana whenua in a process known as 'Sea Change – Tai Timu Tai Pari'. This aims to produce a Hauraki Gulf marine spatial plan that will manage spatial conflicts between users of the Gulf as well as conflicts between users and environmental functioning. The efficacy of the Hauraki plan will shape the future utilisation of MSP in other regions of New Zealand.

The application of MSP to marine management in the EEZ deserves support, although doing so raises a number of questions that are not faced when using it in the coastal zone. There are difficulties in deciding who constitutes a 'stakeholder' in remote marine environments and which communities it is appropriate to engage with in the planning of activities that take place so far from human habitation. In the context of the New Zealand territorial sea, MSP will always require strong indigenous involvement; likewise, there also needs to be clarification regarding Māori rights to resources in the EEZ.[6] Although the EEZ Act provides

6 Although historically it has generally been assumed that little pre-European resource use took place outside the territorial sea, the Waitangi Tribunal has reported detailed customary knowledge of fishing grounds up to 25 nautical miles from shore (see Waitangi Tribunal, 1988). Such evidence of historical use of the EEZ has implications for the developing governance framework of New Zealand's oceans.

for the establishment of Māori advisory groups and for feedback to iwi on regulations, it does not contain a Treaty of Waitangi provision comparable to that in the Resource Management Act 1991.

Finally, although MSP is an effective tool for mapping and prioritising conflicting uses, it does not replace or preclude the need for regulation of activities within the management area (Andrews, 2008). To achieve holistic, effective ocean management on a large scale, individual marine spatial plans must be integrated into a comprehensive national system of governance.

4.3.4 Integrate management in the EEZ

The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) is aimed at governing the environmental effects of non-fishing activities in the EEZ. The cabinet paper introducing this legislation acknowledged that it contained a number of critical gaps, including the failure to consider the cumulative effects of fishing alongside other activities (Cabinet of New Zealand, 2008: 51–56, 153, 167).[7] Such single-sector 'gap-filling' may provide temporary solutions for specific activities in the marine environment, but ultimately it intensifies and prolongs the long-term unviability of existing governance arrangements.

At the time of writing, controversy exists surrounding the Environmental Protection Authority's rejection of marine consent applications submitted by Trans-Tasman Resources and Chatham Rock Phosphate. These cases demonstrate that more certainty is needed around the kind of consideration that such cumulative effects will be granted within the marine consent process. Such clarification would benefit all parties: extractive users, conservation advocates and regulators. The assessment of cumulative impacts is certainly difficult in marine systems, especially given the scale of the EEZ and the lack of data regarding certain remote marine environments. It requires analysis of ecological interactions at a variety of scales and assessment of the carrying capacity of the resource or ecosystem in question (Andrews, 2008). However, the development of these forms of analysis constitutes another crucial step towards *informed* and *integrated* EBM.

Dialogues around ocean management have a tendency to be reduced to arguments about the percentage of the marine environment designated to marine protected areas (MPAs) and about what kind of activities should be permitted or restricted within an area for it to be considered 'protected'. In the context of the vision for our oceans articulated in this report, however, it is more important that MPAs are appropriately nestled within a comprehensive oceans policy that takes an integrated view of ocean use and conservation. Well-planned MPA networks can be effective in meeting the ecological requirements for the conservation of some marine and may increase the overall resilience of the oceans to large-scale threats. It should be remembered that MPAs cannot address all pressures on the marine environment, such as land-based pollution, invasive species or social phenomena (Allison et al., 1998; Ruckelshaus et al., 2008).

Nonetheless, there is clear scientific indication of the value of MPAs as part of a broader network of managed areas subject to different kinds of use (IUCN-WCPA, 2008; Lester et al., 2009). Within New Zealand there is currently no capacity for the comprehensive designation of MPAs outside the 12-mile limit of the territorial sea (see Appendix 2). Existing fisheries closures such as the prohibitions on bottom trawling within the Benthic Protected Areas (BPAs) do not have the capacity to regulate other aspects of resource use that may impact on these same environments. As shown in Figure 11, the majority of BPAs have been designated in areas where little trawling has ever taken place. For this reason, they are also suboptimal in terms of their effectiveness in protecting the most vulnerable marine ecosystems (McGinnis, 2012; Penney & Guinotte, 2013).

7 Other gaps acknowledged in this same Cabinet paper include failing to provide a mechanism for establishing MPAs in the EEZ, and the Act's incapacity to resolve conflicts relating to the spatial allocation of activities (Cabinet of New Zealand, 2008: 51–56, 153, 167).

Commentaries on New Zealand's ocean governance have consistently repeated calls for the extension of MPA legislation to the EEZ (McGinnis, 2012; PCE, 1999).[8] Given the partition of legislation, policy and management responsibilities identified by the oceans policy community in Section 3.1, this report makes the same recommendation. The existing silo-based approach is reflected in the segregation of designation, management and monitoring of marine protection amongst government agencies. Such lack of coherence is confusing for all users and stakeholders. For this reason, it is necessary to integrate existing mechanisms for spatial protection into more comprehensive MPA legislation that extends to the borders of the EEZ. Doing so would aid marine spatial planning in the EEZ by providing those involved in the planning process with a suitable instrument for excluding certain forms of use in areas where this is appropriate.

4.3.5 Prioritise multidisciplinary, whole-systems research

Reflecting one of the central principles for governance of the oceans, this report stresses that ocean management cannot be made effective unless it is properly informed. Scientific research must be the primary source of information for this challenge. Likewise, marine science should be integrated across disciplines in order to provide adequate information for managing the diversity of environmental, social, cultural and economic dynamics that operate within the marine estate. There are many existing sources of marine information in New Zealand: universities, crown research institutes, industry groups, private institutions and the Navy, among others. Although some sharing of information occurs between these groups, there is potential for much greater research collaboration.

At an international level, there is an increasing recognition of the need for multidisciplinary research. This focus is evident in the reports of the IPCC, which draws on evidence from across the spectrum of physical and social sciences in its assessments of climate change. There remains much greater scope for such an approach within the marine sciences in New Zealand. It should also be acknowledged that experts from different disciplines will identify different priorities for marine research (Rudd, 2014). One of the ongoing challenges for multidisciplinary science is to manage this divergence of priorities in such a way that contributes most effectively to our knowledge of marine systems.

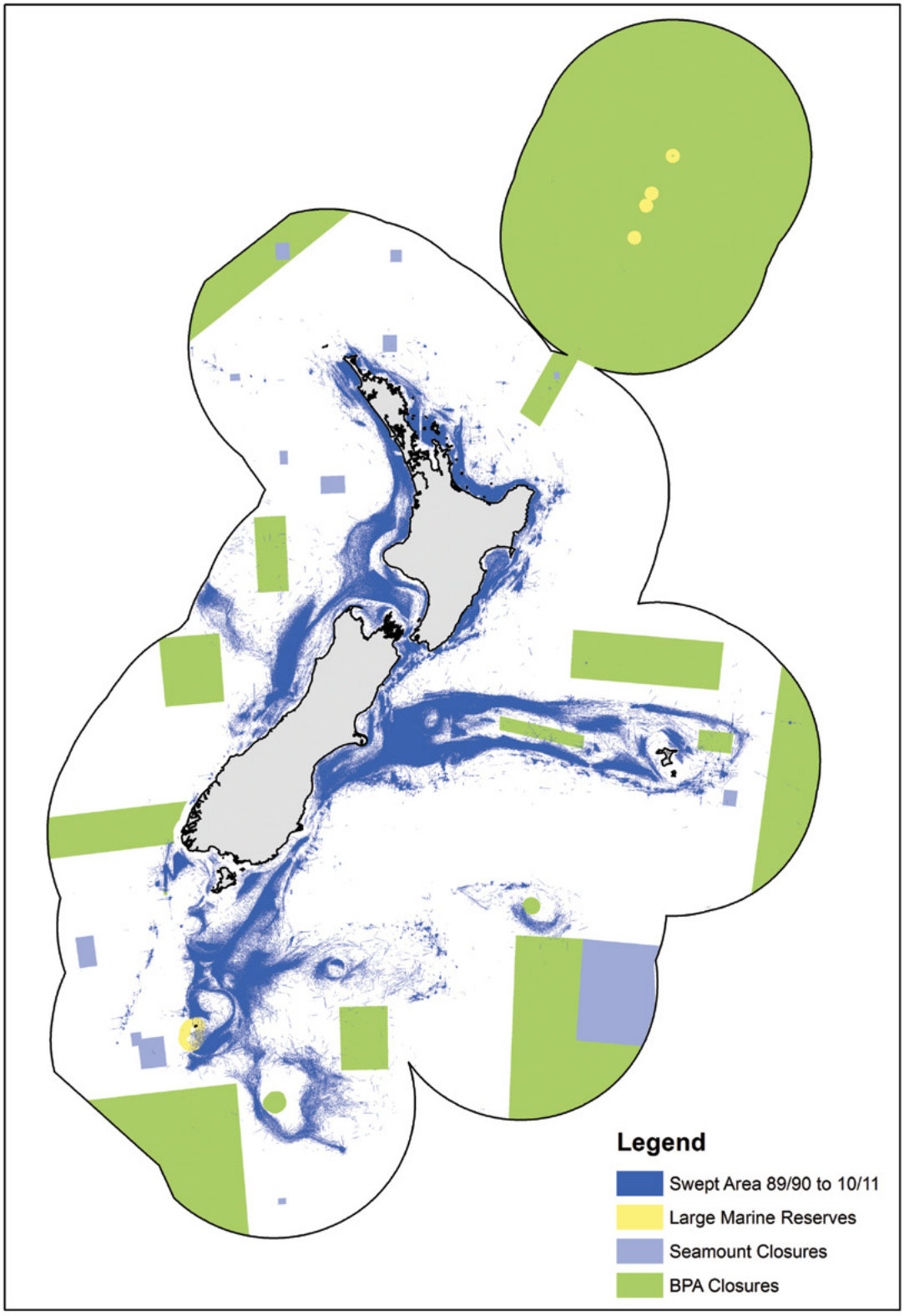
The use of all available scientific information is a key principle of ecosystem-based approaches to management, as discussed in Section 4.3.1 earlier. Doing so will require the development of new models for integrating environmental data; it is likely that undertaking this process will reveal ecological components or interactions about which very little is known, to which research priorities can be directed. At the same time, we should be aware that a lack of information is rarely an excuse for not taking management measures. In most cases, we know enough about marine environments to at least identify an initial direction for management or an immediate response to environmental crises (Agardy et al., 2011: 14).

It should be stressed that interdisciplinary science means more than simple collaboration between physics, geology, chemistry, biology and other traditional divisions of the 'hard' sciences. Biophysical marine science suffers from ongoing weak engagement with the substantial work done by social scientists on the resilience and viability of differing modes of management. This estrangement remains endemic in the New Zealand science community despite considerable interdisciplinary progress in Australia and elsewhere. Understanding the dynamic relationship between people and the ocean requires broader consideration of the socio-cultural and economic factors that shape (and are shaped by) these interactions (Ban et al., 2013).

8 Proposed legislation to this effect exists in the form of the Marine Reserves Bill 2002. This Bill has still not been voted upon, 13 years after it was presented to parliament by the then minister of conservation (McGinnis, 2012).

Figure 11: Total area of seafloor trawled for the period 1989/90 to 2010/11 in comparison with spatially managed areas in the EEZ and territorial sea

Source: Black & Tilney, 2015: 12



Note: Figure does not represent the Bounty Islands, Campbell Island or Antipodes Island Marine Reserves, as these were not designated until 2014, after the period of the trawl data represented.

A comprehensive understanding of the nature of marine ecological change, both on an institutional level and by individual scientists, requires consideration of the 'changing perceptions, governance and management of marine systems' in the context of the 'demographic, technological, economic and cultural drivers of marine resource use' (Schwerdtner Máñez et al., 2014: 2). Longitudinal studies of public knowledge of the marine environment, and of attitudes towards its conservation and use, would be of immense use in tracking the successes and challenges of management.

Likewise, there needs to be a serious reconsideration of both the place of mātauranga Māori within the multidisciplinary marine sciences in New Zealand and its role in informing ocean management alongside data from the Western scientific tradition. Much has been written about the difficulties and sensitivities of attempting to engage with both indigenous (Māori) and Western (Pākehā) modes of understanding, both in New Zealand and internationally. Although on a local level there are laudable ongoing instances of such engagement, especially in the management of mātaitai and taiāpure, at a national scale mātauranga remains largely disregarded.[9]

4.3.6 Cultivate New Zealand's 'ocean constituency'

Democratic reform of environmental policy must reflect, as much as possible, the diverse values and aspirations of society. For this reason, there is an ever-increasing need for marine professionals to interact with the public in a deliberate process of mutual learning through environmental education and exploration. Such interaction is particularly important in those communities which have become disengaged from the marine and coastal environments. Stories about our oceans need to be told that encourage the public to recognise marine environments as actual physical spaces in which they have an interest: as distinct places affected by their personal actions and decisions.

