OCEAN GOVERNANCE:
THE NEW ZEALAND DIMENSION

FULL REPORT

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Ocean Governance:

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Table of Contents

EXECUTIVE SUMMARY 7

1. BEYOND THE BLUE HORIZON 13

1.1 The Islands of Aotearoa 14
1.2 The Nomos of the Earth 18
1.3 The Themes of this Report 21
1.4 Approach and Methods 27
1.5 Future Challenges and Opportunities 29
1.6 Policy Innovation 31
1.7 Management at the Crossroad: An Ocean at Risk 37
1.8 Cultivating an Ocean Constituency 44

2. THE PLACE OF PRINCIPLES IN MARINE GOVERNANCE 46

2.1 Introduction 46
2.2 Critical Issues, Concerns, and Opportunities 46
2.3 Fragmented Government 53
2.4 Improving the Role of Science and Scientists 55
2.5 Offshore Oil and Mining 57
2.6 The Environmental Effects Bill of 2011 and the EPA 66
2.7 Biodiversity Protection: The Importance of Marine Protected Areas 68
2.8 Principles of Marine Governance 75
2.9 Summary 87

3. OF THE LAND AND SEA: MOVING TOWARD A BLUE ECONOMY 91

3.1 Introduction 92
3.2 The Coastal – Marine Interface 96
3.3 Case Study: Marine Farming 98
3.4 Drivers of Aquaculture Policymaking 100
3.5 The Race for Marine Space 105
3.6 The Role of Science, Scientists, and Values 109
3.7 Economics, Ecology, and Equity 118

4. A STRATEGIC APPROACH TO ECOSYSTEM-BASED MARINE PLANNING 122

4.1 The Changing Socio-Ecological Context 122

4.2 The Need for a Proactive Approach 124
4.3 International Best Practice 125
4.4 The Strengths and Weaknesses of Collaborative, Ecosystem-based Planning 127
4.5 Marine Spatial Planning (MSP) 131
4.6 A Strategic Approach to MSP 135
4.7 Elements of a Collaborative Approach to MSP 136
4.8 The Importance of Linking Pressures to Responses 138
4.9 Adaptive Marine Planning in an Age of Climate Disturbance 141
5. CONCLUSION 145
5.1 Integrating Economic Use with Ecological Values 145
5.2 Recognizing Limits of Resource Use 146
5.3 Summary of Short-term Recommendations 148
5.4 List of Recommendations 151

List of Figures and Table

Table 1. Summary of Short-Term Recommendations 9

Figure 1. New Zealand Exclusive Economic Zone.....15

Figure 2. A Sample of Obligations under International Agreements and Conventions 20

Figure 3. An Ecosystem Based Approach to Marine Governance 27

Figure 4. The Synergistic Impacts of Multiple Pressures on Marine Ecosystems 38

Figure 5. Relative Impact of Threats from Different Sources on New Zealand's Marine Habitats 40

Figure 6. Bottom Trawls in New Zealand's Ocean Jurisdiction 42

Figure 7. Marine Management Sectors 54

Figure 8. Likely & Potential Ecological Issues Associated with a Wave Energy Project 66

Figure 9. Aquaculture Industry Farm Statistics (2006) 100

Figure 10. Key Aquaculture Policy and Legislation 102

Figure 11. Documented Ecological Effects of the Marine Farmed Species 104

Figure 12. Shift in Administrative Practices to Support Marine Ecoystem-based Planning 128

Figure 13. Activities in Support of MSP 137

Figure 14. The Process of Adaptive Learning 139

Figure 15. Integrated Responses for MSP 139

Figure 16. Strategic Components to Be Addressed for Each Management Element 141

Table 1. Summary of Short-Term Recommendations 149

EXECUTIVE SUMMARY

While the four hundred islands of Aotearoa are in a vast and dynamic ocean, the maritime peoples of these islands are of the Pacific. Māori arrived by canoe or waka with great wisdom and knowledge of the stars, winds and waves; the first peoples of New Zealand settled and changed the landscape. Centuries later, European explorers travelled by boat, and with new Western ideals settled coastal landscapes inhabited by iwi. The maritime foundations of the diverse peoples of Oceania remain a driving force that is irrevocably embedded in diverse cultures and customs across the Pacific. New Zealand's maritime heritage includes a diversity of cultural values that is irrevocably connected to the animals, plants, and insects that inhabit Aotearoa.

The biological richness and maritime heritage of the country warrant a more concerted effort to establish a marine governance framework that reflects international best practice. In marine governance, international best practice supports an ecosystem-based, integrative planning and management framework that can supports marine life protection and fosters sustainable marine resource use across sectors.

The primary goal of this report is to provide interested members of the public and policymakers with a general overview and a description of the types of principles, planning tools, and policy instruments that can be used to strengthen and improve marine governance in New Zealand. As extractive uses (hydrocarbons and minerals, in particular) ramp up and others are explored and brought on line in the marine areas of New Zealand, the need will increase for a more integrative, ecosystem-based approach to marine governance.

The findings of this report were first published in a Summary Report in April 2012.

A draft of this Full Report was completed in May 2012 before a number of changes to the structure of central government agencies were made. In addition, a number of new plans and policies that are developing and likely to influence the future of marine governance in New Zealand are not fully described in this full report.

This study is based on the following types of analysis:

- a review of the literature on the existing governance framework in New Zealand
- a comprehensive review of the scientific literature on integrative, ecosystem-based marine governance
- an evaluation of case study materials on offshore oil and gas development, marine aquaculture, marine life protection, and marine minerals exploration
- a examination of New Zealand's marine policies and legislation
- a synthesis of materials and input from participants in the project's four workshops on the subjects of marine farming, aquaculture, marine science and technology, and marine governance
- an assessment of the information and materials gained from a series of confidential, one-on-one and group interviews, conducted in person or by telephone during 2010 and 2011, with a selection of ocean stakeholders including academics, members of non-government organizations, regional and national resource managers, members of the public service, and representatives of major ocean industries, such as offshore oil, commercial fishing, and mining interests.

The major findings of this study are that the existing marine governance framework in New Zealand emphasises a traditional sector-by-sector approach to management and planning, and that this fragmented governance framework contributes to a number of institutional challenges, such as:

- a spatial and temporal overlap of human activities and their objectives, causing conflicts (user–user and user–ecosystem conflicts)
- a lack of connection between the various authorities responsible for individual activities
- a lack of connection between offshore activities and resource use and onshore communities that are dependent on them
- a lack of protection of culturally and ecologically sensitive marine areas.

In addition, the study identifies a number of factors that influence marine planning and decision-making in the country, including but not limited to:

- a lack of institutional capacity and capability to govern marine resources and address ecosystem issues across administrative jurisdictions and management sectors
- general scientific uncertainty and a paucity of information with respect to the resources and the more general ecological features of the marine area
- the relationships between economic use of marine resources and the maintenance of marine ecosystem services and goods
- Māori interests, perspectives and treaty obligations
- increasing pressures from the use of marine areas, including the impacts of terrestrial inputs from coastal waterways on nearshore marine ecosystems and resources
- the role of international treaties and conventions
- the synergistic and cumulative impacts of multiple use and climate disturbance on marine ecosystems
- the role of scientists and science in marine planning and decision-making.

This report describes two general recommendations. First, with respect to the territorial sea (which includes the marine area out to 12 nautical miles) the report recommends that regional councils develop integrative marine plans where conflict between users and users-ecosystems is likely to develop in the future. Second, the report recommends the adoption of a new role for central government to support an ecosystem-based approach to integrative marine planning and decision-making. Within central government, stronger interagency coordination and new public policy are needed to address future marine resource conflicts and to support an ecosystem-based approach to integrative marine planning and collaborative decision-making for the EEZ. There is also a new role for place-based collaborative decision-making and planning to address conflicts in marine areas that are likely to be developed in the future. A range of new principles of marine governance, planning tools and policy instruments are described that support a marine ecosystem-based approach to integrative planning across management sectors for the EEZ.

A general summary of the major recommendations described in this report are depicted in the table below. This report describes a number of planning tools, policy instruments and associated strategic elements that can strengthen collaborative, ecosystem-based and integrative marine governance at both regional and central government levels.

Table 1: Summary of Short-Term Recommendations

PRESSURE	RESPONSE (MANAGEMENT PRINCIPLE)	PLANNING TOOL OR POLICY INSTRUMENT
Synergist impacts associated with multiple-use	The maintenance of marine ecological integrity	Creation of an Ocean Health Index Assessment of ecosystem services based on planning tools, such an InVEST and SeaSketch Comprehensive cumulative impact assessment effects and synergistic impacts
Loss of marine biodiversity	Clear statutes in support of the creation of networks of marine reserves that can protect marine life	The Marine Protected Areas Policy and Implementation Plan (MPA Policy) should be amended Use of marine zoning tools Marine protected area designation Adoption of a Compatible Use Criterion Creation of an ocean protection council under the new EPA Further development and implementation of DOC's *PlanBlue*
Expanding scope of conflict across management sectors and user groups	Clear statutory requirements and resources that foster integrative, ecosystem-based planning	New marine policy in support of place-based marine spatial planning Support for place-based, ecosystem-based collaborative planning
Fragmented governance	Clear statutory requirement for well-coordinated ecosystem-based planning and decision-making Strengthening institutional capacity and capability at regional and central government levels	Marine Spatial Planning (by regional councils and with assistance from central government) Place-based collaborative planning The development of a public trust doctrine for the EEZ Administrative reorganization to foster intergovernmental coordination and consistency across sectors and management authorities
Role of science and scientists	Evidence-based decision-making	Establishment of interdisciplinary scientific partnerships that include social and physical scientists Establishment of Māori advisory body under EPA Creation of an ocean science trust under EPA Creation of a publically accessible web-based information clearinghouse Creation of a National Centre for Ecological Analysis and Synthesis

Offshore energy development, fossil fuels, and minerals	Passage of the Environmental Effects Bill and other EEZ policies and statutes	New regulations that support: Compatible use Integrated risk assessment The creation of MPAs for sensitive marine areas used by birds, mammals and fishes The development of a public trust doctrine for the EEZ The establishment of a *Living* Permit process The Creation of mitigation funds to support independent scientific monitoring and enforcement Independent review of permitting applications and environmental assessments under the EPA
Climate disturbance	Adaptive planning	The development of climate adaptation plans at regional scales of governance that can address threats from climate change on the marine and coastal environment
Water pollution	Integrative coastal planning and management	Strengthening and improving the capability and capacity of regional councils to respond to the drivers of impacts from terrestrial inputs on marine areas Clear development of best practices for land-use activities that influence marine areas Water quality monitoring and enforcement Development of catchment-oriented indices Marine spatial planning
Protection of cultural values	Clear support of Māori treaty obligations	Integration of Māori values and traditional ecological knowledge in marine policies, programmes, and plans

Future marine policy in New Zealand is likely to be based on how well the country resolves three general institutional issues and concerns. First, the existing marine governance framework is highly fragmented and is based on a sector-by-sector approach to marine resource use. There are 18 main statutes, 14 agencies, and six government strategies for marine management and planning in New Zealand. Further, marine planning and decision-making are made more complicated by the fractured framework of laws, regulations, and practices that have been developed in New Zealand over the past 30 years.