One of the participants in our discussion event described this need as 'creating a public vision of a desirable ocean', part of a wider process that Michael McGinnis calls the cultivation of an 'ocean constituency' (2012: 44).

This report supports this vision and emphasises the role of such a constituency in developing a *durable* system of governance. Embarking on a voyage of oceans reform that challenges the public to think deeply about the future of our oceans may in itself be the most effective way of cultivating this constituency.

A vibrant and empowered ocean constituency has deep historical and cultural precedence in New Zealand, as discussed earlier in Section 2.2. At this stage in our history, when many have lost sight of this heritage, there is a need to grow an oceans constituency to 'interact with the sea in ways that care for its mauri ... [the essential quality that is] the life force of the living system' (Te Korowai o Te Tai ō Marokura, 2012: 15). Jackson suggests that revitalisation of this awareness depends on a renewed identification with indigenous ways of relating to the oceans:

> It is impossible to detail here all the various laws of *te tai ao*, the environment. It is submitted, however, that within the values and norms that shaped those laws are the seeds of understanding that could transform current international thinking on protection of the global marine environment. (1993: 46)

9 For useful short commentaries on the dynamics between mātauranga and Western epistemologies, see Chambers (2009), Dickison (2009) and Stephenson & Moller (2009).

Far-sighted and comprehensive oceans reform must ultimately reflect this identity and be based in a shift to a public understanding of the marine environment as the rohe moana of Aotearoa. This is an ocean space of which we are all a part. It is an integral component of our national narrative and cultural identity, which it is our privilege to use and to protect.

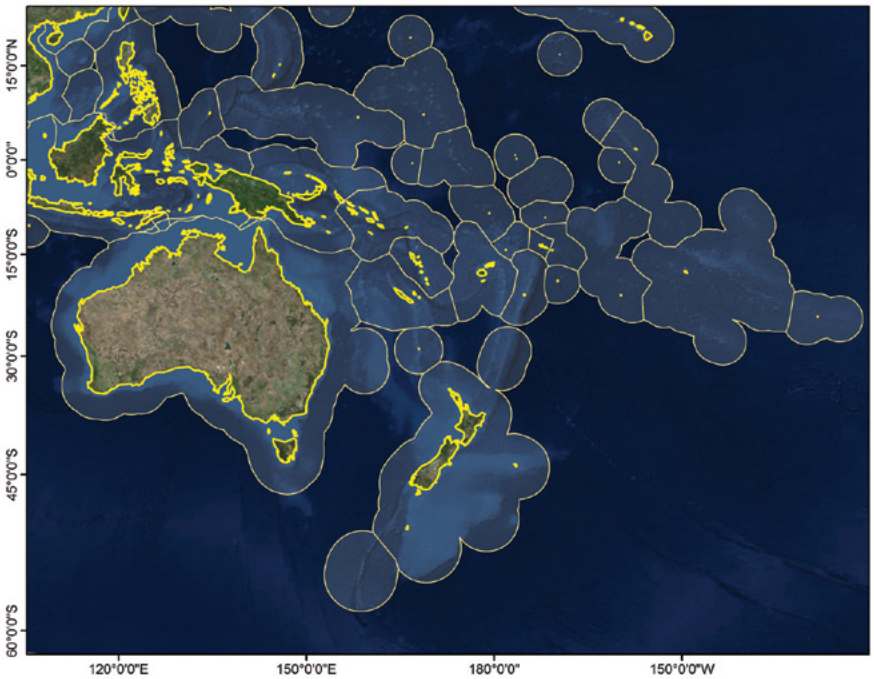
5. Final reflections

This report focuses on the opportunities for effective management of the oceans within the boundaries of New Zealand's marine estate. As such it recommends changes to our national system of ocean governance to better reflect the diversity of cultural, environmental, social and economic values associated with our oceans.

It should also be remembered that although New Zealand has especial privileges and responsibilities in our marine jurisdiction, these islands are also a Pacific archipelago. While it is right and proper that we exercise the most comprehensive management possible over our own marine space, such national property rights ultimately mean little in the context of marine ecosystems undergoing global processes of change. Through the waters of the Pacific we are physically, culturally and ecologically connected to a multitude of other peoples, nation states and marine environments, as well as to the other oceans of the globe. In this sense, there is truly 'One Ocean' for which the world has collective responsibility. Our attitude towards our national ocean governance must reflect this.

Elsewhere in Oceania, the Cook Islands, Kiribati, New Caledonia and Palau have all recently set aside large tracts of ocean for conservation purposes (South Pacific Regional Environment Programme [SPREP], 2012; 2014). In recognition of their physical and cultural reliance on marine ecosystems, these 'small island states' have begun to redefine themselves as 'large ocean states'. As seen in Figure 12, New Zealand sits at the southern edge of a vast web of Pacific marine jurisdictions and must likewise undergo a similar reorientation of our national priorities towards the ocean that surrounds us.

Figure 12: Territorial contiguity of exclusive economic zones (EEZs) in the South Pacific
Source: K. Sammler, personal communication, March 2015



The great Polynesian anthropologist Epeli Hau'ofa wrote evocatively of the islands of the Pacific and the relationship of their inhabitants to the surrounding ocean. In a statement entirely applicable to the archipelago of Aotearoa, he wrote: 'There are no more suitable people on earth to be the custodians of the oceans than those for whom the sea is home. We seem to have forgotten that we are such a people.' (Hau'ofa, 1998: 408)

It is time for us to remember.

Abbreviations

BPA	Benthic protected area
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CO_2	Carbon dioxide
DOC	Department of Conservation
EBM	Ecosystem-based management
EEZ	Exclusive economic zone
FCV	Foreign charter vessel
IGBP	International Geosphere–Biosphere Programme
IUCN-WCPA	International Union for the conservation of Nature World Commission on Protected Areas
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
MBIE	Ministry of Business, Innovation and Employment
MFAT	Ministry of Foreign Affairs and Trade
MfE	Ministry for the Environment
MFish	Ministry of Fisheries
MHWS	Mean high water springs
MLWS	Mean low water springs
MPA	Marine protected area
MPI	Ministry for Primary Industries
MSP	Marine spatial planning
NIWA	National Institute of Water and Atmospheric Research
NZPAM	New Zealand Petroleum and Minerals
NZSAR	New Zealand Search and Rescue
NZSRR	New Zealand Search and Rescue Region
QMS	Quota Management System
PCE	Parliamentary Commissioner for the Environment
SSC	Sargasso Sea Commission
TAC	Total allowable catch
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme

Glossary

Antarctic region
The southernmost region of the globe, including the continent of Antarctica and its associated marine environments. The Antarctic Treaty defines the region as the area south of 60°S latitude (Secretariat of the Antarctic Treaty, 2014).

Argo
A major scientific project to map ocean currents and to monitor temperature and salinity using a worldwide network of battery-powered autonomous floats. The project has been ongoing since 2000, and there are currently approximately 3,200 Argo floats (Feder, 2000: 2).

Benthic protected area (BPA)
A large-scale area of the New Zealand EEZ which is closed to bottom trawling. The BPAs were established in 2007 following a voluntary proposal from the commercial fishing industry (Ministry for Primary Industries [MPI], 2009a).

Biota
All living things present within a defined area.

Climate change
Changes in the dynamics of the planetary climate as a result of both natural and human factors. Natural factors include solar cycles, volcanic gases and changes in the Earth's orbit, whilst the consistent rise in global temperature since the Industrial Revolution is linked to an increase in human emissions of greenhouse gases (Nichols & Williams, 2009: 193).

Continental shelf
The edge of a continent that is covered by the sea, lying between the shoreline and the continental slope (Nichols & Williams, 2009: 109). For the purposes of legal claims under UNCLOS, the continental shelf is defined as extending to the outer edge of the continental margin but no more than 350 nautical miles from shore. This is beyond the limits of the EEZ (UNCLOS, Article 76[1]).

Deep ocean
In this report the deep ocean is defined as the region 2,000 metres or more below the ocean surface.

Ecological baseline
Refers to historical measures of ecosystem dynamics prior to human-induced change. The related social phenomenon of 'shifting baselines' refers to a change over time in scientists' and the general population's ideas of what a healthy ecosystem should look like (Pauly, 1995).

Ecosystem
The living organisms of a particular area together with their physical and chemical environment. Ecosystems encompass the interactions that occur between organisms and their environment and the dynamic change that occurs in both living and non-living components as a result. The boundaries delimiting marine ecosystems can be drawn at a range of scales, from the entire oceanic ecosystem covering 71 percent of the Earth's surface, to the scale of a particular reef or hydrothermal vent (Nichols & Williams, 2009: 150).

Ecosystem-based management (EBM)
Various approaches to environmental management that seek to regulate human activities in a manner which takes into account all of the ways these interact with ecosystems and with the effects of other activities (Agardy et al., 2011; Ehler & Douvere, 2009).

Ecosystem goods and services
The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth (Millennium Ecosystem Assessment, 2003: 49). The term is most often used in approaches that attempt to assign economic weight to these benefits (Zimmerer, 2009: 52).

Endemism
The state of a species being unique to a particular geographical area.

Eutrophication
Describes the effect of an increase in nutrients to a body of water. This is characterised by bacterial or algal blooms and low dissolved oxygen content. Eutrophication is often caused by runoff of agricultural fertilisers and effluent (Chorus & Bartram, 1999: 13).

Exclusive economic zone (EEZ)
A region of ocean adjacent to the territorial sea that extends to a maximum of 200 nautical miles from the coast. Under UNCLOS, states have sovereign rights over the living and non-living resources of their EEZ, both above and below the seabed (Nichols & Williams, 2009: 168).

Fish stock
A management unit in fisheries science, usually referring to a subpopulation of a particular species that will be fished within a defined geographic area (Nichols & Williams, 2009: 172).

High seas
International waters in which no state has jurisdiction, but in which all countries have freedom of navigation and are obliged to comply with international law (Nichols & Williams, 2009: 268).

Institution
Any organisation from the government, business or NGO sectors.

Instrument
In this report an instrument refers to a public policy tool. Instruments vary in their depth, their breadth and the extent to which their content determines the behaviour of institutions. Examples include regulations, guides, annual reports, four-year plans, budget documents, treaties, government priorities, ministerial priorities, environmental national standards, national policy statements, local authority long-term plans, coastal policy statements and government department strategies.

Intrinsic value
The value of an ecosystem or environment, or the components, processes and dynamics associated with these, above and beyond any human use or appreciation of them (Adger & Brown, 2009).

Kai moana
Seafood.

Kaitiakitanga
Often translated as 'guardianship', kaitiakitanga is a philosophical and pragmatic framework for mediating the relationships between humans and the environment. It emphasises the interdependence between the social and natural worlds and draws on principles of reciprocity to stress the responsibility for maintaining these relationships (Kawharu, 2000).

Koha
A gift or contribution. Koha are associated with notions of reciprocity and are important for the maintenance of social relationships both between and within groups in Māori society (Moorfield, 2011).

Mahinga kai
A place where resources, usually food, are traditionally gathered (PCE, 1999: 102).

Mana moana
A modern term used to encapsulate traditional notions of authority over bodies of water, including lakes and parts of the sea. In Māori custom, land rights extended to adjacent seas and lakes, providing fixed boundaries for both inshore and deep sea fishing as well as the gathering of shellfish (Moorfield, 2011).

Marine jurisdiction
In this report the term is used interchangeably with 'marine estate' to refer to the combined area of ocean comprising the territorial sea, EEZ and legal continental shelf.

Marine protected area (MPA)
A spatially defined area where certain human activities are controlled or restricted to a greater degree than in the surrounding ocean. The types of activities necessarily excluded from such an area in order for it to be considered an MPA are subject to debate (Nichols & Williams, 2009: 309). New Zealand's Department of Conservation distinguishes between 'Type 1' MPAs (referring to marine reserves) and 'Type 2' MPAs (which at a minimum prohibit trawling, Danish seining and dredging) (DOC & Ministry of Fisheries [MFish], 2011).

Marine reserve
In the New Zealand context, marine reserves are areas of the territorial sea where all extractive activities are prohibited, for the purpose of maintaining the natural environment for scientific research. Research that disturbs the marine environment requires a permit within marine reserves (Marine Reserves Act 1971).

Marine spatial planning (MSP)
A process comprising a participatory public analysis of the distribution of human activities in a particular area of ocean (usually coastal), followed by the collaborative allocation of activities to areas in a way that best fulfils cultural, environmental, social and economic objectives for the particular marine space (Ehler & Douvere, 2009).