Second, New Zealand is not meeting its international obligations when it comes to marine resource management and biodiversity protection. New Zealand has not created marine reserves within the EEZ that can protect ecosystems from human impacts. While there is growing pressure to exploit marine resources of the country, changes to the existing marine life protection policies should be developed in order to sustain the ecosystem services that healthy marine ecosystems provide, and to support international obligations. With respect to the management of the EEZ, the protection of marine life is an important requirement in international conventions and treaties**,** such as the United Nations Convention on the Law of the Sea (UNCLOS). Every coastal state is granted jurisdiction for the protection and preservation of the marine environment of its EEZ. For example, coastal states have the obligation to control, prevent, and reduce marine pollution from dumping, land-based sources or seabed activities subject to national jurisdiction, or from or through the atmosphere. While New Zealand has access to and the right to use the marine resources of the EEZ, this use is

predicated on the protection of marine life in accordance with international obligations. The management of resource use and human impacts, including the need to develop adaptive strategies to address climate disturbance of coastal and marine ecosystems, are fundamental issues facing the country. Existing international treaties, such as the UNCLOS and the Convention for Biological Diversity, require that resource use of the EEZ includes countries developing protective measures for marine life. National policy that supports the value of marine biodiversity protection has not been fully developed for New Zealand's EEZ, and the current marine reserve designations fall short of international conventions.

Third, the country remains far behind international best practice in marine policy and ecosystem-based programme development and planning. Marine policies should be based on internationally recognised principles of management and planning. The adoption of an ecosystem-based approach to marine governance can contribute to a more comprehensive and integrated approach to marine ecosystem protection and sustainable resource use across diverse management sectors. Policy innovation in the area of land-use and catchment planning are examples of New Zealand's capacity to lead the world in environmental management. Yet in the area of marine governance of the EEZ the country has yet to embrace the principles of management and the planning tools that are being used across the world to better protect marine life, and to resolve resource-based conflicts.

This report focuses on the need for the central government to support several principles of integrative, ecosystem-based marine management and planning. A number of planning tools, policy instruments and associated strategic elements are described in this report that can strengthen collaborative, ecosystem-based integrative marine governance.

This report also includes detailed marine policy analysis; case studies on offshore oil and gas activities, marine mining, marine farming, and marine life protection; and an examination of the major challenges and opportunities in future marine planning and decision-making based on interviews of marine stakeholders and policymakers. This analysis is based on a survey of the academic literature on the subject of marine policymaking; an analysis of government and technical documents; and material from interviews and public workshops.

Sections of the Report

Recognizing the biophysical limits to the oceanic commons is a primary theme of Section One. It provides a descriptive outline of the report. Section One introduces the major pressures that threaten the general health and integrity of marine ecosystems of New Zealand's EEZ. Ecology and socio-economic factors contribute to the challenge of governing the oceanic commons. The synergistic and cumulative impacts of multiple-use of marine resources should be addressed in new programmatic and environmental policies using available technical and planning tools. The management tools developed by central government emphasize market-based, community-oriented governance instruments that support a sector-by-sector approach to marine resource use. Central government has adopted approaches to marine resource management that favour 'self-management', as in the case of commercial fishing quota management and planning, and voluntary measures, such as co-management strategies. In many cases, the country favours the 'privatization' of Crown resources, such as commercially valuable fishes and offshore marine minerals. In addition, the system of laws and policies in New Zealand relies on regional councils to develop and implement programmes for a range of environmental concerns within territorial waters, including permitting activities for coastal land-use activities within catchment basins. The

capability of regional councils to address complex coastal and marine issues in the territorial sea remains a subject of concern given the lack of resources, the lack of scientific and professional expertise, and the lack of institutional capacity at regional levels of management.

Section Two reviews the major challenges and opportunities described by individuals who were interviewed for this study. This section also includes a case study of offshore oil activity and marine mining, and analysis of important policy issues and marine activities that are developing in New Zealand. This section also includes a review of the recent proposed Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill introduced in August 2011. The analysis of the Bill is based on its major goals as of January 2012.

It should be acknowledged that commercial fishing and marine transportation continue to be primary threats to marine systems. The report does not represent a comprehensive analysis of these marine activities. Yet it is important to recognize that 98 percent of the New Zealand's trade is by sea, and more than 95 percent of all commercial fish landed is exported and worth $3.5 billion New Zealand. Commercial fishing activities include trawling of the sea floor which has had impact on marine ecosystems, while commercial vessel activities (as reflected in the recent Rena disaster) remain a major threat to marine life.

With respect to Environmental Effects Bill and programmatic development under a new Environmental Protected Authority (EPA), Section Two notes that future policy is needed in the area of risk assessment, permitting, administrative processes (such as due process), and evidence-based decision-making, among other institutional practices that are developing and being implemented in other countries. A number of principles of ocean governance are described in this section, including the adoption of a public trust doctrine, a compatible use criterion in marine planning and decision-making, the value of protected marine ecosystem services, among others.

Section Three provides a case study of offshore marine aquaculture, and describes a number of planning tools and policy instruments that support an integrative approach to marine planning and decision-making. This section also explores the diverse scientific epistemologies that are shaping aquaculture policymaking and planning. A particular emphasis is on the need to integrate the values of ecology, economy and equity. What is needed is a more integrative and holistic approach to address multiple impacts, multiple scales, and multiple sectors.

Section Four describes a number of strategic elements that support integrative, ecosystem-based planning with a particular emphasis on collaborative decision-making and planning, and marine spatial planning. International best practice supports an adaptive approach to resource use and addressing the impacts of human activities in marine areas.

Section Five concludes the report.

1. BEYOND THE BLUE HORIZON

> *Not only is no person an island, no island is an island. Albatrosses inhabit only a few islands. Humans inhabit only one, a blue and white marble surrounded by a soap bubble, afloat the great dark sea of space*. Carl Safina, *No Island Is an Island* (2011).

The Pacific Ocean is the largest ecosystem on the planet and covers 34 percent of the globe. It is one of the most vulnerable ecosystems on the planet. Given the importance of the ocean, the Okeanos Foundation funded the construction of a fleet of seven Polynesian vakas (sailing vessels) using designs based on old drawings of Polynesian canoes. Under a project entitled *Vaka Moana*, voyagers from 14 island nations, including Tahiti, Fiji, the Cook Islands, New Zealand, Tonga, New Guinea and Samoa set sail from New Zealand in February 2011 relying on only the stars to guide them and the wind and sun to power their journey.[1] Each vaka includes a large solar panel on deck to garner the energy from the sun. No fossil fuels are used. Each vaka's navigator has been taught the ancient wisdom of celestial navigation, sailing by the stars. The voyage of the vakas symbolizes the need to protect the ocean. The vakas travel the route of the green sea turtle, the flight of the albatross, sooty shearwater, and migration of whales. These beautiful sailing vessels reflect a great wisdom based on respect for the sea and our connection to one another.

From Auckland, New Zealand, the seven vakas carrying 120 sailors stopped over in the Marquesas Islands, sailed throughout French Polynesia, visited Tahiti, and this past June dropped anchor in Honolulu, Hawaii. In June I was invited to participate in the welcoming celebration in Hawaii. As I floated on my back over the coral reefs off Diamond Head awaiting the vakas, the clouds were painted a brush pink hue in a foreground that was the bluest salt smile. The sunset was about to burst open the night. On the blue horizon, the vakas had travelled over 48,000 miles to Honolulu.

In Hawaii, the Okeanos Foundation brought together eighty scientists, film makers, native Hawaiians, poets, writers, activists, and the sailors of the vakas to discuss the future of the ocean, and to exchange ocean stories while drinking kava. The kava root is used to produce a drink having sedative and anaesthetic properties, and is consumed throughout the Pacific Ocean cultures of Polynesia including Hawaii, Vanuatu, Melanesia and some parts of Micronesia. Kava is primarily consumed to relax without disrupting mental clarity. It has been used for hundreds of years to mediate disputes, unite people, and foster peace. At the kava event, a single message from the diverse participants emerged – we are on one large vaka, and the ocean needs our support as we sail together in a turbulent storm that includes the threats brought on by climate change and major biodiversity loss. Without the life-giving values of a healthy ocean, we are more vulnerable and sensitive to the changes in our climate and environment.

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[1] For a description of the voyage across the Pacific Ocean, see: http://pacificvoyagers.org/the-voyage

Michael Vincent McGinnis (2011).

From Hawaii, the sailors travelled up to the northeast Pacific, to San Francisco, down the California coast to Monterey, and then to southern California in August 2011. In June 2012, the sailors of the seven vakas returned from this voyage to the South Pacific Islands of their origin. The voyage included a ceremony at the Festival of Pacific Arts in the Solomon Islands in July 2012. This remarkable journey reflects a hopeful response to the myriad challenges that maritime cultures and Pacific islanders face today.

1.1 The Islands of Aotearoa

While the four hundred islands of Aotearoa are *in* a vast and dynamic ocean, the maritime peoples of Zealandria are *of* the Pacific. Māori arrived by canoe, or waka, with wisdom and knowledge of the stars, winds and waves, the first peoples of New Zealand to settle and change the landscape. Centuries later, European explorers travelled by boat, and with new Western ideals settled coastal landscapes inhabited by iwi. The maritime foundations of the diverse peoples of Oceania remain a driving force that is irrevocably embedded in diverse cultures and customs across the Pacific. New Zealand's maritime heritage is a reflection of a community of diverse voices, which is also irrevocably connected to the animals, plants and insects that inhabit Aotearoa.

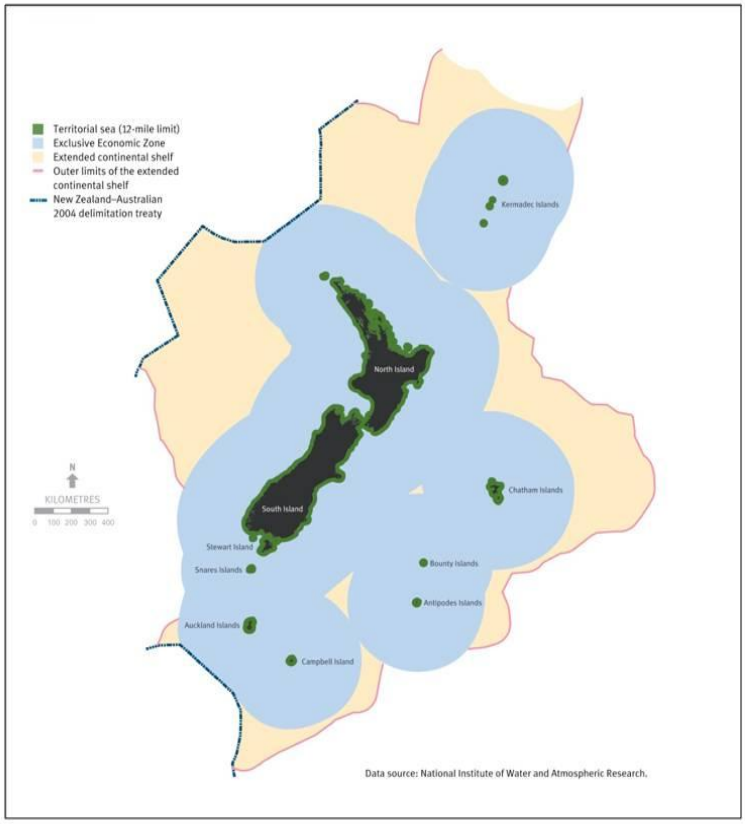
After its declaration of an Exclusive Economic Zone (EEZ) in 1978, New Zealand, with a coastline longer than 19,000 km has jurisdiction over 3million kms^2 of ocean (Figure 1). New Zealand's EEZ is the fourth largest in the world, with an area of about 15 times that of the land mass (or 5.7 percent of the world's EEZ).[2] With the legal continental shelf extensions,

[2] MINISTRY FOR THE ENVIRONMENT, IMPROVING REGULATION OF ENVIRONMENTAL EFFECTS IN NEW ZEALAND'S EXCLUSIVE ECONOMIC ZONE (August 2007). The discussion paper builds on national government's interest to strengthen the permitting process of future marine activities within the EEZ by developing an 'effects' based approach to environmental assessment. The discussion paper notes, 'The EEZ is managed as a public commons, not as private property. Decisions on uses should be for the greatest national benefit. When one activity has a negative impact on another, efforts should be made to avoid or mitigate adverse effects when the application is considered' at p. viii. In August

New Zealand's current ocean area jurisdiction spans more than 20 times the area of its land – 1.2 percent of the earth's surface area.

New Zealand's Ocean Areas
New Zealand Exclusive Economic Zone area: 4,300,000 km^2
Legal continental shelf extension area: 800,000 – 2,400,000 km^2
New Zealand territorial sea area: 169,000 km^2

Figure 1: New Zealand Exclusive Economic Zone



Source: Data and Figure from the National Institute of Water and Atmospheric Research (NIWA)

The marine life of New Zealand has global significance. New Zealand is a 'Noah's ark' of species diversity. Its oceans contain between a third and three-quarters of its endemic species. Many of these are unique to New Zealand.[3] The high level of endemic species and the range

2011, the government's EXCLUSIVE ECONOMIC ZONE AND CONTINENTAL SHELF (ENVIRONMENTAL EFFECTS) BILL OF 2011 was introduced that would give authority under a new Environmental Protection Authority (EPA) to permit activities within the EEZ.

[3] For a comprehensive review of the marine environment, see MINISTRY FOR THE ENVIRONMENT, THE NEW ZEALAND MARINE ENVIRONMENT CLASSIFICATION (June 2005), and D.P. Gordon et al., *Marine Biodiversity of Aotearoa New Zealand*, 5 PLoS ONE e10905 (2010) doi:10.1371/journal.pone.0010905.

of marine habitats associated with New Zealand make the county's EEZ one of the top hot spots for biodiversity in the world.[4] New species are found every year off the coast.[5] Over 17,000 species of marine life have been identified in New Zealand's seas, including over 4,000 that have been collected, but which have yet to be described. This comprises just over 30 percent of all known biodiversity associated with the country.[6] While the number of identified fishes has doubled over the past 15 years, and is increasing at a rate of 15 species per year,[7] the number of undiscovered marine species in New Zealand waters likely exceeds the number of species that have been identified.[8]

Albatross on Stewart Island. Lou Hunt (2009)

New Zealand's marine area hosts a very high diversity of seabirds and marine mammals. Almost three-quarters of the world's penguin, albatross and petrel species, and half of the world's shearwater and shag species are found in the country's islands and coastal areas. In addition, nearly half the world's species of whales and dolphins have been sighted in New Zealand, including nine species of baleen whales, 17 members of the dolphin family, and 12 species of beaked whales.[9] Many of the migrating species depend on a much broader ecological area that supports important feeding grounds in the northern Pacific Ocean. For example, the sooty shearwater nests in the southern islands of New Zealand but depends on the north Pacific marine area off southern California.

The biophysical scale of the New Zealand's marine environment is a key factor that influences management and planning. A range of values are carried by healthy marine

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[4] R.T. Kingsforce, et al., *Major Conservation Policy Issues for Biodiversity in Oceania*, 23 CONSERVATION BIOLOGY 834.

[5] Based on new models, for instance, there is a more comprehensive understanding of synergistic impacts on coastal marine ecosystems, *see*: B.S. Halpern et al., *A global map of human impact on marine ecosystems*, 319 SCIENCE 948 (2008) and E.L. Miles, *On the Increasing Vulnerability of the World Ocean to Multiple Stresses*, 34 ANN. REV. OF ENV. AND RES. 17 (2009). With respect to new planning tools, *see*: K. St. Martin and M. Hall-Arber, *The missing layer: geotechnologies, communities, and implications for marine spatial planning*, 32 MARINE POLICY 779 (2008).

[6] Gordon et al., at 3.

[7] *Id*.

[8] *Id*. at 12.

[9] *Id*. at 10.

ecosystems. These values are not limited to the economic use of marine areas, and support the diverse maritime values that sustain cultures across generations. Management is not merely a question of balancing uses or addressing environmental effects or mitigating the impacts of a proposed resource use. Marine governance is ultimately a question of how well society can integrate the multiple-values supported by the life-giving character of marine areas. The types of institutional tools and instruments that are used to address these challenges influence the future state of marine areas and the health of maritime cultures.

With increasing evidence of large-scale migration of marine species, such as marine mammals and sea birds, it is important that New Zealanders recognize their own role as marine stewards: New Zealand needs to respond to the increasing pressures, threats and associated impacts that human beings have on marine ecosystems across the territorial sea and the EEZ. The country should develop new interdisciplinary scientific programmes that can better assess the multiple-values and impacts that human beings have on marine ecosystems. Recognizing New Zealand's role as an ocean steward is a first step to the creation of a more sustainable approach to marine governance. The foundation of sustainable resource use is based on the management goal of sustaining the economic goods and ecosystems services provided by healthy marine systems. The health and integrity of the marine ecosystems associated with New Zealand is dependent on a range of factors, including the manner in which threats, pressures, and stressors are addressed by institutions.

> In its report the Ministerial Advisory Committee on Oceans Policy wrote in 2001, 'An Oceans Policy should reflect and be responsive to the inter-connections between the air, sea and land and to the physical and biological dynamics of the ocean and along the coastline. Decisions made about land-based activities must take into account their effect on the sea. Management responses should be of an integrated nature and reflect natural systems such as ecosystems rather than imposed boundaries... There is strong support for the need to act to protect the health of marine eco-systems. This needs to be defined, threats to it identified and management tools matched to the nature of those threats. There was also concern at general degradation of marine ecosystems arising from many uses, including fishing activity. There was widespread support for the level of marine protection necessary to ensure the health of marine ecosystems but desire to have a range of flexible and responsive tools available to achieve that. Protection measures should take into account customary use and management.'[10]

With respect to the biophysical scale of marine ecosystems, there is growing concern that the existing governance structure is poorly equipped to address the transboundary effects of marine resource use and impacts. Marine ecosystems transcend administrative, political and economic jurisdictions and boundaries. The boundaries between one island's marine area and that of another are soft, not hard; there is a complex interrelationship and linkage between peoples and places that exist across the islands of New Zealand. Political, economic and administrative jurisdictions that have been established by coastal states rarely reflect the complex relationships and linkages that exist in marine ecosystems. Indeed, this scale mismatch is recognized as one of the primary factors contributing to the mismanagement and

[10] HEALTHY SEA: HEALTHY SOCIETY. TOWARDS AN OCEANS POLICY FOR NEW ZEALAND**.** REPORT ON CONSULTATION UNDERTAKEN BY THE MINISTERIAL ADVISORY COMMITTEE ON OCEANS POLICY (September 2001) at 4-5.

unsustainable use of ecosystems. In addition, the socio-ecological relationships that exist across users of marine areas, including traditional and industrial activities, need to be recognized and understood by marine planners and policymakers.

Eighty percent of the world's biodiversity lives in the ocean. New Zealand plays a significant role in the governance of the Pacific Ocean. Large-scale features of the climate or atmosphere, oceanographic currents, biology, and human activities influence and contribute to the health of this marine ecosystem.

Due to the dynamic ecology of the oceanic processes, it is important to recognize that no single use, such as commercial fishing, or management sector takes place in isolation from another. Impacts, pressures and stressors on marine ecosystems often originate on the land; land-use activity, such as farming, are important factors that contribute to health and integrity of marine life. (This is explored further in Section Three). This section provides a general overview of the major themes and goals of this report. The section begins with a general characterization of the status of New Zealand's marine areas based on recent surveys conducted by members of the Crown Resource Institutes (CRIs) and other scientific organizations, such as The Cawthron Institute. The section notes that New Zealand will likely face increasing conflicts over marine areas and marine sectors given the country's interest is expanding the use of the EEZ. The 'race for marine space' is shaped by the level of use and proposed future of marine activities that includes proposed offshore oil and minerals development, an increase in marine areas used for aquaculture or marine farming within the territorial sea, and other activities that may put extra pressures on marine species and habitats. There is also increasing evidence of the impact of a range of factors associated with climate disturbance. The section includes a number of general recommendations that can be used by New Zealand to strengthen and improve the existing management framework to address conflict and the biophysical scale of the marine environment.

1.2 The Nomos of the Earth

The *Nomos of the Earth* is Carl Schmitt's most influential work on international relations. Published in 1950, he describes the origin of the Eurocentric global order, which Schmitt dates from the discovery of the 'New World'. This 'discovery' took place through an increasing use of maritime trade and colonization of lands long inhabited by indigenous peoples. Across the South Pacific, trade by sea and the use of marine resources contributed to the early European settlements of Aotearoa.

Colonization of the islands across Oceania was supported by a myth of an ocean as an expanding frontier with endless resources. This myth fails to incorporate an understanding of the importance of the indigenous maritime traditions and the biophysical limits to marine ecosystems. Notable in Schmitt's discussion of the European epoch of world history is the role played by the ideals of global economic development and growth, which Schmitt argues replaced the 'Old World as the centre of the Earth' and became the arbiter in European and world politics. This view that European values have replaced the traditional values held by Pacific Islanders has hardly been the case in New Zealand and the other islands of Oceania. Yet island peoples are struggling to maintain their unique language, knowledge, and traditional values in a context that includes global economic development and global climate change. In addition, with the loss of marine biodiversity, we are currently witnessing the loss of many island maritime cultures and traditions across the world.