Mātaitai
A marine area on a traditional fishing ground, which is managed by tāngata whenua for the purpose of providing for food gathering and the customary management of marine resources. Tāngata whenua can recommend bylaws to be made regarding the regulation of fishing activity. Generally, commercial fishing is excluded from these areas (MPI, 2014b).

Mātauranga Māori
The body of knowledge concerned with all aspects of Te Ao Māori (the Māori world), including that involving the relationship of living beings with each other and the wider environment. Mātauranga is often used more specifically to refer to indigenous ways of understanding the environment that may differ from those of Western science (Stephenson & Moller, 2009).

Mauri
The essential quality and vitality of a being or entity that enables it to exist as itself. The mauri of an environmental entity such as a body of water can be enhanced or diminished by human actions (Moorfield, 2011; PCE, 1999: 102; Te Korowai o Te Tai ō Marokura, 2012: 15).

Nautical mile
Standard unit of nautical and aviation measurement, equal to one minute of arc measured along any meridian of the Earth. This distance is equivalent to 1,852 metres (Nichol & Williams, 2009: 261).

Non-use values
In utilitarian understandings of preference satisfaction, non-use values are those people associate with ecosystem services which they are not currently using (Millennium Ecosystem Assessment, 2003: 128).

Nutrient pollution
See eutrophication.

Ocean acidification
The observed and measurable trend of the oceans becoming more acidic as the result of increased CO_2 concentrations in the atmosphere, which reacts with seawater to form carbonic acid (Bates et al., 2014; Turley et al., 2010).

Ocean currents
Persistent large-scale horizontal or vertical flows of water driven by gravitational forces, surface winds and temperature and salinity differences (Nichol & Williams, 2009: 122).

Oceanography
The study of the oceans and the atmosphere above the oceans at a systemic level, incorporating elements of the physical, chemical, biological and geological sciences (Nichol & Williams, 2009: 400).

Overfishing
Exploitation of fish stocks at a magnitude or intensity that leads to the depletion of the stock below sustainable limits (Nichol & Williams, 2009: 171).

Plastic pollution
Marine plastic debris is a major environmental problem, with long-term implications for marine ecology and human health. Floating plastic does not biodegrade but breaks into increasingly smaller pieces which accumulate toxic chemicals and are integrated into marine food webs. Floating plastic debris is now found in all the oceans of the world (Cózar et al., 2014).

Phytoplankton
Microscopic organisms in the upper layer of the oceans that use chlorophyll for photosynthesis. Phytoplankton are the primary producers in marine food webs, meaning they supply the bulk of the energy on which all other organisms in the oceans depend (Nichol & Williams, 2009: 430).

Quota Management System (QMS)
A market-based system introduced in 1986 for the management of New Zealand's commercial fisheries. The QMS is based on the allocation of individual transferrable quota, which gives fishers the right to a percentage of the total allowable catch of a particular fish stock in a given year. This quota can be bought and sold (Mace et al., 2014).

Rāhui
Customary closure of an area or resource by forbidding access or harvest. Rāhui may be recognised under the Fisheries Act 1996 or may operate on a moral basis outside formal legal instruments (PCE, 1999: 103; Te Korowai o Te Tai ō Marokura, 2012: 135-6).

Rohe moana
The coastal and marine area customarily occupied and utilised by an iwi or hapū (PCE, 1999: 103).

Sector
In this report the term is used to refer to the different industries or groups with interest in the oceans, rather than referring to a specific sector under the government's Budget appropriations process.

Sedimentation
The build-up of suspended sediment in a body of water. Too much sediment near the coast may prevent sunlight from reaching submerged aquatic vegetation and can smother reefs composed of shellfish or corals. Sedimentation may be intensified by an increase in terrestrial erosion rates due to deforestation, urbanisation or poor agricultural land use practices (Nichol & Williams, 2009: 486).

Subantarctic
The region of the Southern Hemisphere located immediately north of the Antarctic. Usually it is taken to correspond to latitudes of between 46° and 60° south.

Subtropical
The subtropics are the regions of the Earth located directly north or south of the tropics and are generally delimited by the tropic circle of latitude (the Tropic of Cancer and Tropic of Capricorn) and 38° north and south respectively.

Taiāpure
A management tool established over a marine area of traditional significance to tāngata whenua for spiritual or cultural reasons or as a source of food. Taiāpure have a management committee nominated by tāngata whenua; this committee cannot make bylaws itself but provides advice and recommendations to the minister for primary industries regarding fishing regulations. Unlike mātaitai, commercial fishing is not excluded from taiāpure, and management committees often include representatives of commercial and recreational fisheries (MPI, 2014d).

Tapu
In the context used in this report tapu refers to a spiritual restriction or prohibition which may be temporarily applied to a resource (for instance, in the establishment of rāhui). An object or resource designated as tapu is considered to be untouchable and no longer to be put to common use (Moorfield, 2011).

Tectonic plates
Geological sections of the Earth's continental and oceanic crust that correspond to 'plates' on a sphere and which appear to 'float' on the upper mantle. These plates interact where their boundaries meet, resulting in subduction zones, mountain ranges, oceanic ridges and other tectonic activity such as earthquakes and volcanism (Nichol & Williams, 2009: 436).

Te tai ao
The 'environment' or the natural world. Also written as 'te taiao' (Jackson, 1993: 46; Moorfield, 2011).

Te tikanga o te moana
A term that Jackson refers to as 'the law of the sea' in traditional Māori legal systems (1993: 46). More comprehensively, it could mean the entire complex of culturally mediated laws, protocols, customs and relationships that regulate interactions with the marine environment (Moorfield, 2011).

Territorial sea
The coastal waters over which states hold sovereignty and in which all the laws of a state apply as they do on land, with the exception of the right of naval and merchant ships to innocent passage. Under UNCLOS the territorial sea is defined as stretching a maximum of 12 nautical miles from the coast (Nichol & Williams, 2009: 524).

Thermal expansion
The increase in the volume of a given quantity of seawater as its temperature rises. This is one of the key contributors to current sea level rise (Nichol & Williams, 2009: 329).

United Nations Convention on the Law of the Sea (UNCLOS)
An international treaty established by the United Nations in 1982; it came into force in 1994 and was ratified by New Zealand in 1996. The Convention defines various maritime boundaries and sets out the rights and responsibilities of states within these boundaries (Nichol & Williams, 2009: 268; Wood et al., 2003).

Use values
In utilitarian understandings of preference satisfaction, use values are those associated with the actual or potential use, of ecosystems and the provisioning, regulating, cultural, and supporting services they provide (Millennium Ecosystem Assessment, 2003: 128).

Whakapapa
Genealogy and descent that encapsulates relationships to extended kin groups and the natural world. Traditionally whakapapa are central to all Māori institutions in terms of leadership, land and fishing rights, kinship and status (Moorfield, 2011).

Appendix 1 Timeline of key events

Timelines map the history of specific public policy topics over time, illustrating the direction public policy and events have taken to form an understanding of where it may yet lead. This includes entries regarding legislation. A full list of legislations and regulations can be found in *Working Paper 2015/03: Legal Instruments of New Zealand's Oceans Management* (McGuinness Institute, 2015c).

References for each entry in this timeline can be found on the McGuinness Institute website: Home > Timelines > Ocean Management. Please note that the timeline on the Institute's website will continue to be updated.

1971	September 1971: The Marine Reserves Act 1971 is passed, allowing the establishment of marine reserves where all extractive activities (fishing, mining, etc.) are prohibited in areas of scientific and/or conservation value. Public access is retained.
1975	1975: New Zealand's first marine reserve, Cape Rodney-Okakari Point (also known as Goat Island), is established.
1977	September 1977: The Territorial Sea, Contiguous Zone, and Exclusive Economic Zone Act 1977 is passed.
1978	April 1978: New Zealand declares an exclusive economic zone (EEZ) in the waters within a 200-nautical-mile radius of its coastline. Including the Kermadec and Chatham Islands and various subantarctic islands, this constitutes the fourth-largest EEZ in the world.
	October 1978: The Marine Mammals Protection Act 1978 is passed, prohibiting harming or harassment of marine mammals, and allowing the establishment of Marine Mammal Sanctuaries.
1980	May 1980: The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) is signed, establishing a management regime for Antarctic fisheries and other marine living resources.
1981	October 1981: The Antarctic Marine Living Resources Act 1981 is passed, prohibiting the harvest of any living marine resources in the CCAMLR jurisdiction without a permit.
1982	December 1982: The United Nations Convention on the Law of the Sea (UNCLOS) is signed in Jamaica. Among other provisions, this formalises the exclusive rights of states to the exploration and exploitation of marine resources within their EEZ. UNCLOS does not come into force until 1994, and New Zealand does not ratify it until 1996.
1983	September 1983: Fisheries Act 1983 passed. The Act establishes the legislative framework for the foundation of the Quota Management System (QMS) in 1986.
1986	October 1986: New Zealand introduces a QMS for fisheries within its EEZ, following several years of discussion and consultation. Initially the QMS is implemented for 27 major species, with fishers being issued quota as a form of harvesting right for a specific tonnage of fish. The amount of quota allocated to fishers in 1986 was dependent on their recorded catch history, with a number of individual allocations being increased through an appeal process over the following years.
1987	March 1987: The Conservation Act 1987 is passed, establishing the Department of Conservation (DOC).
1989	December 1989: The Māori Fisheries Act 1989 is passed, in recognition of Māori claims to having been left out of commercial quota allocation under the QMS. Government actively trades in the ITQ market in order to transfer 10 percent of the total allowable catch of commercial species to the newly formed Māori Fisheries Commission. As not all this quota is available, the monetary value of the remainder is transferred to the Commission in cash.

1990	April 1990: The Fisheries Amendment Act 1990 is passed. This legislation changes the nature of fishing quota under the QMS from an absolute tonnage to a proportion of the TAC of the stock in question. As individual transferable quota (ITQ), this harvesting right can be traded (bought, sold or leased), and the Crown is liable to pay compensation if the TAC is reduced. The change is made via supplementary order paper and is opposed by a number of smaller commercial operators and some Māori. Non-commercial fishing interests are not accounted for in TAC allocations.
	December 1990: The Parliamentary Commissioner for the Environment (PCE) and the Auditor-General publish a report, *Marine Fisheries Management,* reviewing the sustainable management of marine fisheries as a food source and commercial and recreational asset.
1991	March 1991: The Sugar Loaf Islands are classified as a marine protected area (MPA) through their own act of legislation. This is New Zealand's first MPA to exclude mining and commercial fishing operations whilst retaining recreational fishing rights.
	April 1991: The PCE publishes a report, *The Control of Marine Oil Pollution in New Zealand: A review of the system.* This reviews the existing system established by government to control marine oil pollution in New Zealand, with particular reference to oil spills in New Zealand waters.
	July 1991: The Resource Management Act 1991 (RMA) is passed. The RMA regulates natural resource management activities in the coastal marine area, which is equal to New Zealand's territorial sea (12 nautical miles from the coast). Activities in the coastal marine area are to be controlled by regional councils, overseen by DOC.
	July 1991: The Crown Minerals Act 1991 is passed, under which New Zealand claims access to the entire continental shelf (including those parts extending beyond the EEZ) for the mining of minerals, petroleum and other natural resources. The Act vests the right to explore and exploit these resources in the Crown.
1992	September 1992: A deed of settlement between Māori and the Crown is signed as the full and final settlement of Māori commercial fisheries claims under the Treaty of Waitangi. The Māori Fisheries Commission receives a 50 percent ownership of Sealord Products Ltd and rights to 20 percent of all future species brought into the QMS. This becomes known as the 'Sealord Deal'.
	November 1992: The Marine Mammal Protection Regulations 1992 are passed, prescribing conditions on human interaction with marine mammals.
1993	August 1993: The Biosecurity Act 1993 is passed, including provisions on the management of unwanted organisms within the territorial sea (12 nautical miles from coast).
1994	May 1994: Publication of the first *New Zealand Coastal Policy Statement*
	November 1994: The Marine Transport Act 1994 is passed, giving protocols for preventing and responding to oil spills and pollution from ships as well as the granting of marine dumping permits. Most pollution provisions in the Act apply throughout the EEZ.
	December 1994: The Southern Ocean Whale Sanctuary is established by the International Whaling Commission with support from New Zealand.
	December 1994: The Antarctica (Environmental Protection) Act 1994 is passed, prohibiting activity relating to mineral resources in Antarctica, its islands and its continental shelf.
1996	July 1996: New Zealand ratifies the 1982 United Nations Convention on the Law of the Sea (UNCLOS).
	August 1996: The Fisheries Act 1996 is passed, largely replacing the Fisheries Act 1983. It codifies the allocation of new commercial quota once Māori obligations are met.