It is important to sustain and protect the diverse cultural heritages of island peoples – their customs, languages, and traditional ecological knowledge (TEK). Maritime heritage is a key facet of the management of human behaviour and marine resource use. Indigenous tradition and knowledge are also recognized as essential elements of a more comprehensive approach to marine planning and decision-making. [11] TEK can contribute to conservation of biodiversity, rare species, protected areas, ecological processes, and sustainable resource use.[12] For instance, there is increasing recognition of the role of TEK as an essential foundation to the long-term sustainability of maritime societies across the South Pacific. Practices largely abandoned by more western approaches to resource management are still found in traditional societies. These practices are based on the knowledge of particular places, habitats, and species that are held by indigenous societies, the language used by these peoples, and their cultural practices that support and sustain the ecosystems they depend on.

The peoples and places of the sea are interconnected and influenced by global processes that include not just the currents, winds, and waves but the governance structures and institutional arrangements that are created. The biophysical scale of New Zealand's EEZ includes complex relationships and linkages between species and habitats that are influenced by the diverse peoples of the Pacific Ocean, climate, and physical processes, such as its currents and eddies.

New Zealand has authority to address issues of marine use and habitat protection within the EEZ. This study's focus is on domestic policy associated with marine uses and impacts of the EEZ and the territorial waters (referred to as New Zealand's ocean jurisdiction) rather than international governance issues on the high seas or global climate-related concerns brought on by greenhouse emissions. Domestically, the use of New Zealand's marine areas of ocean jurisdiction includes traditional or indigenous activities and industrial-scale activities. The management of the ocean jurisdiction is shaped by New Zealand's political system, which is very different from most countries. New Zealand's political organisation is: a unitary system that embraces a strong emphasis in regionalism (including the role of regional councils in the management of the territorial sea); a unicameral parliamentary and Westminster system; and one that lacks a formal written constitution. The management of public trust resources remains under the Crown. Furthermore, New Zealand's governance framework is influenced by obligations set forth in the Treaty of Waitangi, which was negotiated between the British and Māori in 1840.

New Zealand is required to support a range of obligations under international treaties, such as the United Nations Convention of the Law of the Sea (UNCLOS), with respect to its extended continental shelf.[13] A sample of international treaties and conventions are indicated in Figure 2. Under international conventions and framework agreements New Zealand is responsible for and has management jurisdiction over an essential part of the ocean that is used by a range of species and maritime peoples. International laws and framework agreements, such as the UNCLOS, require that New Zealand act as good steward of the

[11] Traditional ecological knowledge plays an important role in monitoring, responding to, and managing ecosystem processes and functions, with special attention to ecological resilience. See, for example, F. Berkes, J. Colding, and C. Folke, *Rediscovery of Traditional Ecological Knowledge as Adaptive Management*, 10 ECOLOGICAL APPLICATIONS 1251 (2000).

[12] Id.

[13] D. ROTHWELL AND T. STEPHENS, THE INTERNATIONAL LAW OF THE SEA (2010).

EEZ.[14] UNCLOS lays down the fundamental obligation of all states to protect and preserve the marine environment. It further urges all states to cooperate on a global and regional basis in formulating rules and standards and otherwise take measures for the same purpose. Coastal States are empowered to enforce their national standards and anti-pollution measures within their territorial sea. Every coastal State is granted jurisdiction for the protection and preservation of the marine environment of its EEZ. For example, coastal States have the obligation to control, prevent, and reduce marine pollution from dumping, land-based sources or seabed activities subject to national jurisdiction, or from or through the atmosphere. Accordingly, New Zealand has access and right to use marine resources of the EEZ, but this use is also predicated on the protection of marine areas. The management of resource use and human impacts, including the need to develop adaptive strategies to address climate disturbance on marine ecosystems associated with New Zealand, are fundamental issues facing the country.

Figure 2: A Sample of Obligations under International Agreements and Conventions

- 'Protect and preserve the marine environment' (UNCLOS – ratified 1996)
- Take all measures necessary to 'prevent, reduce and control pollution of the marine environment…' (UNCLOS)
- 'Protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life' (UNCLOS)
- Require environmental impact assessment of proposed projects likely to have significant adverse effects on biological diversity (Biodiversity Convention – ratified 1993)
- Establish a system of marine protected areas (Biodiversity Convention)
- Application of ecosystem-based approach by 2010 and representative network of MPAs by 2012 (Plan of Implementation)

While large-scale human activities and impacts influence the conditions of the climate and ocean, a primary management concern is how to control human behaviour, use, and associated impacts that occur in the country's ocean jurisdiction. Based on a 2010 Ministry of Fisheries report entitled *Assessment of Anthropogenic Threats to New Zealand Marine Habitats*, MacDiarmid and colleagues characterize the primary threats and pressures on the country's marine ecosystems.[15] These scientists used a model developed in the United States (USA), and being used by the United Nations Environmental Program (UNEP). The important study by MacDiarmid and colleagues show that the two top threats and

[14] OCEANS POLICY SECRETARIAT, SETTING THE SCENE: NEW ZEALAND'S OCEANS-RELATED OBLIGATIONS AND WORK ON THE INTERNATIONAL STAGE, WORKING PAPER ONE (14 March 2003) and OCEANS POLICY SECRETARIAT, INTERNATIONAL OCEAN ISSUES, WORKING PAPER ELEVEN (14 March 2003)

[15] ALISON MACDIARMID, ANDY MCKENZIE, JAMES STURMAN, JENNY BEAUMONT, SARA MIKALOFF-FLETCHER, JOHN DUNNE, ASSESSMENT OF ANTHROPOGENIC THREATS TO NEW ZEALAND MARINE HABITATS, MINISTRY OF FISHERIES, FINAL PROJECT REPORT (December 2010). A comprehensive survey of important ecological indicators for New Zealand's oceans can be found at M.H. PINKERTON, HEADLINE INDICATORS FOR THE NEW ZEALAND OCEAN, Paper prepared for NIWA (2010). The 'ocean health index' should be further developed based on the work (noted above) that includes an array of available indices that, with further monitoring, can assess trends in the general status of important coastal marine areas of the EEZ. This type of index could also play a valuable role in future effects-based environmental assessments and risk analysis. However, the development of such an index requires stronger relationships between members of the diverse scientific communities, including those scientists conducting ecological monitoring under the Crown Research Institutes.

vulnerabilities stem from human activities associated with climate disturbance, which are driven by the continued reliance on fossil fuels across the world, and by human activities in coastal areas, including the impacts of farming.[16] By a considerable margin, the highest-scoring threat is considered to be ocean acidification, a consequence of higher CO_2 levels in the sea. The second highest overall scoring threat is rising sea temperatures resulting from global climate change. These results indicate the importance of international threats to New Zealand's marine ecosystems. The biophysical scale of global climate change, including the rise in sea surface temperature, increasing acidification of marine areas, loss of biodiversity, and other biochemical changes to marine areas are threats that are well beyond the control of New Zealand to address.

Today, there is great interest in developing marine resources and increasing demand for resource use and ocean space within New Zealand's ocean jurisdiction. The country is expanding resource use in marine areas, and has leased major areas of the EEZ for deep seabed mining and offshore oil and gas activity. Within its territorial sea New Zealand is expanding areas for aquaculture production, including sensitive areas such as the Marlborough sounds. New aquaculture development will likely take place within the territorial waters, including coastal areas for such new species as sea cucumbers. There are opportunities to develop marine farming in deeper marine areas beyond the territorial waters as well. Given the winds and tidal flows of the country, there is also potential for new renewable energy development in marine areas.[17]

1.3 The Themes of this Report

Internationally, policy innovation in the area of marine governance has been a response to a crisis or catastrophe. Such a reactive response should be avoided. For instance, the history of marine policy in the USA reflects a series of institutional responses to oil catastrophes. Many of the federal and state environmental laws and programmes there were created in response to the 1969 oil spill offshore Santa Barbara, California.[18] Today, the global crisis in the world's oceans is much deeper; the decline in the health and integrity of the oceans should be recognized as a catastrophe. The level of marine biodiversity loss is metaphorically akin to a *silent spill* insofar as society has not responded to the social, economic and ecological factors contributing to the large-scale degradation of ecosystems. There is no simple acquiescence or institutional resolution to the dramatic changes that human beings are imposing on the world's oceans. As this report argues, the dominant approach to marine management that supports large-scale economic development and the utilitarian distribution of resources at global scales needs to change to an approach that is more holistic, integrative and ecosystem-

[16] For a characterization of the impacts of climate disturbance on New Zealand's biodiversity, see: W. GREN, CLIMATE CHANGE IMPACTS ON NEW ZEALAND'S BIODIVERSITY. A background paper prepared for the Parliamentary Commissioner for the Environment (November 2006), and more generally M. MCGLONE, T. CLARKSON, AND B. FITZHARRIS, UNSETTLED-OUTLOOK: NEW ZEALAND IN A GREENHOUSE WORLD (1990).

[17] Ian Boisvert, *Lifting the Looking Glass: How Tradable Coastal Occupation Could Enable Ocean Renewable Energy in New Zealand*, 15 NEW ZEALAND JOURNAL OF ENVIRONMENTAL LAW (2011). ERC Research Paper No. 12/7. Available at SSRN: http://ssrn.com/abstract=2034006

[18] NATIONAL COMMISSION ON THE BP DEEPWATER HORIZON OIL SPILL AND OFFSHORE DRILLING (2011) *at* 23.

based.[19] A more proactive approach to manage marine resource use and to address the multiple impacts and pressures from climate disturbance is warranted today.

The report's primary goal is to strengthen and improve the marine governance framework so that New Zealand can better protect marine life and sustain resource use across generations. A number of recommendations are described in each section of the report. A summary of recommendations that should be adopted in the short term are summarized in the final section. New Zealand has a rich history of policy innovation that supports the principle of sustainability in many sectors, such as commercial fishing activity, and is considered a world leader in the management of commercial fisheries. One recent emphasis is the need for marine policy to identify and address environmental effects. A careful examination and determination of environmental effects requires qualitative and quantitative assessments of cumulative impacts and the non-consumptive values of marine ecosystems. Determination of cumulative impacts assessments also requires that marine planners and managers identify and address the larger-scale synergistic impacts of multiple-use, including air and water pollution from commercial vessels, fishing activities, and other threats from human activities, such as the impacts of climate change, marine habitat loss, and the introduction of non-native invasive species on biodiversity. New planning tools and policy instruments should be adopted in New Zealand to support a more integrative approach to multiple use management of marine ecosystems.

As this section shows, a concerted effort began in 1999 to develop a more integrated, comprehensive, and ecosystem-based approach to marine policy across resource sectors. With these early developments in mind, future marine resource use should be made more compatible with the value of biological integrity. This is not merely a management issue of planning for sustainable resource use, maximizing resource allocation or yield, or balancing competing interests for resource use while protecting marine areas. The challenge is to integrate uses across a common marine area while prioritizing biodiversity protection so that the use of the area can be sustained through generations. Maintaining biological integrity requires that elements of ecosystem processes, structures and functions (such as biological diversity) are preserved.[20] This will be more difficult in a context of climate change.