1997	December 1997: The Māori Land Court rules that it can consider whether the foreshore and seabed in the Marlborough Sounds should be classified as customary land. However, this decision was later overturned by the High Court in what became known as the Ngāti Apa case. This case was brought by eight iwi in response to concerns over a proliferation of marine farms in the Marlborough Sounds.
1998	February 1998: In response to 1998 being designated the Year of the Oceans by the United Nations, Environment and Conservation Organisations of Aotearoa New Zealand (ECO) holds a conference entitled Seaviews: Marine Ecosystems Management Obligations and Opportunities.
1999	March 1999: The Minister for the Environment and the Ministers of Conservation and Biosecurity direct ministry officials to investigate current arrangements for oceans management. The issues raised in the review suggest a whole-of-government approach is necessary.
	December 1999: The PCE produces a report entitled *Setting Course for a Sustainable Future: The Management of New Zealand's Marine Environment.* The report points out the complexity of the existing management regime, both in terms of the number of regulatory agencies involved and the diversity of legislation involved, and recommends the establishment of a coastal and oceans task force to develop an integrated and holistic strategy for managing the oceans.
2000	February 2000: The Hauraki Gulf is designated New Zealand's first marine park.
	February 2000: *The New Zealand Biodiversity Strategy* is launched in partial fulfilment of commitments made by New Zealand under the Convention for Biological Diversity. The strategy stresses the need for a coordinated governmental approach to ocean management.
	July 2000: In response to the 1999 PCE report, Cabinet delegates six ministers, chaired by Minister of Fisheries Pete Hodgson, to develop a national oceans policy. It was agreed that this would focus on those areas within New Zealand's domestic jurisdiction rather than marine issues associated with regional or international obligations.
2001	March 2001: Following a public nomination process, Cabinet appoints the Ministerial Advisory Committee on Oceans Policy. The members of the Committee are responsible to ministers for completing the following key tasks: a. Developing and recommending advice on a process by which to consult with New Zealanders to identify a shared vision for managing New Zealand's oceans and the goals, principles and objectives to achieve such a vision. This process is to be undertaken in two stages. The first stage will be preliminary consultation with targeted groups to assist in identifying relevant issues and developing consultation material. The second stage is to consult more widely on options for the shared vision, goals, objectives and principles relevant to managing the marine environment. b. Leading and managing the consultation process approved by ministers and ensuring the process is undertaken in a manner that provides independence and integrity to the process and is able to provide credible advice to ministers. c. Reporting to ministers on the range of views, values, principles and any shared vision identified in the course of the consultation process; the issues that need to be addressed; and recommendations on goals, objectives and principles to support enduring long-term solutions for the management of New Zealand's marine environment.
	March–September 2001: The Ministerial Advisory Committee on Oceans Policy undertakes public consultation aimed at discovering what New Zealanders value and prioritise in the marine environment. The Committee's report, *Healthy sea: Healthy society – towards an oceans policy for New Zealand,* is presented to Cabinet in September.

2002	June 2002: The Minister of Conservation introduces the Marine Reserves Bill to Parliament. The Bill was never voted on.
	July 2002: A group of iwi led by Ngāti Apa appeals the decision by the High Court regarding customary tenure of the foreshore and seabed in the Marlborough Sounds. The case is heard by the Court of Appeal.
	October 2002: The Marine Reserves Bill is referred to the Local Government and Environment Committee at Parliament.
	December 2002: A stocktake of ocean legislation in New Zealand is published by the Oceans Policy Secretariat, a newly formed cross-governmental body. It identifies a number of weaknesses in the current legislation: the lack of an overarching goal for ocean management; inconsistent decision-making processes; inconsistent management of similar activities; an uncertain status under the Treaty of Waitangi; the prevalence of ecologically arbitrary management areas; and a general lack of scientific information.
2003	February 2003: The Oceans Policy Secretariat releases a series of working papers discussing issues relevant to the development of a national oceans policy. The Secretariat notes that although tools for the implementation of existing environmental policy are not being fully utilised with respect to ocean management, formal processes to deal with competing or conflicting uses of the marine environment are lacking.
	March 2003: A series of workshops and hui are held with key stakeholders to discuss working papers published in February 2013.
	April 2003: A Māori Working Group is formed to provide advice to the Oceans Policy Secretariat.
	May 2003: The Oceans Policy Secretariat produces a report on the current status of ocean management at a sub-national level by DOC conservancies and regional authorities. It notes a lack of emphasis on ocean management as a whole and a focus on specific issues within the coastal environment.
	June 2003: The Oceans Policy Secretariat releases a report surveying current economic activities in the marine environment and the potential for future oceans-based economic development. Notes that a stated goal of a national oceans policy should be a continued economic return from the oceans.
	June 2003: The Court of Appeal decides on the Ngāti Apa case, finding that Māori can make claims of customary title over the foreshore and seabed. This gives the Māori Land Court jurisdiction to investigate such claims.
	December 2003: Cabinet releases its proposed foreshore and seabed policy, following a process of public submissions and consultations from August to October. The policy proposes vesting the foreshore and seabed in the public domain: this proves controversial and the policy is later altered to vest the area in the Crown.
	Late 2003: As a result of fierce public debate following the Ngāti Apa case, the development of a national oceans policy is put 'on hold' until ownership of the foreshore and seabed can be clarified. The Oceans Policy Secretariat is disbanded and oceans work is taken over by the Ministry for the Environment (MfE).

2004	March 2004: The Waitangi Tribunal publishes a highly critical review of government's approach to the foreshore and seabed controversy.
	April–May 2004: A hikoi in protest against the proposed Foreshore and Seabed legislation leaves Northland on 22 April, with supporters joining as it makes its way south. The hikoi arrives outside Parliament with up to 50,000 people on 5 April, the day before Parliament begins debate on the Bill.
	September 2004: The Māori Fisheries Act 2004 is passed, establishing a process for allocating Māori fishery assets to iwi.
	November 2004: The Foreshore and Seabed Act 2004 is passed, vesting the foreshore and seabed in the Crown from mean high water springs to the limit of the territorial sea (12 nautical miles). The Act was highly controversial and accompanied by public protest, as it effectively prevented Māori customary ownership of the foreshore and seabed being processed in the courts.
2005	March 2005: Ocean Survey 20/20 is launched. This is envisaged as a 15-year project to establish fundamental scientific knowledge and research priorities relating to New Zealand's EEZ, making extensive use of the National Institute of Water and Atmospheric Research's (NIWA) research vessels and other scientific infrastructure. At the launch the Minister for Land Information signals that he is looking at restarting the oceans policy process.
	June 2005: MfE publishes a report on the need for an information-based framework for oceans management and the need for more comprehensive baseline data.
	June 2005: MfE publishes a report on managing environmental effects in the EEZ beyond the territorial sea. It suggests that while voluntary industry agreements are acceptable in the short term, in the medium term legislative change will be necessary.
	November 2005: At the Environmental Defence Society's (EDS) Seachange Conference, the Minister for the Environment announces that the oceans policy process will be recommenced.
	December 2005: DOC publishes the *Marine Protected Areas: Policy and Implementation Plan,* stressing the need for a science-based approach to marine protection. The *Plan* aims to have 10 percent of New Zealand's marine environment under some form of spatial protection by 2010.
2006	March 2006: MfE and Maritime New Zealand produce a set of guidelines for best practice relating to the environmental impacts of petroleum exploration, development and impact in the EEZ and continental shelf. The guidelines are produced in conjunction with the Petroleum Exploration and Production Association of New Zealand (PEPANZ).
	April 2006: A United Nations human rights investigator recommends changes to the Foreshore and Seabed Act 2004 to recognise the inherent rights of Māori.
	May 2006: MfE publishes a report reflecting on possible government interventions to better facilitate commercial development in the EEZ. The report draws on findings from the failed national oceans policy proposal.

2007	April 2007: The Organisation for Economic Cooperation and Development (OECD) environmental performance review of New Zealand refers to the slow development of a national ocean policy in New Zealand and notes that management of some high seas fish stocks remains challenging.
	June 2007: International mining corporation Rio Tinto begins airborne surveys of iron sand along the west coast of the North Island. Protest group Kiwis Against Sand Mining presents a 15,000-signature petition calling for a blanket ban on sand mining of the seabed.
	August 2007: MfE produces a public discussion paper on regulating environmental effects in the EEZ. Public submissions are invited.
	November 2007: Benthic protection areas (BPAs) are established. The regulations close 17 areas to bottom trawling and dredging over an area of seabed habitat equal to 1.2 million square kilometres.
	December 2007: MfE summarises public submissions on environmental regulations in the EEZ.
2009	March 2009: The newly elected Fifth National Government consents to a review of foreshore and seabed legislation as part of its confidence and supply agreement with the Māori Party.
	July 2009: The Ministerial Review Panel on the Foreshore and Seabed Act advises that the 2004 Act be repealed and recommends the establishment of a bicultural body for the management of the whole coastal marine area.
2010	January 2010: New Zealand becomes signatory to the Te Vaka Moana Arrangement, agreeing to develop subregional fisheries strategies with other Polynesian countries that share common EEZ borders.
	March 2010: The Government releases a public consultation document on a possible repeal of the Foreshore and Seabed Act 2004.
	June 2010: The Government announces its intention to repeal the Foreshore and Seabed Act 2004.
	June 2010: Energy and Resources Minister awards the first petroleum exploration permit for the Raukumara Basin off the North Island's East Coast to giant Brazilian firm Petrobras.
	October 2010: The Aichi Biodiversity Targets are agreed on by the Partners to the Convention on Biological Diversity (CBD), including New Zealand. Target 11 states that 'by 2020 at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes'.
	December 2010: The second *New Zealand Coastal Policy Statement* (NZCPS) took effect, following a six year process of review and public consultation. The NZCPS guides local authorities in their day to day management of their coastal environment. The statement covers coastal land, foreshore and seabed, and coastal waters from the high tide mark to the outer limits of the Territorial Sea. The NZCPS is the only mandatory national policy statement under the Resource Management Act, and it must be given effect to by regional councils in their coastal plans and consent decisions.

2011	January 2011: The Regional Coastal Plan: Kermadec and Subantarctic Islands is publicly notified. As at March 2015 the plan is at Environment Court appeal stage.
	February 2011: The PEW Environment Group establishes a programme, The Kermadecs: An Ocean Wilderness, to establish an ocean sanctuary covering the Kermadec region located between the North Island and Tonga. This campaign programme is currently ongoing.
	March 2011: Protests greet the passing of the Marine and Coastal Area Act, especially by Māori concerned that very few iwi or hapu will be able to prove continuous occupation.
	March 2011: The Marine and Coastal Area (Takutai Moana) Act 2011 is passed, repealing and replacing the Foreshore and Seabed Act 2004. The 2011 Act bestows a special status on the foreshore and seabed, stipulating that it is owned neither by the Crown nor by anyone else. It restores the right of Māori to lodge claims through the courts for customary title or non-territorial customary rights, albeit with stringent conditions.
	July 2011: The Waitangi Tribunal report on the WAI 262 (Flora and Fauna Claim) inquiry is released. Titled Ko Aotearoa Tenei it found that the Government had failed to meet its obligations under the Treaty of Waitangi to ensure that the relationship between Māori and their taonga (including flora and fauna as well as traditional knowledge and culture and the use of these) are protected and acknowledged. The claim was lodged in 1991 by six individuals on behalf on themselves and their iwi. Iwi represented were; Ngāti Kurī, Te Rarawa, Ngāti Wai, Ngāti Porou, Ngāti Kahungunu, and Ngāti Koata. It concerned the place of Māori culture, identity and traditional knowledge in New Zealand's laws and policies, including the ownership and use of Māori culture, knowledge and indigenous flora and fauna. This claim was the Waitangi Tribunal's first whole of government inquiry and one of the most significant in the Tribunal's history.
	July 2011: A joint work programme is created between local authorities and the Department of Conservation. This included a National Implementation Plan to ensure district and regional councils are well informed about the NZCPS 2010 and able to implement its policies.
	August 2011: The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill is introduced to Parliament.
	August 2011: DOC undertakes a broad-scale analysis of marine protection within the territorial sea, concluding that there are large gaps in the network of protected areas.
	December 2011: The Parliamentary Commissioner for the Environment submits on the proposed EEZ Bill, pointing out inconsistencies with the Convention on Biological Diversity and the need for a precautionary approach.
2012	February 2012: Public submissions on proposed EEZ Bill are presented in front of a select committee. A variety of environmental groups express their dissatisfaction with the Bill.
	February 2012: The Environment and Conservation Organisations of NZ Inc. (ECO) releases a critique of New Zealand's fisheries QMS, alleging that total allowable catches are routinely set too high.
	May 2012: NIWA presents MfE with an expert environmental risk assessment of activities in the EEZ and continental shelf, largely focused on the risks associated with mining and mineral exploration.
	May 2012: The Minister for the Environment releases a discussion document on proposed regulations under future EEZ legislation and invites public submissions.
	June 2012: The McGuinness Institute submits on the proposed EEZ regulations, observing that the Bill appears to favour economic incentives and arguing that environmental considerations must be given more weighting.