Recognizing and acknowledging the biophysical limits to the oceanic commons is a primary theme of this report. The over-use of marine resources and climate impacts are diminishing the life-giving values that are carried by healthy marine ecosystems. One consequence is that human beings are more vulnerable to the insecurities brought on by both the synergistic impacts of climate change and the dramatic decline in the productivity of marine systems.[21] The multiple pressures of climate change and the over-use of marine resources are reflected in the decline of protein from the sea (e.g., wild fish), loss of soil and agricultural production (e.g., the decline of carbohydrates such as rice and wheat), drought, floods, and the decline of

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[19] K. MCLEOD AND H. LESLIE. ECOSYSTEM-BASED MANAGEMENT FOR THE OCEANS (2009). For a characterization of the importance of protecting LMEs, *see more generally*, SUSTAINING THE WORLD'S LARGE MARINE ECOSYSTEMS (K. Sherman et al., eds., 2009).

[20] B.S. Halpern et al., *Placing marine protected areas onto the ecosystem-based management seascape*, 107 PNAS 18312 (2010). Halpern and colleagues found that fishing activities are responsible for more than fifty percent of the overall impact to coastal marine ecosystems across the world, and that in some areas, more than eighty percent of the cumulative impact on ocean health comes from over-fishing *at* 18314.

[21] BIODIVERSITY, ECOSYSTEM FUNCTIONING, AND HUMAN WELLBEING: AN ECOLOGICAL AND ECONOMIC PERSPECTIVE (S. Naeem, D. Bunker, A. Hector, M. Loreau, C. Perrings, eds., 2009).

clean drinking water and clean air. These are signs of humanity's rising ecological insecurity.[22]

This section has several goals. Overall, this section is a primer or introduction to the major pressures that threaten the general health and integrity of marine ecosystems associated with New Zealand' EEZ. Ecology and socio-economic factors contribute to the challenge of governing the commons. New Zealand has not fully recognized the multiple values carried by the marine system, which certainly transcend mere economic value. New Zealand has undertaken no comprehensive analysis of the value of the ecosystem goods and services associated with the EEZ. There is also a paucity of data on a range of marine habitats, such as the benthos, in New Zealand's EEZ. Yet, future decisions and plans will need to be made with respect to the level of marine resource use and biodiversity protection.

> **Recommendation 1.1:** That no single marine resource use or activity, such as commercial and recreational fishing, be considered and managed in isolation from other marine activities and that the synergistic and cumulative impacts from human use of marine ecosystems, including the impacts of land-use activity, such as farming, on marine systems, be addressed in new programmatic and environmental policies using available technical tools and methodologies.

The existing management marine governance framework is described in Section Two, which provides an overview of the institutional setting, including a discussion of the link between regional councils and central government, the science-policy interface, the planning and policymaking processes, and factors that can contribute to the strengthening of institutional capacity and capability, such as the cultivation of planning and professional expertise in the area of marine management. The management tools developed by national government emphasize market-based, community-oriented governance instruments that support a sector-by-sector approach to marine resource use. Central government has adopted approaches to marine resource management that favour 'self-management', as in the case of commercial fishing quota management and planning, and voluntary measures, such as co-management strategies. Unlike most other commonwealth countries and the USA, the jurisprudence of New Zealand does not include a 'public trust doctrine'[23] with respect to commonly held resources (e.g., oil and other minerals). In New Zealand public resources are considered to be under Crown ownership. In many cases the country favours the 'privatization' of Crown resources, such as commercially valuable fishes. In addition, the system of laws and policies in New Zealand relies on regional councils to develop and implement programmes for a range of environmental concerns within territorial waters, including permitting activities for coastal land-use activities within catchment basins. The ability of regional councils to address complex marine issues within the territorial sea remains a subject of concern given the lack of resources, the lack of scientific and professional expertise, and the lack of institutional capacity.

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[22] UNITED NATIONS ENVIRONMENT PROGRAM EMERGING ISSUES, ENVIRONMENTAL CONSEQUENCES OF OCEAN ACIDIFICATION: A THREAT TO FOOD SECURITY (2010). With respect to the impacts of climate change and other human activities on the world's large marine ecosystems, *see* SUSTAINABLE DEVELOPMENT OF THE WORLD'S MARINE ECOSYSTEMS DURING CLIMATE CHANGE: A COMMEMORATIVE VOLUME TO ADVANCE SUSTAINABLE DEVELOPMENT ON THE OCCASION OF THE PRESENTATION OF THE 2010 GÖTEBORG AWARD (K. Sherman and S. Adams, eds., 2010).

[23] *See* M. Turnipseed et al., *The Silver Anniversary of the United States' Exclusive Economic Zone: Twenty-five years of Ocean Use and Abuse, and the Possibility of a Blue Water Public Trust Doctrine*, 36 ECOLOGY L.Q. 1 (2009).

Section Two includes a case study of offshore oil and mining, and an analysis of important policy issues and marine activities that are developing in New Zealand. The case study is devoted to an evaluation of the politics over offshore oil and deep sea bed minerals development, including a review of the recent proposed Environmental Effects Bill introduced in August 2011. Major fisheries and marine transportation continue to be the primary activities that are regulated by government in the ocean jurisdiction of the country. The report does not represent a comprehensive analysis of all existing or future marine activities or an analysis of all marine-related policies or programmes. Yet it is important to recognize that 95 percent of the New Zealand's trade is by sea, and overseas merchandise trade was worth an estimated $46 billion (2010-2011) in New Zealand.[24] Section Two notes that future policy is needed in the area of risk assessment, permitting, administrative processes (such as due process), evidence-based decision-making, adaptive planning to address climate change, among other institutional practices that are developing and being implemented in other countries.

Section Two also reviews the existing framework for marine life protection in New Zealand. Recent initiatives in other countries and under the United Nations Environmental Program (UNEP) emphasize integrative, ecosystem-based planning, decision-making and policymaking to protect marine life.[25] There is an urgent need to protect large areas of marine ecosystems from the impacts of fishing and other extractive activities, such as mining and offshore oil development. Jane Lubchenco, the current US Under-Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, and Laura Petes warn, 'Many ocean ecosystems appear to be at a critical juncture. Like other complex, nonlinear systems, ocean ecosystems are often characterized by thresholds or 'tipping points', where a little more change in a stressor can result in a sudden and precipitous loss of ecological functionality.'[26] New Zealand has not set aside the level of representative marine habitat within a network of marine reserves that is needed to protect key components of marine ecosystems.[27]

Future programmes and initiatives should include new planning tools and policy instruments, such as integrated risk assessment; the creation of ocean health indices for monitoring; ecosystem-based marine spatial planning; and, comprehensive permitting processes and planning activities for resource use in the offshore continental shelf, including proposed offshore oil and gas exploration activities and renewal energy development. In addition to the description of a number of institutional and democratic principles that should support marine governance in the future, new planning tools and policy instruments are described in this report.

Section Three provides a case study of marine aquaculture, and describes a number of planning tools and policy instruments that support the principles of integrative planning, and ecosystem-based marine governance. The section draws on experience in other countries in the development of new tools and instruments that support marine ecosystem-based planning

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[24] NEW ZEALAND MINISTRY OF TRANSPORT. Available at: http://www.transport.govt.nz/ourwork/tmif/ft015/

[25] C. EHLER AND F. DOUVERE, VISIONS FOR A SEA CHANGE, REPORT OF THE FIRST INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION AND MAN AND THE BIOSPHERE PROGRAMME, IOC MANUAL AND GUIDES, THE BIOSPHERE no. 48, IOCAM Dossier no. 4, 12 (UNESCO 2007).

[26] J. Lubchenco and L.E. Petes, *The Interconnected Biosphere: Science at the Ocean's Tipping Points* 23 OCEANOGRAPHY 115 (2010) *at* 115-116.

[27] With respect to the inadequacy of New Zealand's benthic protected areas, *see*: J. Leathwick et al., *Novel methods for the design and evaluation of marine protected areas in offshore waters*, 1 CONSERVATION LETTERS 91 (2008) *at* 96-99.

and management. An approach of 'balancing' competing use is supportive of a more traditional and conventional resource management approach, which includes emphasis on sector-by-sector management and resource allocation of marine space. New Zealand tends to focus on such issue-specific policy development which can fail to respond to and address the multiple effects of a range of marine activities. A sector-by-sector approach also can lead to conflicts between resource management agencies and a lack of coordination across sectors to address ecosystem-wide issues and effects.

Governance is made more complicated by the fractured framework of laws, regulations, and practices that have been developed in New Zealand over the past thirty years. With respect to a sector-by-sector approach to marine management, Lester et al write: '[T]here is a historical legacy of piecemeal management that has largely focused on single sectors of activity and failed to consider marine ecosystems as interconnected wholes.'[28] As an example, traditional methods of single species and single sector fisheries management should give way to broader ecosystem-based approaches that include factors such as changes in fish biomass, the sources or sinks of marine fish species, levels of primary and secondary productivity, levels of by-catch from fishing, and general food web characteristics. As Rosenberg and Sandifer maintain, 'Under sector-by-sector management, trade-offs within a sector may be considered, but those among sectors are largely ignored and often remain unaccounted for.'[29] Elliott Norse argues, 'This situation was hardly problematic when ample distance remained between swinging fists and noses, but in the face of today's increasing demands, a system of ocean governance less likely to give us healthy oceans and sustainable economies would be difficult to design. Without strong interagency coordination, sectoral management *cannot* work.'[30] New policy tools and instruments are needed that support a more integrative, ecosystem-based approach to marine systems.

Today there is a lack of institutional capacity and policy to address future conflicts between users, and between users and ecosystems.[31] The current marine governance framework in New Zealand is highly fragmented with each sector managed in isolation from others. A more integrative and holistic approach to address multiple impacts, multiple scales, and multiple sectors is needed. International best practice supports an adaptive and integrated approach to resource use and marine life protection. The value of 'compatible use' is being developed and implemented in a range of marine governance frameworks to sustain resource use across generations and to improve marine life protection measures.[32] Section Four provides a number of recommendations that support the development of collaborative, integrative approaches to marine ecosystem-based planning. These recommendations include

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[28] S. Lester et al., *Science in support of ecosystem-based management for the US West Coast and beyond*, 143 BIOLOGICAL CONSERVATION 576 (2010)

[29] A.A. Rosenberg and P. A. Sandifer, *What do managers need?* (K. McLeod and H. Leslie, eds. ECOSYSTEM-BASED MANAGEMENT FOR THE OCEANS, 2009) at 13.

[30] E.A. Norse, *Ecosystem-based Spatial Planning and Management of Marine Fisheries: Why and How?* 86 BULLETIN OF MARINE SCIENCE 179 (2010) at 184.

[31] The discuss of potential competition and conflict over marine resources is depicted in OCEAN POLICY SECRETARIAT, ADAPTING TO FUTURE CHALLENGES, WORKING PAPER NINE (14 March 2003). The paper notes, 'Humanity's influence on the sea has increased markedly over time. Growing populations, patterns of urbanization and technological advances have enlarged our ecological footprint at a rapid rate and have led to increasing conflict over the use of scarce resources,' at page 2.

[32] For a review of the principle of 'compatible use' see S.E. Farady, *'Compatible Use' Within National Marine Sanctuaries: Determining Implementation*, 12 OCEAN & COASTAL L.J. 1 (2006).

strategic and planning elements and goals that support collaborative planning and marine spatial planning.