2012 (Cont.)	July 2012: Greenpeace and East Coast iwi Te Whānau-ā-Apanui lodge an appeal against the granting of Petrobras's deep-sea petroleum exploration licence. The High Court had earlier upheld the decision to grant Petrobras a licence.
	September 2012: The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) is passed. The Act applies to activities that cause environmental effects in the EEZ or continental shelf that are not already regulated by other legislation. Such activities may include seabed mining, petroleum exploration and extraction, energy generation, carbon capture and storage and marine farming. The Act also lays out a process for granting marine consents for these activities, with the Environmental Protection Agency (EPA) making decisions on consents.
	December 2012: Petrobras hands back its permits for petroleum exploration in the Raukumara Basin, citing financial difficulties.
	December 2012: The Local Government and Environment Committee examines the Marine Reserves Bill and recommends that it not be passed. The Government announces that it intends to introduce a new Marine Reserves Bill to better align with Government policy and EEZ legislation in the second half of 2013.
	December 2012: First block offer for petroleum exploration. Five-year exploration permits are awarded to the following companies or consortiums: Anadarko; Shell, OMV and Mitsui; Todd Exploration and Cue Taranaki; New Zealand Oil & Gas; Cheal Petroleum and East West Petroleum; TAG Oil; New Zealand Energy Corporation and New Zealand Oil & Gas. This replaces the previous first-in first-served (priority in time) approach.
2013	April 2013: The Minister for the Environment announces the intention to introduce a new classification for 'non-notified discretionary activities' under the EEZ Act. Such activities will include exploration drilling for petroleum and certain forms of discharge and dumping.
	June 2013: The Exclusive Economic Zone and Continental Shelf (Environmental Effects—Permitted Activities) Regulations 2013 come into effect. This initial set of regulations does not include the changes to the non-notified discretionary classification proposed in April 2013.
	September 2013: The 'Sea Change – Tai Timu Tai Pari' process is launched to develop a marine spatial plan to govern activities in the Hauraki Gulf.
	November 2013: Trans-Tasman Resources (TTR), a mining company, is the first applicant for a marine consent under the EEZ Act 2012. TTR proposes to undertake iron sand mining in the South Taranaki Bight. The EPA publicly notifies the application and invites submissions.
	December 2013: Government releases the Draft Exclusive Economic Zone and Continental Shelf (Environmental Effects – Non-Notified Activities) Regulations 2013 in its proposal to reclassify exploratory oil drilling as non-notifiable under the EEZ Act, and it invites public submissions.

2014	January 2014: The McGuinness Institute makes a submission on the proposed regulatory changes to the EEZ Act contained in the *Draft for Consultation: Exclusive Economic Zone and Continental Shelf (Environmental Effects–Discharge and Dumping) Regulations 2014.*
	February 2014: New regulations to the EEZ Act mean that exploratory drilling is classified as a non-notified discretionary activity. As a result, the EPA can no longer take public submissions into account when deciding whether to grant marine consents for these activities.
	February 2014: The Environmental Reporting Bill is introduced. The purpose of this Bill is to create a national-level environmental reporting system; one of the five reporting domains is the marine domain.
	March 2014: The hearing for Trans-Tasman Resources' application for iron sand mining is scheduled to take place in Wellington.
	May 2014: Chatham Rock Phosphate Ltd (CRP) lodges an application for a marine consent with the EPA, proposing to mine phosphate nodules on the Chatham Rise.
	June 2014: The US Department of State hosts the 'Our Ocean' conference, a high-level gathering to discuss international cooperation on oceans issues, in Washington, D.C. Key themes are sustainable fisheries, marine pollution and ocean acidification.
	June 2014: The EPA decides not to approve an application by Trans-Tasman Resources Ltd (TTR) for a marine consent to undertake iron ore extraction and processing in the South Taranaki Bight. The consent was refused on the grounds that the applicant could not satisfy the Decision Making Body that the life-supporting capacity of the environment would be safeguarded. Furthermore, the applicant could not show that the adverse effects of their proposal could be avoided, remedied or mitigated and there was uncertainty as to the extent of potential adverse effects. In addition the Decision-making Committee found that there was a lack of clarity as to the economic benefits of the proposal to New Zealand.
	June 2014: The Global Ocean Commission publishes a 'rescue package' containing a series of eight proposals to slow ocean decline and initiate a cycle of recovery in the high seas over the next five years.
	July 2014: TTR launches an appeal to the High Court regarding the rejection of its marine consent application to mine iron sands off Taranaki. EDS announces it will oppose the appeal.
	September 2014: The Ministry of Business, Innovation and Employment (MBIE) launches the Sustainable Seas National Science Challenge. The Challenge will be led by NIWA and will shape the government's investment in marine research.
	December 2014: The EPA grants a marine consent to OMV NZ Ltd to continue its drilling programme in the Maari oil field in the South Taranaki Bight.
2015	January 2015: The UN Ad Hoc Open-ended Informal Working Group agrees that talks will occur towards a legally binding future agreement on the conservation and sustainable use of the high seas beyond national jurisdiction.
	February 2015: The EPA decides not to approve an application by Chatham Rock Phosphate Ltd (CRP) for a marine consent to mine phosphate on the Chatham Rise. CRP were not able to provide certainty as to the adverse effects of their proposal and the consent was refused on the grounds that it would have significant and permanent adverse effects on the environment. Furthermore, the Decision-making Committee found that the destructive effects of the removing the phosphate combined with impact on the wider marine environment could not be reasonably mitigated, and the economic benefit to New Zealand would be modest at best.

Appendix 2 New Zealand's rights and obligations by marine zone

Adapted from Ministry for the Environment (MfE), 2014. Additional information taken from Global Ocean Commission, 2014 and NZSAR, 2011.

Zone/ boundary	Location	Rights/obligations under international and domestic law	Notes on areas
Land	Landward above the line of mean high water springs (MHWS).	New Zealand has full sovereignty over its land. This is beyond the scope of the United Nations Convention on the Law of the Sea (UNCLOS).	
Foreshore	Seaward of MHWS to mean low water springs (MLWS).	New Zealand has full sovereignty over its foreshore. This is a territory defined under the Resource Management Act 1991 (RMA) and is also beyond the scope of UNCLOS.	
Coastal marine area	The foreshore, seabed and coastal water and the air space above the water extending from MHWS (with a few exceptions) to the limits of the territorial sea – 12 nautical miles from shore.	New Zealand has full sovereignty within the coastal marine area that extends between MHWS and MLWS. Like the foreshore, this is a territory defined under the RMA and is beyond the scope of UNCLOS. Seaward of MLWS to the limits of the territorial sea, New Zealand's sovereignty is subject to rights and duties established by UNCLOS and to other rules of international law. Other states have rights such as 'innocent passage' of their vessels.	
Baselines	Normally the line of MLWS, but with exceptions for rivers, bays, islands, fiords, harbour works, etc.		
Internal waters	Waters on the landward side of the baseline of the territorial sea.	New Zealand has full sovereignty over its internal waters.	

Zone/ boundary	Location	Rights/obligations under international and domestic law	Notes on areas
Territorial sea	Seaward of the baseline out to 12 nautical miles.	New Zealand has full sovereignty over its territorial sea, subject to the rights and duties established in UNCLOS and to other rules of international law. Other states have rights such as the 'innocent passage' of their vessels.	
Contiguous zone	Between the outer limits of the territorial sea to 24 nautical miles (12–24 nautical miles).	In addition to 'sovereign rights' conferred over this area as part of the Exclusive Economic Zone (EEZ), New Zealand may exercise such control as is necessary to prevent and punish infringements of its customs, immigration, tax and sanitary laws within its territory or territorial sea.	
Exclusive Economic Zone (EEZ)	Seaward of the outer limits of the territorial sea, including the contiguous zone, to an outer limit of 200 nautical miles from the baselines (meaning that the breadth of the EEZ is normally 188 nautical miles).	New Zealand has 'sovereign rights' – a more limited jurisdiction than sovereignty – for the purposes of exploring and exploiting, conserving and managing natural resources of the waters, seabed and subsoil. New Zealand also has 'jurisdiction' with regard to the establishment of artificial islands, installations and structures, marine scientific research and the protection and preservation of the marine environment. New Zealand must also have due regard for the rights of other states. Other states have certain freedoms including navigation, overflight and laying cables in the EEZ.	New Zealand's EEZ is one of the largest in the world, with an area of four million square kilometres. This amounts to more than 15 times the area of our land mass.

Zone/ boundary	Location	Rights/obligations under international and domestic law	Notes on areas
Continental shelf	The seabed and subsoil of submarine areas beyond the territorial sea (12 nautical miles) to the outer edge of the continental margin or to 200 nautical miles from the baselines (whichever is greatest).	'Sovereign rights' (as for the EEZ) for the purpose of exploring and exploiting the natural resources of the seabed and subsoils (including immobile organisms which live on or under the seabed/ subsoil). In areas where the continental shelf extends beyond 200 nautical miles from the baseline, the water itself above the continental shelf is not within New Zealand's jurisdiction and forms part of the high seas.	New Zealand's legal continental shelf includes approximately 1.7 million square kilometres of seabed outside the existing EEZ. This area alone equates to about six times the area of our land mass.
New Zealand's search and rescue region (NZSRR)*	The International Maritime Organisation (IMO) has designated search and rescue responsibilities to different countries, covering the entirety of the world's oceans.	Region where New Zealand has responsibility to provide emergency assistance to those in distress and to carry out search and rescue operations.	The NZSRR extends over more than 30 million square kilometres, an area far larger than the EEZ and legal continental shelf. It covers one-twelfth of the surface of the Earth, from Samoa to the South Pole.
High seas/ international waters	Water column beyond the outer limits of coastal states' EEZs.	Open to all states, subject to due regard for the interests of other states. All states have 'freedom of the high seas', which includes freedom of navigation, overflight, laying cables and pipelines, constructing artificial installations, fishing and scientific research.	The high seas beyond national jurisdictions represent 64 percent of the world's oceans by surface area.
The area [seabed]	Seabed and subsoil beyond the limits of national jurisdiction (i.e. seaward of the outer limit of continental shelves).	Vested in humankind as a whole and administered by the International Seabed Authority. No state can claim or exercise sovereignty or sovereign rights over the area.	

*Note that as New Zealand's obligations in the NZSRR do not include exclusive resource rights or particular conservation responsibilities, we do not consider it part of New Zealand's 'marine jurisdiction' or 'marine estate' under this report's definition of these terms (see glossary).

Appendix 3 Government department strategies (GDSs) concerning oceans management

This appendix contains definitions of key terms and information on the key government department strategies (GDSs) concerning oceans governance in New Zealand.

A. Terminology

The reasons why a document is called a strategy, as distinct from a plan, are not always clear. To add to the confusion, sometimes both a strategy and a plan can be contained in the same document. For the purposes of this report, we provide the following definitions:

A strategy: Professor Lawrence Freedman describes strategy as being about 'maintaining a balance between ends, ways and means; about identifying objectives; and about the resources and methods available for meeting such objectives. This balance requires not only finding out how to achieve desired ends but also adjusting ends so that realistic ways can be found to meet them by available means ... By and large, strategy comes into play where there is actual and potential conflict, when interests collide and forms of resolution are required. This is why strategy is much more than a plan' (2013: xi). While Freedman's is a contemporary definition, it is also useful to look at an earlier interpretation by Professor Henry Mintzberg. In 1987 he wrote about the 'five Ps for strategy' – Plan, Ploy, Pattern, Position and Perspective – indicating a plan was only one component of a strategy (Mintzberg, 1987:11). Put simply, a strategy is an allocation or reallocation of resources to achieve success or a desirable goal/goals.

A government department strategy (GDS): A document that must: (i) be a publicly available statement or report; (ii) be generated by government departments with a national rather than a local focus; (iii) contain long-term thinking, in such a way that the strategy links to a long-term vision or aim, and ideally provide clarity over the factors that may impinge on the attainment of that vision or aim; and (iv) guide the department's thinking and operations over the long term (i.e. contain a work programme to achieve change over two years or more) (McGuinness Institute, 2014). Based on this definition 17 GDSs are currently in operation to manage New Zealand's ocean.

A plan: A plan is operational in nature; it focuses on who will do what and when. It does not explore the tensions/trade-offs in the external environment or the strategic ways/options in any detail.

B. The 17 government department strategies

There are 17 GDSs that were identified as relating to ocean governance. sixteen were identified and scored as part of the *GDS Index*, and one was not. *The New Zealand Coastal Policy Statement 2010* (NZCPS) is a GDS but was not included in the list of GDSs as at June 2014. Possibly the reason for this was that the title did not include the terms 'strategy' or 'plan'. Retrospectively, we have listed the document in the *GDS Index*, but it has not been scored or ranked. The remaining sixteen are examined further below. This information is based on research carried out by the McGuinness Institute and forms part of the *StrategyNZ* project. *StrategyNZ* is a long-term initiative of the Institute which aims to support strategic thinking and effectiveness in the public sector.

The initial stage of this research built on the Institute's 2007 publication *Report 2: New Zealand Central Government Strategies: Reviewing the landscape 1990–2007* and was undertaken in 2014. This resulted in the collection of 290 GDSs published over the last 20 years. The second stage involved an 'overview analysis' of the 136 GDSs in operation as at 30 June 2014.

In 2015 each GDS was read in detail and analysed. It is important to note that the Institute did not assess the quality of the GDS's approach nor the extent to which it had been implemented. The strategies were scored across the six elements that the Institute believes form the basis of a 'good strategy document':

Element 1: *Opportunities and Threats*

Element 2: *Capabilities and Resources*

Element 3: *Vision and Benefits*

Element 4: *Approach and Focus*

Element 5: *Implementation and Accountability*

Element 6: *Alignment and Authority*

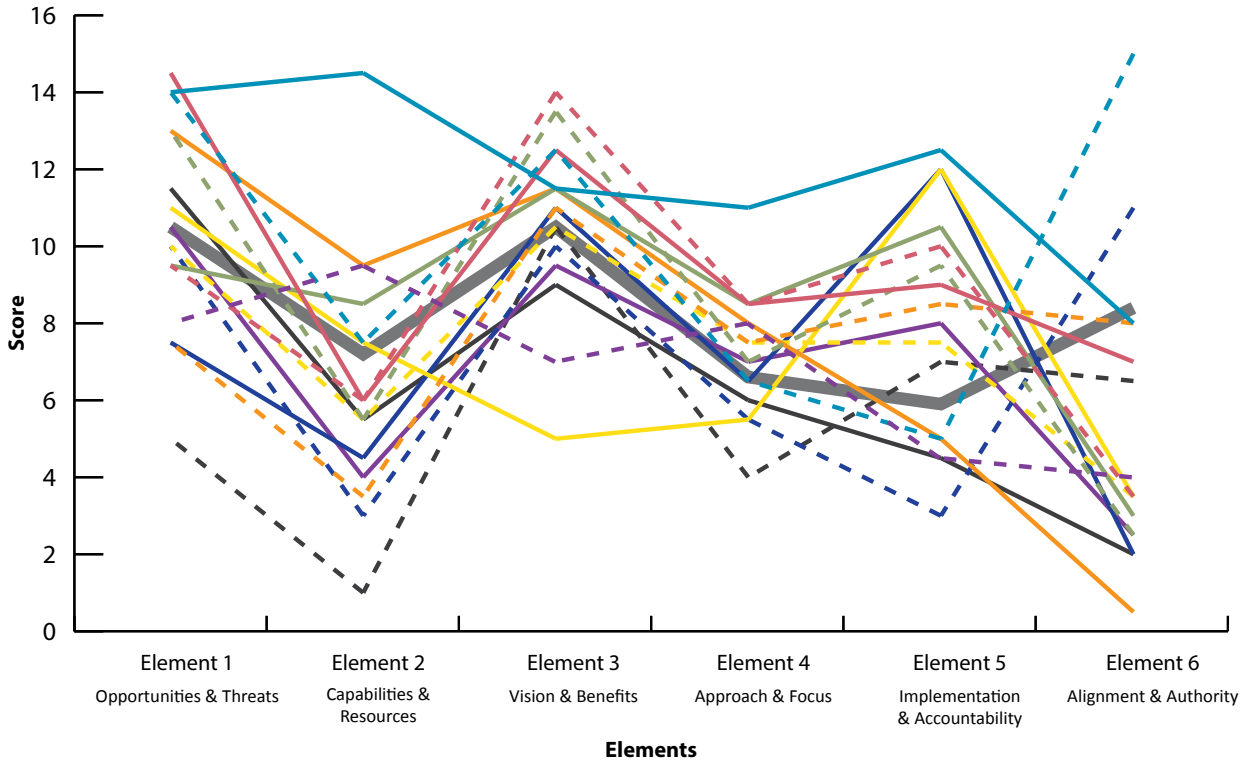
The scores were then totalled and compared, enabling each strategy to be ranked out of 136. Each department and sector was also ranked, based on the average scores of its strategies. As a result of this analysis, seven tables and 136 profiles were published in separate documents called *The Government Department Strategies Index 2015: Tables* and *The Government Department Strategies Index 2015: Profiles*. Together *Tables*, *Profiles*, *Observations* and the *Methodology* form *The Government Department Strategy Index 2015*. All 136 strategy documents, along with the methodology behind the scoring, the elements of the scorecard and the ranking, can be found on the website (www.gdsindexnz.org), which hosts all of the results.

Figure 13 illustrates the rankings of the GDSs that relate directly to New Zealand's ocean. It shows that our ocean strategy documents are consistently poor at reporting on the department's capabilities and resources (with the exception of *Rena*'s long-term environmental plan) and that this in turn might explain why departments are poor at clarifying how the strategy will be implemented and by whom. Put simply, we may be good at identifying the problem/opportunity (element 1) and preparing a vision (element 3), but we are poor at reporting on our capabilities and resources (element 2), the options/ways forward (element 4), the means (element 5) and for many strategy documents, how the strategy aligns and secures a mandate for action (element 6).

A brief description of how each GDS will resolve or achieve the 'means' to the 'end' is discussed below. Each GDS is ranked (i) against each other (out of 16) and (ii) against all 136 GDSs in operation (in brackets). See each GDS's radar chart to see how it scored against the six elements. You will note 11 of the strategies have the word 'plan' in the title. These were included as strategies, as they fit the definition of a GDS.

Figure 13: Analysis of 16 government department strategies (GDSs)

Source: McGuinness Institute, 2015a

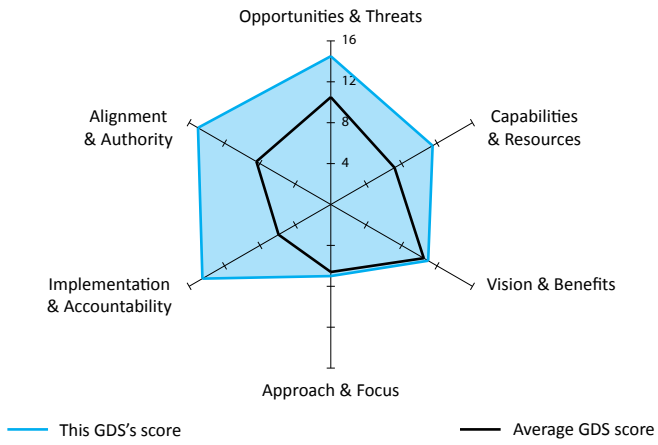


- Rank 1 Rena: Long-term Environmental Recovery Plan (MPI, 2011)
- Rank 2 The New Zealand Biodiversity Strategy (DOC, 2000)
- Rank 3 National Plan of Action for the Conservation and Management of Sharks 2013 (MPI, 2013)
- Rank 4 National Fisheries Plan for Deepwater and Middle-depth Fisheries (MPI, 2010)
- Rank 5 National Fisheries Plan for Highly Migratory Species (HMS) 2010–2015 (MPI, 2010)
- Rank 6 National Plan of Action – 2013: To Reduce the Incidental Catch of Seabirds in New Zealand Fisheries (MPI, 2013)
- Rank 7 Hector's and Maui's Dolphin Threat Management Plan (DOC, 2007)
- Rank 8 Fisheries 2030: New Zealanders Maximising Benefits From the Use of Fisheries Within Environmental Limits (MPI, 2009)
- Rank 9 New Zealand Subantarctic Islands Research Strategy (DOC, 2005)
- Rank 10 Draft National Fisheries Plan for Inshore Finfish (MPI, 2011)
- Rank 11 Marine Protected Areas: Policy and Implementation Plan (MPI, 2005)
- Rank 12 The Government's Aquaculture Strategy and Five-year Action Plan to Support Aquaculture (MPI, 2011)
- Rank 13 Draft National Fisheries Plan for Inshore Shellfish (MPI, 2011)
- Rank 14 New Zealand Antarctic & Southern Ocean Science: Directions and Priorities 2010–2020 (MFAT, 2010)
- Rank 15 New Zealand Sea Lion Species Management Plan: 2009–2014 (DOC, 2009)
- Rank 16 Harvest Strategy Standard for New Zealand Fisheries (MPI, 2008)
- Average score of all 136 GDSs in operation as at 30 June 2014

Rena: Long-term Environmental Recovery Plan (2011)
Rank 1/16 (5=/136)

Department: Ministry for the Environment
Sector: Environment Sector

Figure 14: Rena: Long-term Environmental Recovery Plan radar chart
Source: McGuinness Institute, 2015a

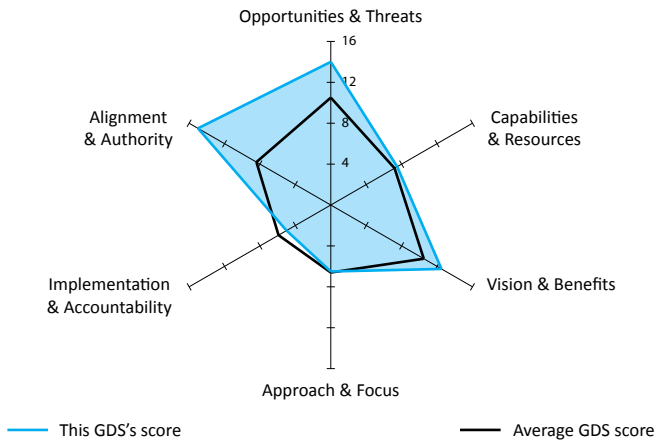


This strategy sets the goals and objective for the long-term environmental recovery from the *Rena* grounding on the Astrolabe Reef in 2011. It outlines the actions that will be taken towards recovery, whilst taking into consideration the environmental issues. The approach is to coordinate the long-term recovery and restoration of the Bay of Plenty after *Rena* as well as identifying the responsible agencies and their specific roles in the recovery effort. (MfE, 2011)

The New Zealand Biodiversity Strategy (2000)
Rank 2/16 (23=/136)

Department: Department of Conservation
Sector: Environment Sector

Figure 15: The New Zealand Biodiversity Strategy radar chart
Source: McGuinness Institute, 2015a

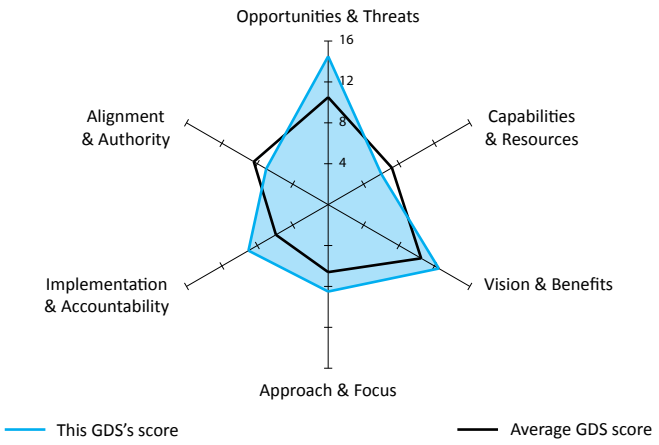


This strategy was implemented to fulfil, in part, New Zealand's obligations under the United Nations Convention on Biological Diversity, which New Zealand ratified in 1996. The approach of the strategy is to manage New Zealand's biodiversity using a threat management response at all levels (including partnerships between agencies), such as government, land managers and iwi. (DOC, 2000)

National Plan of Action for the Conservation and Management of Sharks 2013 (2013)
Rank 3/16 (32=/136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 16: National Plan of Action for the Conservation and Management of Sharks 2013 radar chart
Source: McGuinness Institute, 2015a

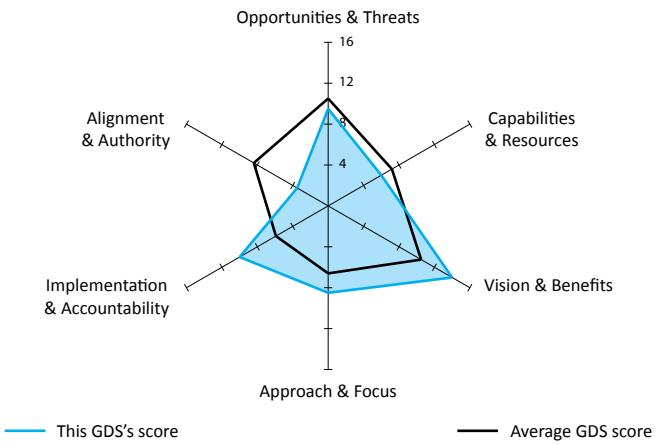


The approach is to implement objectives necessary to meet New Zealand's international obligations for the protection of sharks across MFAT, DOC and MPI. (MPI, 2013b)