Each section of this report offers a number of recommendations to support an ecosystem-based approach to management and planning for New Zealand's marine areas. The management challenge is not simply a matter of improving the management of fisheries or paying more attention to the promise of offshore energy or mineral resources that may exist. Marine governance also requires more than the utilization of collaborative planning techniques or evidence-based decision making. Effective ocean governance is difficult for a range of reasons, including the dynamic and complex relationships and connections that exist in marine ecosystems, and the increasing human demand on these ecosystems. The report does not represent a comprehensive analysis of the specific coastal and marine policies, government arrangements, and activities associated with New Zealand. That has been depicted elsewhere and is the subject of a number of published papers.[33]

New Zealand could become a world leader in marine governance but, as in the past, this will require political will and leadership. In the early 1990s the country was considered a leader in 'green programmes' and in the forefront in the development of new integrative approaches to coastal management and land-use planning.[34] An era of new ocean governance and policy development is emerging in New Zealand, with a renewed focus on development strategies, plans and programmes for the management of the country's EEZ and continental shelf; new resource development, including aquaculture, offshore oil, deep seabed minerals, among other marine activities; and new pilot projects and planning activities for such marine areas as the Hauraki Gulf.[35]

New Zealand's 'green brand' of *100% Pure New Zealand* is a double-sided sword – it represents an opportunity for the country to create the policies and programmes that support the brand and a vulnerability or liability with respect to the potential economic fallout if the country fails to live up to the brand. This is particularly so in marine management and planning. With respect to the importance of tourism to the New Zealand economy, the country has an opportunity to learn from the international community and to be a world leader in the area of marine governance.

[33] P. Helm, *New Zealand's Ocean Future Opportunities and Responsibilities*, PROCEEDINGS OF THE FEBRUARY 1998 SEA VIEWS CONFERENCE (1998); C.M. Risk, *An oceans policy for New Zealand: why, what, how?* NEW ZEALAND PETROLEUM CONFERENCE PROCEEDINGS (24-27 February 2002); A. Foster, *New Zealand's Ocean Policy*, 34 VICTORIA U. OF WELL. L. REV. 469 (2003); RAEWYN PEART AND KATE MULCAHY MANAGING THE MARINE ENVIRONMENT: AN EDS COMMUNITY GUIDE (2005); KATHERINE ANDREWS, GOVERNING THE EXCLUSIVE ECONOMIC ZONE: THE OCEAN COMMONS, CUMULATIVE IMPACTS AND POTENTIAL STRATEGIES FOR IMPROVED GOVERNANCE (2008); J. Vince and M. Haward, *New Zealand oceans governance: Calming turbulent waters?* 33 MARINE POLICY 412 (2009); R. Bess and R. Rallapudi, *Spatial conflicts in New Zealand Fisheries: the Rights of Fishers and Protection of the Environment*, 31 MARINE POLICY 719 (2007).

[34] H.G. Rennie, *The coastal environment*, ENVIRONMENTAL PLANNING IN NEW ZEALAND (P.A. Memon and H.C. Perkins, H.C. eds., 1993), Chapter 7 provides a detailed on the development of integrated coastal management (ICM) in New Zealand under the Resources Management Act of 1991.

[35] HAURAKI GULF FORUM, SPATIAL PLANNING FOR THE GULF: AN INTERNATIONAL REVIEW OF MARINE SPATIAL PLANNING INITIATIVES AND APPLICATION TO THE HAURAKI GULF (2011).

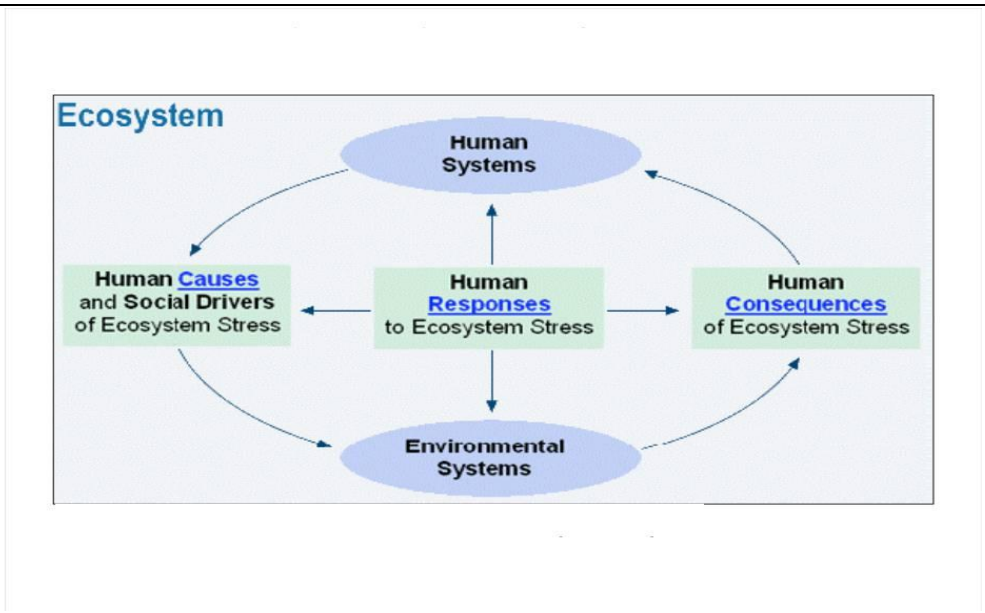
The relative size of New Zealand's population also represents a double-edged sword: while the country lacks the resources to address large-scale features of the marine area associated with the country, the government also has a rich history of policy innovation and adaptation with respect to environmental program development and policymaking. The propensity for risk aversion and fear of experimentation should give way to a more adaptive, precautionary, and creative approach to marine management and planning.

1.4 Approach and Methods

This report is based on the merits of an ecosystem-based approach to marine governance. While recent proposals support marine spatial planning for such areas as the Hauraki Gulf, it is important to recognize that these are only planning tools. Planning tools need to be supported by institutional approaches and management principles that are clearly articulated in policies and statutes. This report incorporates a multi-method analytical approach that includes the use of case studies, documentary analysis, and materials from interviews of key stakeholders and policymakers conducted during 2010 and 2011 in New Zealand.

Responding to the social drivers of ecosystem change is fundamentally an institutional challenge that is taking place at diverse scales – from local or regional scales to large-scale global scales. The approach used in this report is based on an ecosystem-based approach to understand the causes of marine ecosystem stress, and the need to develop appropriate institutional responses to the pressures that contribute to ecosystem stress (Figure 3.

Figure 3: An Ecosystem-Based Approach to Marine Governance



Source: Lubchenco and Petes (2010)

The key to marine governance is to understand those aspects that human beings control. The scale of human consequences of ecosystem stress brought on by global climate change, for instance, may vary across time and spatial locale. New Zealand has relatively little control over large-scale changes to marine and atmospheric conditions brought on by the continued dependence of fossil fuels in industrialized countries. It is a minor contributor to the global

level of greenhouse gases emitted into the atmosphere, but the amount of emissions of these gases is increasing in New Zealand.[36] With respect to management and planning of marine resource use (such as coastal land use, offshore energy and minerals development, air and water pollution, fishing activities), the administrative focus should be on the management of resource use that takes place across particular areas and sectors within the EEZ.

An ecosystem-based approach recognizes the inter-relationships that exist between the social and ecological domains. Institutions of governance are a key determinant of the social domain, and the management frameworks created and developed are important in the general maintenance of ecosystem goods and services. In July 2011 The Royal Society of New Zealand released a working paper on the subject of ecosystem goods and services, noting:

> In the Resource Management Act 1991, sustainable management includes 'safeguarding the life-supporting capacity of air, water, soil, and ecosystems'. Similarly, the Hauraki Gulf Marine Park Act 2000 includes recognition of the 'interrelationship between the Hauraki Gulf, its islands, and catchments and the ability of that interrelationship to sustain the life-supporting capacity of the environment… including the capacity to provide for the historic, traditional, cultural, and spiritual relationship of the tangata whenua … and to maintain the soil, air, water, and ecosystems of the Gulf.'[37]

The Royal Society goes on to describe the importance of biodiversity in the maintenance of the goods and services:

> Biodiversity is often valued for providing resilience to environmental change. More biodiversity generally leads to more resilience, but the relationship is rarely simple. Ecosystem functions, such as nutrient regulation, are provided by the traits of organisms within that ecosystem. Greater genetic diversity provides a greater reservoir of traits that can replace traits lost if particularly important species are lost. More diversity also provides more opportunity for functions to operate across a broader range of conditions. In this way, biodiversity provides the insurance value that future environmental changes will not reduce services. Biodiversity itself provides existence value and option value (in this case, the value of preserving the benefits of unknown future uses of currently unused species and the opportunity for current use of those species). The past fifty years have seen a 'substantial and largely irreversible loss' of biodiversity. New Zealand's unique endemic biodiversity has similarly seen serious decline—an unknown but large loss of common wealth and natural heritage.

With respect to sustainability, the management and control of the multiple impacts of human behaviour is a key consideration in planning and decision-making. The protection of biodiversity is recognized as a key component of a comprehensive management framework in which resource use and associated impact should not be considered in isolation from one another. Synergistic impacts are known to be associated with water pollution, the introduction of non-native invasive species, the over-use of resources (such as over-fishing), habitat

[36] NIWA, CLIMATE CHANGE PROJECIONS FOR NEW ZEALAND (August 2008).

[37] THE ROYAL SOCIETY OF NEW ZEALAND, EMERGING ISSUES: ECOSYSTEM SERVICES (July 2011). In addition, the Society has published a report that includes a review of living and non-living marine resources and the knowledge needed to benefit from them economically. See the Society's publication FUTURE MARINE RESOURCE USE: EMERGING ISSUES (May 2012) available at http://www.royalsociety.org.nz/media/Future-Marine-Resource-Use-web.pdf

destruction (such as the loss of coastal wetlands or the nurseries to the sea), and climate disturbance. While human beings influence the atmosphere and ecological processes that all life on the planet depends on, the management concern is human behaviour. Recognizing the need to change social behaviour is the foundation for this report; with respect to marine policymaking, changing behaviour is the key to sustainability and to the maintenance of ecological security and human wellbeing.

The dynamic process of sustainable marine governance includes two dimensions: a political dimension (governance), where ultimate authority and accountability for action resides, both within and among formal and informal mechanisms; and an analytical, active dimension (management), where analysis of pressure and threats to ecosystems are addressed and responded to in government action. For the future it is important to promote greater integration of policy and management processes through formal strategic planning in marine governance. Scientific and government studies increasingly support a more integrative, adaptive, and ecosystem-based approach to ocean governance; the future policies for marine ecosystems will need to be founded on principles of comprehensive and integrated approaches to ocean management that can sustain the multiple values carried by healthy marine ecosystems. What is needed is a systems perspective that facilitates thinking about interactions among multiple biophysical and human drivers and pressures, and the responses by managers and planners that respond to these interactions. A more holistic, integrative, and ecosystem-based approach to address the multiple impacts and synergistic pressures on systems is recommended.