National Fisheries Plan for Deepwater and Middle-depth Fisheries (2010)
Rank 4=/16 (49=/136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 17: National Fisheries Plan for Deepwater and Middle-depth Fisheries radar chart
Source: McGuinness Institute, 2015a

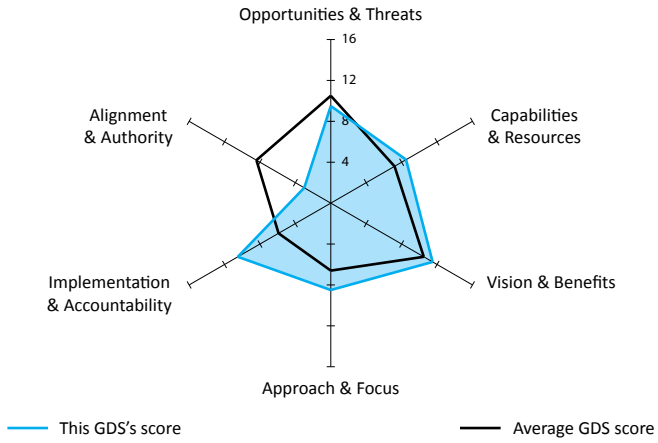


The approach is for MPI's fisheries department to prioritise strategic objectives found in the GDS *Fisheries 2030* according to a five-year timeline involving commercial, amateur and iwi use of fisheries. (MFish, 2010a)

National Fisheries Plan for Highly Migratory Species (HMS) 2010–2015 (2010)
Rank 4 = /16 (49 = /136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 18: National Fisheries Plan for Highly Migratory Species (HMS) 2010–2015 radar chart
Source: McGuinness Institute, 2015a

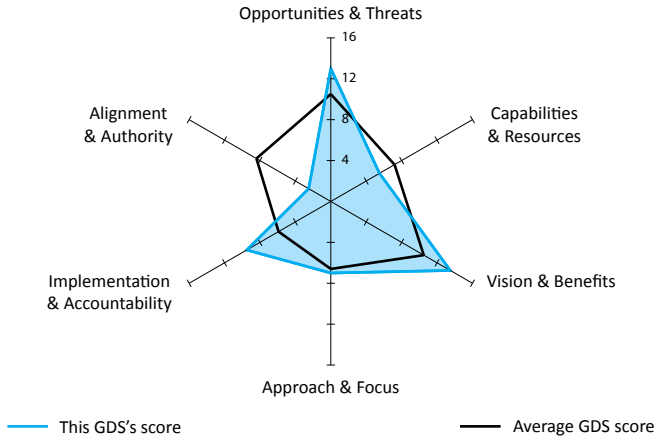


The approach is to manage the outcomes for New Zealand fisheries' highly migratory species with a fisheries plan advisory group. (MFish, 2010b)

National Plan of Action – 2013: To Reduce the Incidental Catch of Seabirds in New Zealand Fisheries (2013)
Rank 6/16 (55/136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 19: National Plan of Action – 2013: To Reduce the Incidental Catch of Seabirds in New Zealand Fisheries radar chart
Source: McGuinness Institute, 2015a

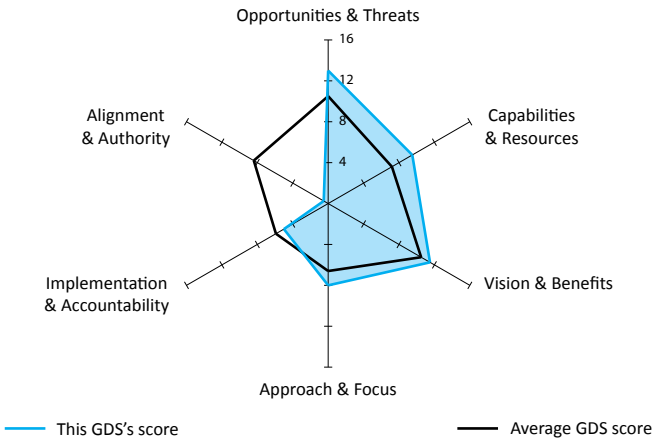


The approach is to continue the 2004 version of the strategy by setting new overarching objectives, which will be implemented and monitored by MPI, for the prevention, monitoring and management of incidental seabird capture. (MPI, 2013a)

Hector's and Māui's Dolphin Threat Management Plan (2007)
Rank 7/16 (66=/136)

Department: Department of Conservation
Sector: Environment Sector

Figure 20: Hector's and Māui's Dolphin Threat Management Plan radar chart
Source: McGuinness Institute, 2015a

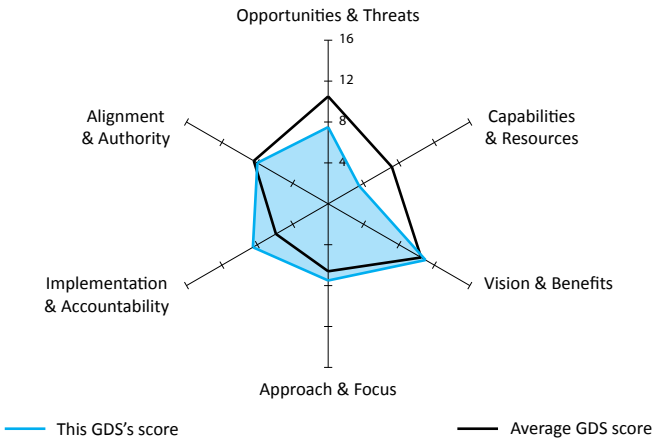


The approach is to manage human-induced threats to Hector's and Māui's dolphins and to seek stakeholder perspectives on the measures contained in the strategy. (MFish & DOC, 2007)

Fisheries 2030: New Zealanders Maximising Benefits From the Use of Fisheries Within Environmental Limits (2009)
Rank 8/16 (76=/136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 21: Fisheries 2030: New Zealanders Maximising Benefits From the Use of Fisheries Within Environmental Limits radar chart
Source: McGuinness Institute, 2015a



The approach taken is to ensure MPI oversees the new institutional arrangements within the fisheries sector to balance the 'use' and 'environment' outcomes in order to maximise the economic benefits of fisheries. (MFish, 2009)

New Zealand Subantarctic Islands Research Strategy (2005)

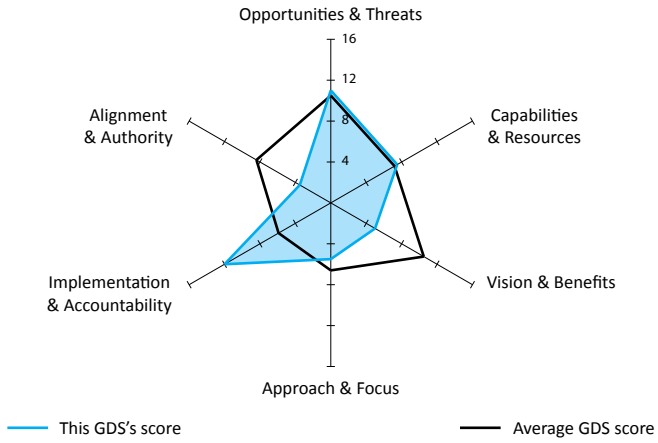
Rank 9 = /16 (87 = /136)

Department: Department of Conservation

Sector: Environment Sector

Figure 22: New Zealand Subantarctic Islands Research Strategy radar chart

Source: McGuinness Institute, 2015a



The approach is to set guidelines for researchers who seek access to the Southland Conservancy and to provide a tool for managers to aid in identifying the research needs of DOC in this geographic area. (DOC, 2005)

Draft National Fisheries Plan for Inshore Finfish (2011)

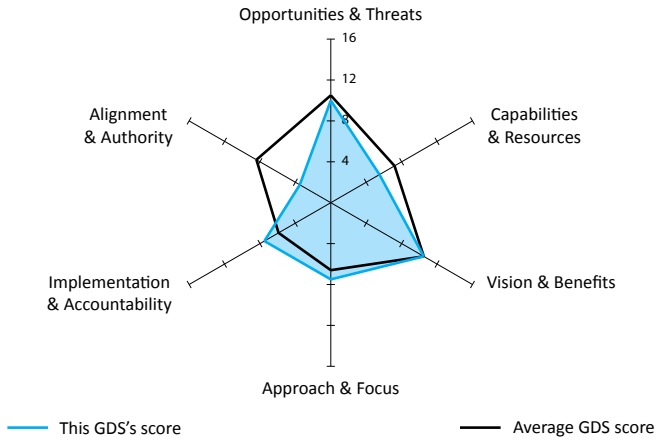
Rank 9 = /16 (87 = /136)

Department: Ministry for Primary Industries

Sector: Primary Industries Sector

Figure 23: Draft National Fisheries Plan for Inshore Finfish radar chart

Source: McGuinness Institute, 2015a

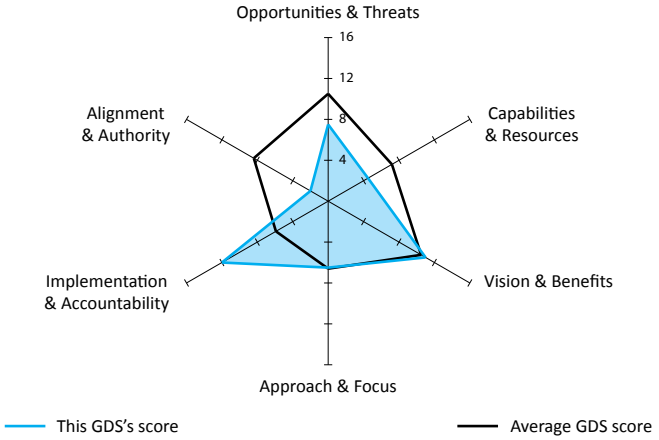


The approach is to (i) manage the environmentally sound use of inshore finfish by sorting finfish species into categories based on their abundant or endangered status and (ii) devise management objectives for fisheries stakeholders to adhere to for each category. (MFish, 2011a)

Marine Protected Areas: Policy and Implementation Plan (2005)
Rank 11/16 (94=/136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 24: Marine Protected Areas: Policy and Implementation Plan radar chart
Source: McGuinness Institute, 2015a

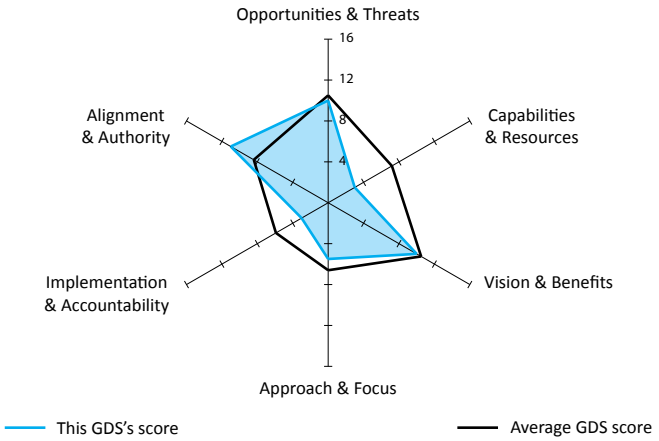


The approach is for DOC to implement MPI's Marine Protected Areas Policy according to the four stages of their policy implementation plan, which will create new marine protected areas. (DOC & MFish, 2005)

The Government's Aquaculture Strategy and Five-year Action Plan to Support Aquaculture (2011)
Rank 12/16 (100=/136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 25: The Government's Aquaculture Strategy and Five-year Action Plan to Support Aquaculture radar chart
Source: McGuinness Institute, 2015a

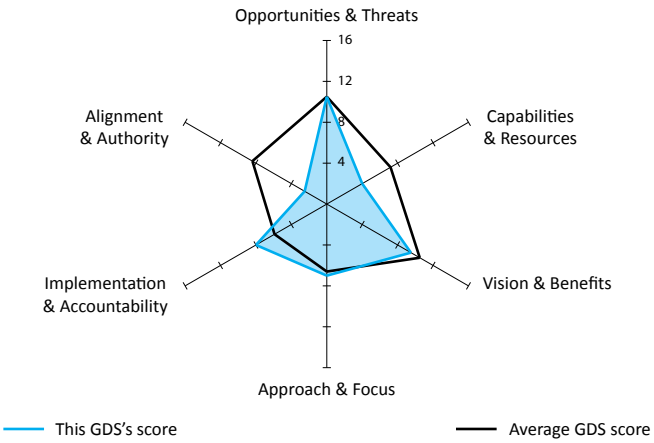


The approach is to coordinate a response across government to enable the primary sector to make the most of the aquaculture industry by ensuring the relevant departments (such as DOC, MPI, TPK and MfE) complete actions to improve investment and regulations in this area before 2016. (MPI, 2011)

Draft National Fisheries Plan for Inshore Shellfish (2011)
Rank 13/16 (104/136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 26: Draft National Fisheries Plan for Inshore Shellfish radar chart
Source: McGuinness Institute, 2015a

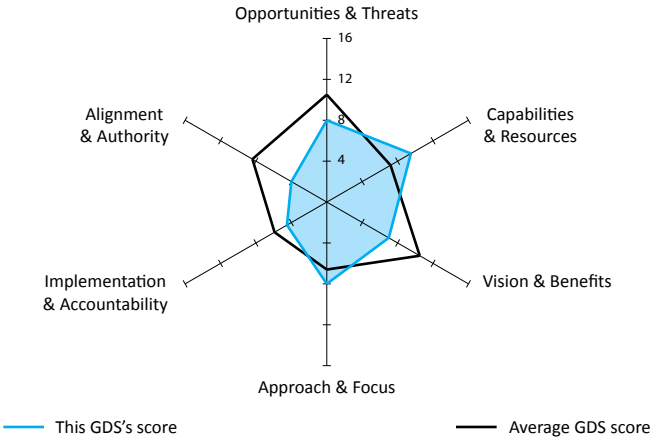


The approach is to sort inshore shellfish stocks into categories based on their use and conservation status, which will then be assigned specific management objectives applicable to all fisheries stakeholders (such as Māori, amateur or commercial fishers). (MFish, 2011b)

New Zealand Antarctic & Southern Ocean Science: Directions and Priorities 2010–2020 (2010)
Rank 14/16 (105=/136)

Department: Ministry of Foreign Affairs and Trade
Sector: External Sector

Figure 27: New Zealand Antarctic & Southern Ocean Science: Directions and Priorities 2010–2020 radar chart
Source: McGuinness Institute, 2015a

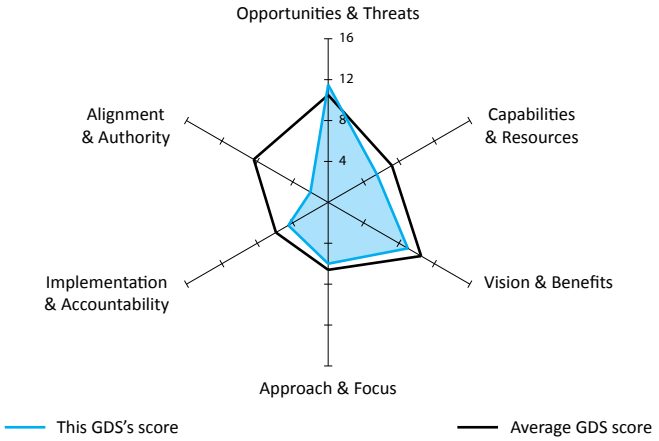


The approach is to develop a science research programme in the Antarctic Ocean by receiving guidance from bodies such as the Scientific Committee on Antarctic Research as to how government funding can enable researchers to meet their goals and deliver on government priorities. (MFAT, 2010)

New Zealand Sea Lion Species Management Plan: 2009–2014 (2009)
Rank 15/16 (112/136)

Department: Department of Conservation
Sector: Environment Sector

Figure 28: New Zealand Sea Lion Species Management Plan: 2009–2014 radar chart
Source: McGuinness Institute, 2015a

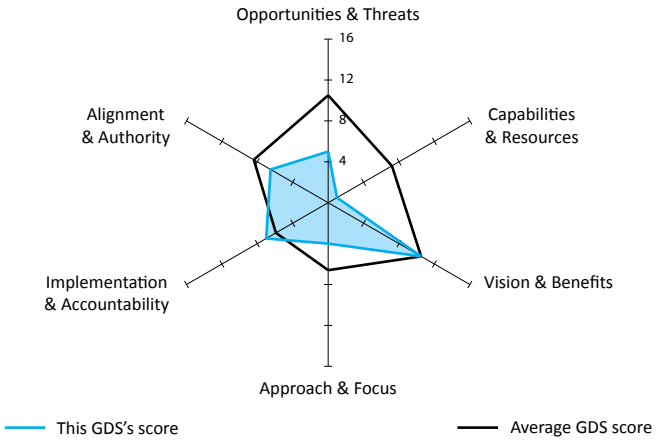


The approach taken is to restrict human interactions with sea lions in order to increase the population of this threatened species, whilst funding research which will guide management practices for the species in the future. (DOC, 2009)

Harvest Strategy Standard for New Zealand Fisheries (2008)
Rank 16/16 (125/136)

Department: Ministry for Primary Industries
Sector: Primary Industries Sector

Figure 29: Harvest Strategy Standard for New Zealand Fisheries radar chart
Source: McGuinness Institute, 2015a



The approach is to better manage New Zealand fisheries by outlining targets and limits to be set, although there is no strategic planning evident. (MFish, 2007)

Appendix 4 Instruments for spatial marine protection in New Zealand

Management tools for coastal marine bioregions in New Zealand's waters

Mechanisms for protection and management	Enabling legislation	Scope of protection/ management	Area (km²)	NZ waters where tool applies
Type 1 MPA				
Marine reserves[10]	Marine Reserves Act 1971	Identified area fully protected from fishing, removal of material, dredging, dumping, construction or any other direct human disturbance.	17,430[11]	Territorial sea
Type 2 MPA				
Marine mammal sanctuaries[12]	Marine Mammals Protection Act 1978	A range of potential restrictions depending on range and behaviour of focal species. These vary from full protection from commercial fishing to special fisheries regulations.	6,180[13]	Territorial sea
Marine parks	Hauraki Gulf Marine Park Act 2000 and 2001 amendment Fisheries Act 1996 Sugar Loaf Islands Marine Protection Area Act 1991	A range of potential restrictions depending on spatial parameters, ecosystem health, etc. These include a variety of fishing restrictions from all commercial fishing being prohibited to special fisheries regulations.	20,536[14]	Territorial sea

10 There are currently 44 marine reserves: Akaroa Marine Reserve; Auckland Islands—Motu Maha Marine Reserve; Cape Rodney-Okakari Point Marine Reserve; Hautai Marine Reserve; Hawea (Clio Rocks) Marine Reserve; Hikurangi Marine Reserve; Horoirangi Marine Reserve; Kahukura (Gold Arm) Marine Reserve; Kahurangi Marine Reserve; Kapiti Marine Reserve; Kermadec Islands Marine Reserve; Kutu Parera (Gaer Arm) Marine Reserve; Long Bay-Okura Marine Reserve; Long Island—Kokomohua Marine Reserve; Moana Uta (Wet Jacket Arm) Marine Reserve; Motu Manawa-Pollen Island Marine Reserve; Moutere Hauriri/Bounty Islands Marine Reserve; Moutere Ihupuku/Campbell Island Marine Reserve; Moutere Mahue/Antipodes Island Marine Reserve; Parininihi Marine Reserve; Piopiotahi (Milford Sound) Marine Reserve; Pohatu Marine Reserve; Poor Knights Islands Marine Reserve; Punakaiki Marine Reserve; Taipari Roa (Elizabeth Island) Marine Reserve; Tapuae Marine Reserve; Taputeranga Marine Reserve; Taumoana (Five Finger Peninsula) Marine Reserve; Tauparikākā Marine Reserve; Tāwharanui Marine Reserve; Te Angiangi Marine Reserve; Te Awaatu Channel (The Gut) Marine Reserve; Te Hapua (Sutherland Sound) Marine Reserve;Te Matuku Marine Reserve; Te Paepae o Aotea (Volkner Rocks) Marine Reserve; Te Tapuwae o Hua (Long Sound) Marine Reserve; Te Tapuwae o Rongokako Marine Reserve; Tonga Island Marine Reserve; Tuhua (Mayor Island) Marine Reserve; Ulva Island—Te Wharawhara Marine Reserve; Waiau Glacier Coast Marine Reserve; Westhaven (Te Tai Tapu) Marine Reserve; Whanganui A Hei (Cathedral Cove) Marine Reserve and Whangarei Harbour Marine Reserve (DOC, personal communication, 23 March 2015).

11 Data current as at December 2014 (DOC, 2014).

12 There are currently six marine mammal sanctuaries: Auckland Islands; Banks Peninsula; Catlins Coast; Clifford and Cloudy Bay; Te Waewae Bay, West Coast North Island (DOC, n.d.).

13 Data current as at December 2008 (MfE, 2008).

14 Data current as at December 2008 (MfE, 2008).

Mechanisms for protection and management	Enabling legislation	Scope of protection/ management	Area (km^2)	NZ waters where tool applies
Type 2 MPA				
Fiordland (Te Moana o Atawhenua) Marine Area	Fiordland (Te Moana o Atawhenua) Marine Management Act 2005	Specific to the identified area and its biodiversity. Trawling, Danish seine and all dredging are prohibited (so it meets the minimum standard for Type 2 MPAs). The Fiordland Marine Guardians are appointed by the minister for the environment as an advisory body.	379[15]	Territorial sea
Submarine cables and pipelines protection zones	Submarine Cables and Pipelines Protection Order 1992	No fishing or anchoring except for ships being used for research by or for the Ministry of Fisheries as long as research is done without directly or indirectly attaching any ship to the seabed.	1,732[16]	Territorial sea and Exclusive Economic Zone
Other management tools				
Mātaitai – closed area	Fisheries Act 1996 Fisheries (Declaration of Mātaitai Reserve and Appointment of Tāngata Kaitaki/ Tiaki) Notice	In general, commercial fishing are prohibited and amateur regulations apply unless amended by appointed tāngata tiaki/kaitiaki who can authorise customary food gathering.[17]	401[18]	Territorial sea

15 Data current as at August 2011 (DOC & MFish, 2011).

16 Data current as at December 2008 (MfE, 2008).

17 MPI (2014b)

18 Figure refers to marine area only (excludes freshwater and lagoon zones). Where this area is < 1 km^2, the mātaitai has been represented in the data as 1 km^2. Data current as at August 2014 (MPI, 2014a).

Mechanisms for protection and management	Enabling legislation	Scope of protection/ management	Area (km²)	NZ waters where tool applies
Other management tools				
Taiāpure – closed areas	Fisheries Act 1996 Fisheries Order	A spatial closure to set aside coastal fishing areas which customarily have been of special significance to an iwi or hapū as a source of food (kai moana) or for spiritual or cultural reasons.[19]	401[20]	Territorial sea
Section 186 – temporary closures	Fisheries Act 1996 Fisheries (Temporary Closure) Notice	A range of restrictions apply depending on the particular area. All restrictions prohibit the removal of at least one species.	769[21]	Territorial sea
Benthic protected areas (BPAs)	Fisheries Act 1996 Fisheries (Benthic Protection Areas) Regulations 2007	Prohibition on use of dredge and restrictions on use of trawl net within 100 metres of the sea floor.	1,134,207[22]	Territorial sea and Exclusive Economic Zone
Seamount closures	Fisheries Act 1996 Fisheries Regulations	Trawling prohibited.	85,459[23]	Territorial sea and Exclusive Economic Zone

19 MPI (2014d)

20 Data current as at September 2014 (MPI, 2014c).

21 Data current as at December 2008 (MfE, 2008).

22 Note this figure does not include those parts of the BPAs located outside the EEZ. Total BPAs, including parts outside the EEZ = 1,151,205 km². (DOC, personal communication, 25 March 2015).

23 Figure refers to total seamount closures within the EEZ, and includes areas of overlap with BPAs. Note that in cases of overlap, seamount closure rules apply; there is 3,382 km² of overlap within the EEZ. Total seamount closures, including parts of closures outside the EEZ = 108,128 km². (DOC, personal communication, 25 March 2015).

Classification of spatial protection instruments

A: Marine Protection Areas (MPAs)

Type 1 MPAs: Marine reserves

Marine reserves established under the Marine Reserves Act 1971.

Type 2 MPAs: Other MPAs

Fisheries Act 1996 prohibitions (i.e. those rules imposed primarily for the purpose of sustaining fisheries resources and for avoiding, remedying or mitigating the adverse effects of fishing on the environment) on:

- Dredging, bottom trawling and Danish seining.
- Bottom gillnetting and potting when used on sensitive biogenic habitats.
- Purse seining, midwater trawling, midwater gillnetting and bottom gillnetting. Prohibitions on other methods may be appropriate on a case-by-case basis.

Tools may also include cable protection zones, marine mammal sanctuaries and the Resource Management Act 1991, possibly in combination with other tools. Other tools may include provisions in:

- the Crown Minerals Act 1991;
- the Maritime Transport Act 1994; and
- the Biosecurity Act 1993.

B: Other marine protection tools

Tools similar to those for MPAs, but which in particular cases, do not protect sufficient biodiversity to meet the protection standard.

Source: DOC & MFish, 2011: 8

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