Recommendation 1.2: That New Zealand conduct a more systematic approach to assess and value the marine ecosystem goods and services associated with the EEZ. An alternative approach is needed today in New Zealand – one that can sustain and maintain the general ecosystems 'goods and services' that are provided by healthy ecosystems. The foundation of a new integrated, ecosystem-based approach to manage multiple use and impacts across sectors is based on the principle that use should be made more compatible with the value of preserving the biological integrity of ecosystems so that goods and services can be maintained across generations. Sections 2–4 describe the types of planning tools and policy instruments that support an integrated, ecosystem-based approach to marine governance. The challenge is to integrate uses across a common marine area while prioritizing biodiversity protection so that the use of the area can be sustained across generations. Maintaining biological integrity requires that elements of ecosystem processes, structures and functions (such as biological diversity) are preserved. This will be more difficult in a context of climate change and increasing marine resource use in the ocean jurisdiction of New Zealand.

1.5 Future Challenges and Opportunities

The justification for an ecosystem-based approach to marine governance is based on the dramatic evidence that the world's oceans are undergoing major change, and that this change is a result of over-use and synergistic pressures and impacts from human activities.[38] Jackson and colleagues describe the history of the collapse of marine ecosystems as one that predates the development of contemporary marine science:

> Overfishing and ecological extinction predate and precondition modern ecological investigations and the collapse of marine ecosystems in recent times, raising the

[38] R. SCHUBERT ET AL., THE FUTURE OCEANS – WARMING UP, RISING HIGH, TURNING SOUR (Special Report. German Advisory Council on Global Change, 2006).

possibility that many more marine ecosystems may be vulnerable to collapse in the near future.[39]

At every level of the food web there is evidence of dramatic decline in the general health of marine ecosystems. Worldwide, the coastal zone and the sea beyond the continental shelf are coming under increasing pressure from human populations. This is certainly the case in New Zealand as the country explores new potential resource development beyond its territorial sea. More than 50 percent of the world's population lives within 100 km of the sea, and with new technological advances there are very few regions or depths of the sea that are not affected by human use and impact. There is also evidence that with increasing population growth we can expect more impact from human over-use and exploitation of marine systems.

With respect to marine governance of the continental shelf and EEZ, there are many challenges facing New Zealanders, such as:

- general scientific uncertainty and a paucity of information with respect to the resources and the more general ecological features of the marine area
- Māori interests and perspectives
- increasing pressures from the multiple use of marine areas, including the impacts of terrestrial inputs from coastal waterways on nearshore marine ecosystems and resources
- the lack of public understanding of the marine opportunities that may exist and the national responsibilities, obligations, and liabilities that are associated with managing offshore marine areas
- the Pacific islands dimension, including New Zealand's responsibilities
- the international relations dimension including obligations and responsibilities associated with international treaties
- Antarctic and Southern Seas issues and concerns
- the synergistic and cumulative impacts of natural variability and anthropogenic climate change on marine ecosystems and the human communities that depend on these ecosystems
- the lack of institutional capacity to govern marine resources and address ecosystem issues across administrative jurisdictions and management sectors.

Marine governance in New Zealand is symptomatic of the problem facing most coastal states – resource management and the management of impacts of human beings remains highly 'balkanized' and often supports single-sector approaches to manage specific effects or uses. Governmental attempts to mitigate or adapt to particular resource uses on a sector-by-sector approach has been proven to be ineffective and unresponsive to the cumulative and synergistic impacts and pressures from human activities.

Current marine governance remains sector-based and fragmented among a range of policies, programmes, and agencies. Problems arise from fragmentation in the governance systems used to manage specific human uses of marine resources, together with spatial and temporal mismatches between ecological systems and the administrative processes created to manage human interactions with ecosystems. Successful ocean governance requires the institutional capacity to deal with socio-ecological systems that are complex, heterogeneous, dynamic, and

[39] J.B. Jackson et al., *Historical overfishing and the recent collapse of coastal ecosystems*, 293 SCIENCE 629 (1998). *See also* B. Worm et al., *Impacts of biodiversity loss on ocean ecosystem services*, 787 SCIENCE 314 (2006).

prone to non-linear and often abrupt changes.[40] Natural regime shifts in oceanographic processes, such as the warming or cooling of the currents, influence marine ecosystems. Human beings cannot control these natural variations. Moreover, the management challenge is not simply a matter of improving the management of commercial or recreational fishing activities or the permitting of marine areas for offshore for oil, gas or minerals exploration and development. Scientists, policy makers, and managers increasingly recognize the benefits and needs of a more integrative and ecosystem-based approach that reflects the multi-dimensional character of multiple-use. Integrative coastal and marine governance includes the following principles:[41]

- Support sustainable multiple-use of the marine environment, and resolve potential conflicts among the multiple users of coastal and ocean resources
- Protect coastal and marine ecological processes, life support systems, and biological diversity
- Minimize the loss of human life and property from human and climate-related impacts and threats
- Provide public access to, and enjoyment of, the marine environment.

The current marine governance framework in New Zealand contributes to a number of government challenges, such as:

- a spatial and temporal overlap of human activities and their objectives, causing conflicts (user–user and user–ecosystem conflicts)
- a lack of connection between the various authorities responsible for individual activities or the protection and management of the environment as a whole
- a lack of connection between offshore activities and resource use and onshore communities that are dependent on them
- a lack of protection of biologically and ecologically sensitive marine areas.[42]

1.6 Policy Innovation

Early development of an integrated, ecosystem-based approach to marine policy in New Zealand resulted from concern that existing legislation and regulation dealing with the ocean domain did not provide an integrated or holistic approach. Community and market approaches were intertwined with regulatory approaches that centred on sectoral management. A 'window of opportunity' opened in 1999. Following the New Zealand election of 27 November 1999, when a new Labour government took office, early support for action on management of New Zealand's marine jurisdiction occurred with the release of the Parliamentary Commissioner for the Environment report, *Setting Course for a Sustainable Future: The Management of New Zealand' Marine Environment,* in December 1999. The following major activities and events have shaped ocean policy development in New Zealand.[43]

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[40] O.R. Young et al., *Solving the crisis in ocean governance: place-based management of marine ecosystems*, 49 ENV. 8 (2007).

[41] M.M. Foley et al., *Guiding ecological principles for marine spatial planning*, 34 MAR. POL. 955 (2010).

[42] F. Douvere and C.N. Ehler, *New perspectives on sea use management: Initial findings from European experience with marine spatial planning*, 90 J. OF ENV. MGMT. 77 (2009).

[43] *After,* Vince and Howard, op cit.

- In 1983, amendments to the Fisheries Act introduced far-reaching changes. As part of this reform to fisheries management the introduction of the quota management system (QMS) occurred with a trial based on a developmental deep-water fishery.
- From this initial model the QMS was introduced more broadly in inshore fisheries in 1986.
- In the 1990s the New Zealand government increased the use of economic instruments, chiefly through the introduction of individual transferable quotas (ITQs), fishing rights, and focus on resource rent recovery. Other market instruments include user fees and charges, increasingly used in areas such as marine parks.
- The Resource Management Act 1991 (RMA) was the culmination of 'a massive legislative and administrative reform process as the question of ''sustainable development'' increased in political salience'. The RMA saw 700 statutory bodies in such diverse areas as harbour management trusts and drainage boards abolished, and 167 separate pieces of legislation revoked.
- The RMA dealt with aquaculture by providing the framework for resource consent (occupation of space) while the Fisheries Act 1983 gave provision for marine farming permits. Under this joint legislative approach 'marine farmers require a resource consent from the relevant regional council (under the RMA) and a marine farming permit from the Ministry of Fisheries (granted under the Fisheries Act)'. The coastal permits of farms that have joint permits can be reviewed under the Aquaculture Reform (Repeals and Transitional Provisions) Act 2004.
- *FIRST WAVE*: The move toward a more comprehensive oceans policy began following the New Zealand election of a new Labour government in 1999 and the release of the report, *Setting Course for a Sustainable Future: The Management of New Zealand' Marine Environment*, in December 1999.
- In March 2000, the New Zealand Biodiversity Strategy was released. In the same month the Minister for the Environment was tasked by Cabinet with responsibility for developing an oceans policy.
- In July 2000, an ad hoc Ministerial Group of six ministers with responsibilities for economic and environmental matters affecting New Zealand's ocean domain was formed.
- An Oceans Policy Secretariat was also established. The Secretariat was 'a group of officials who continue to work in their respective agencies and are coordinated by the Minister for the Environment's office' to oversee and support oceans policy development. In short a 'whole of government approach' to improve integration across sectors was sought by the New Zealand government. The 'scope of the project was approved by Cabinet' on 18 September 2000. This initiative was spearheaded by deliberations of the Cabinet Policy Committee in July 2000.
- The New Zealand government proposed developing the policy in three stages: Defining the Vision —consulting the community over the values placed on the marine environment; Design the Vision—designing policies to achieve the Vision set out by Zealanders in the first stage; and Deliver the Vision—implementing the policy.
- The New Zealand oceans policy process involved extensive public consultation. Forty-seven meetings and 24 hui were held across New Zealand, including meetings on Stewart Island and on Chatham Island, from 25 June to 13 August 2001. Over 2000 people attended these meetings, with 1160 written submissions being received and 300,000 downloads from consultation website. Eight hundred submissions (69

percent of the total) were by individuals, while 360 submissions (31 percent of total) were by groups—ranging in size from two to 31,000 members. The vision underpinning New Zealand's oceans policy was encapsulated in the statement 'Healthy Oceans: New Zealanders understand marine life and marine processes and, accordingly take responsibility for wisely managing the health of the ocean and its contribution to the present and future social, cultural, environmental and economic well being of New Zealand'.

- In the early months of 2002, the challenge for the New Zealand government was to keep stakeholders involved in oceans policy development. In February, the Minister for Fisheries, Hon Pete Hodgson, addressed the Ngai Tahu Waipounamu Treaty Festival and outlined the key issues for stage two of policy development. These included integrated management, the need for holistic QMSs, and voluntary compliance.
- The Oceans Policy Secretariat focused on addressing these issues. It commissioned Enfocus Ltd, URS New Zealand, and Hill Young Cooper to prepare a 'stocktake' of the oceans in November 2002. The report concluded that the legal instruments and government strategies have 'no unifying thread or theme' and that 'each has been developed for a different purpose and therefore has a different utility'.
- On 14 March 2003 the Oceans Policy Secretariat released a series of 11 working papers on issues as part of the second stage of the oceans policy process. Meetings were held in Auckland and Wellington in late March 2003 with a hui also held in Wellington. The Oceans policy Secretariat provided a document summarising feedback from the meeting and from written comment in April 2003.
- The following institutional arrangements were suggested in 2003: ad hoc Ministerial Group; Oceans Policy External Reference Group; Officials Steering Group; Oceans Policy Secretariat; Working Groups; Oceans Policy Group Chair; Departmental Reference Group.
- In May 2003, the research report *Oceans Management at the Local Level* was produced for the Oceans Policy Secretariat by Enfocus Ltd, which summarized the findings of surveys completed by local authorities and Department of Conservation conservancies. This report was indicative of the 'bottom-up' approach to implementation being pursued by the Secretariat. Following this, on the 30th June 2003, the Centre for Advanced Engineering released a report prepared for the Secretariat titled *Economic Opportunities in New Zealand's Oceans: Informing the Development of Oceans Policy*. The work undertaken from 2000 to 2003 in New Zealand provided an important base for oceans policy development and implementation.
- The policy development process was abruptly terminated in mid-2003. Following the New Zealand Court of Appeal's decision in Ngati Apa, Ngati Koata and Ors v Ki Te TuaIhu Trust and Ors (the Ngati Apa case) in June 2003 the New Zealand government took the view that issues regarding the ownership of the foreshore and seabed between the Māori and the Crown needed to be resolved before any further oceans policy development continued.
- The Foreshore and Seabed Act, a landmark piece of legislation in New Zealand's history of conflict over landownership, was finally enacted on 24 November 2004. The United Nations Committee on the Elimination of Racial Discrimination, although its decisions are not enforceable against New Zealand, brought down its decision in

March 2005, determining that the Foreshore and Seabed Act discriminates against Māori. This determination was rejected and opposed by the New Zealand Government.

- *Second Wave*: On 11 February, 19 March and 4 June 2004, the Ministry of Environment held informal workshops to 'test ideas' on oceans policy priority. Participants included representatives from government agencies, consultants and NGOs. The outcomes of these workshops were summarized in two papers—Getting Our Priorities Right: The Role of Information in Setting Priorities for Management of New Zealand's Ocean; and Offshore Options: Managing Environmental Effects in New Zealand's Exclusive Economic Zone. Both were released in June 2005 by the Ministry for the Environment.
- The Offshore Options paper focused on current environmental legislation in the EEZ and management gaps, international environmental management of activities in the EEZ, and options for improving the environmental management in the EEZ. With reference to the last, it identified four options for improving environmental management. Option 1 was the voluntary approach: government would work with industries operating in the EEZ to develop appropriate environmental management procedures. Compliance with these procedures would be voluntary (at least initially). Option 2 focussed on filling the gaps in current legislation: this would involve putting in place new legislation to cover activities not already covered, and improving the environmental management provisions of existing legislation as necessary. Option 3 envisaged one act to manage all resources in the EEZ: all of the current legislation applying in the EEZ would be replaced by one act controlling resource management (including the allocation of resources and/or management of their effects) in the EEZ. And Option 4 advanced an 'umbrella act': a new statute would be developed requiring environmental assessments to be carried out for all activities with potentially significant environmental effects.
- In November 2005 that the Minister for the Environment announced that work on New Zealand's oceans policy had recommenced.
- In 2006 the government launched the Marine Protected Areas Policy and Implementation Plan (MPA Policy). The MPA Policy outlines a non-legislative, coordinated approach for planning and establishing an MPA network that is representative of New Zealand's marine habitats and ecosystems. The MPA network is intended to include marine reserves and management controls available under the Fisheries Act 1996. The MPA Policy specifies separate processes for implementation in coastal and deepwater environments, with the demarcation being the territorial sea. The MPA planning process for the deepwater environment is scheduled to commence in 2013 and will be implemented by an expert panel, including representation of those with non-extractive interests.
- In March 2006, the Environmental Best Practice Guidelines for the Offshore Petroleum Industry paper was released and it stated that 'until there is an oceans policy, industry and government agree to voluntary principles to manage environmental impacts beyond New Zealand's territorial sea'.
- In August 2007 the first step towards a legislative component to the oceans policy was explored through the release of the discussion paper Improving Regulation of Environmental effects in New Zealand's Exclusive Economic Zone. Instead of an 'umbrella act', the discussion paper recommended the establishment of legislative

mechanisms focused on filling key gaps in EEZ environmental regulation and promoting a consistent approach across statues, including the assessment of cumulative effects.

- The Resource Management (Simplifying and Streamlining) Amendment Act 2009 sets out several amendments that make up the first phase of the RMA review. The Minister for the Environment considers that this first phase improves the resource consent process by, among other things, restricting occasions for frivolous, vexatious and anti-competitive objections and by having projects of national significance considered at a national level. The Minister also considers that the Act improves the regional planning process by reducing repetitive consultation processes and reporting requirements for both plan development and plan changes. Work has begun on the more complex second phase of review, which aims to have central government provide better direction for regional councils and improved alignment of the RMA with existing legislation. The second phase also aims to improve the management of infrastructure, urban design, aquaculture (including improved allocation of coastal space) and water (including both quality and allocation).
- Aquaculture Legislation Amendment Act (No 3) 239-1 (2010) implements the Government's decisions on reforming legislation governing aquaculture. Four separate Acts—the Resource Management Act 1991, the Fisheries Act 1996, the Māori Commercial Aquaculture Claims Settlement Act 2004, and the Aquaculture Reform (Repeals and Transitional Provisions) Act 2004—were amended by the Act.
- The passing of the Marine and Coastal Area (Takutai Moana) Act ('the MCAA or Act') by Parliament on 24 March 2011 established a new regime for recognition of customary rights and title over the foreshore and seabed. The new Act may be viewed as the latest step in a chain of events which started with the Court of Appeal finding that the Māori Land Court had jurisdiction to determine claims of customary ownership to the foreshore and seabed in Ngāti Apa v Attorney-General [2003] 3 NZLR 643. The MCAA repealed Crown ownership of New Zealand's foreshore and seabed, in order to replace it with a regime that will enable Māori-only ownership and control.[44]
- A new Environmental Protection Authority (EPA) was announced in June 2010.
- The Office of the Minister for the Environment releases the Proposal for EEZ Environmental Effects Legislation in June 2011.
- The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill was introduced on 24 August 2011, and referred to a select committee.[45] The Environmental Effects Bill of 2011 would put in place an effective consenting process for oil and gas exploration, deep sea aquaculture and marine energy projects. The Bill gives new functions to the Environmental Protection Authority which will be responsible for consenting, monitoring and enforcement. It establishes a framework for regulations that will classify activities as permitted, discretionary or prohibited. It sets out decision-making criteria that recognise biological values and require decision-makers to take a precautionary approach when information is limited. Any significant

[44] R. Makgill and H. Rennie, *The Marine and Coastal Area Act 2011*, RESOURCE MANAGEMENT JOURNAL (April 2011): 1, 2-7; and, R. Makgill, *Feeling left out at sea? Navigating no ownership, customary rights & resource management* (August 2011), available at: http://www.nsenvironmentallaw.com/resources/MCAA_Robert_Makgill.pdf

[45] Bell Gully, *Unlocking New Zealand's Energy Potential?* ENERGY UPDATE (August 2011).

proposals will be subject to full public hearings. As of July 2012, the Bill is in its second reading by Parliament. It is not intended to apply to activities that are fully regulated under existing legislation, such as fishing under the Fisheries Act 1996, maritime transport under the Maritime Transport Act 1994, and maintenance and repairs undertaken under the Submarine Cables and Pipelines Protection Act 1996. However, the Bill proposes consequential amendments to existing legislation that will require decision makers to take account of the cumulative effects of all activities in a region. In the interim there are some temporary new measures that have been put in place. These tighten the present regime but are still very much stop-gap in nature.

In addition to these policy developments and activities, New Zealand has also signed over 13 international conventions with marine implications, including the 1992 Convention on Biological Diversity (CBD) and the UNLOS which was ratified in July 1996, which were discussed earlier.

Despite the early interest in the development of a national marine policy for New Zealand in the late 1990s, the process stalled in 2003, only to be reignited to some degree in 2005. The assumption is that the primary reason for the termination of the development of a new national marine policy framework was the debate over Māori rights to coastal and marine resources in 2003. An additional reason for termination is that the move toward a more comprehensive approach to marine governance requires political will and leadership because major policy innovation in this domain is difficult, given the current institutional culture in the country. Multi-sector policy innovation can threaten institutional cultures. The national government took the view that issues regarding ownership of the foreshore and seabed between Māori and the Crown needed to be resolved before further development of new marine policy.

There have been a range of recent proposals made by members of non-governmental organizations during the past several years. For example, support for a new approach to marine governance includes proposals for the creation of a special Royal Commission on Oceans, the development of pilot projects for integrated marine spatial planning (e.g., for the Hauraki Gulf), and calls for the establishment of a separate overarching Ministry for Oceans that could include a new ocean council and ocean strategy to support of integrative planning for the EEZ.[46]

Future marine policy that requires environmental assessments will likely be developed under the Environmental Effects Bill and administered by a new EPA, which will have jurisdiction over permitting uses within the marine area beyond 12nm. It remains unclear how the confusing array of laws, regulations, and practices will be addressed, and whether a multi-sector and comprehensive approach to marine governance will be established. No institutional framework exists for establishing a common vision and a common set of objectives.[47]

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[46] These proposed activities were discussed during Workshops 2 and 3 for this project, and were sponsored by Victoria University of Wellington's Institute for Policy Studies, School of Government, in 2010.

[47] R. PEART, K. SERJEANT, AND K. MULCAHY, GOVERNING OUR OCEANS: ENVIRONMENTAL REFORM FOR THE EXCLUSIVE ECONOMIC ZONE (2011).

1.7 Management at the Crossroad: An Ocean at Risk

Marine governance in New Zealand should be understood as taking place in a much broader socio-ecological context that includes increasing trade of resources from the sea, increasing threats and pressures from the use of marine areas, and the multi-scalar impacts associated with global climate change. This context includes the synergistic impacts associated with natural and anthropogenic stressors and pressures. A study conducted by researchers at Stanford University's Center for Oceans Solutions in 2008 reviewed over 3,400 peer-reviewed articles that provide analysis of the primary threats to the Pacific Ocean.[48] The study identified four primary threats described in the scientific literature – pollution, overfishing, habitat destruction and climate change. As of November 2010, over 425 scientists from around the globe have signed a consensus statement corroborating the findings of the Center.[49]

With the development of new modelling techniques, scientists are describing the synergistic impacts of multiple-use and anthropogenic pressures on marine systems. Human impacts (e.g., overfishing, pollution, habitat degradation, among other pressures) and climate change exacerbate an ecosystem's ability to withstand stress and associated disturbance events.[50]

More often than not, environmental assessments rarely consider the cumulative impacts of proposed marine resource use. In the USA, for example, state and federal laws require that environmental assessments consider all 'future and foreseeable' activities that are associated with a marine area, in addition to a proposed activity. However, the analysis of cumulative impacts is often inadequately conducted, so effects are therefore undervalued. The cumulative impacts associated with a range of pressures on marine ecosystems contribute to a decline in the ecosystem 'goods and services' that we receive from healthy ecosystems. These goods and services can be maintained only if the cumulative impacts from multiple-use of resources do not overstress the capacity of ecosystems to sustain ecological processes, function, and complexity.

It is important to recognize the synergistic impacts of these multiple pressures or stressors on marine ecosystems (Figure 4).

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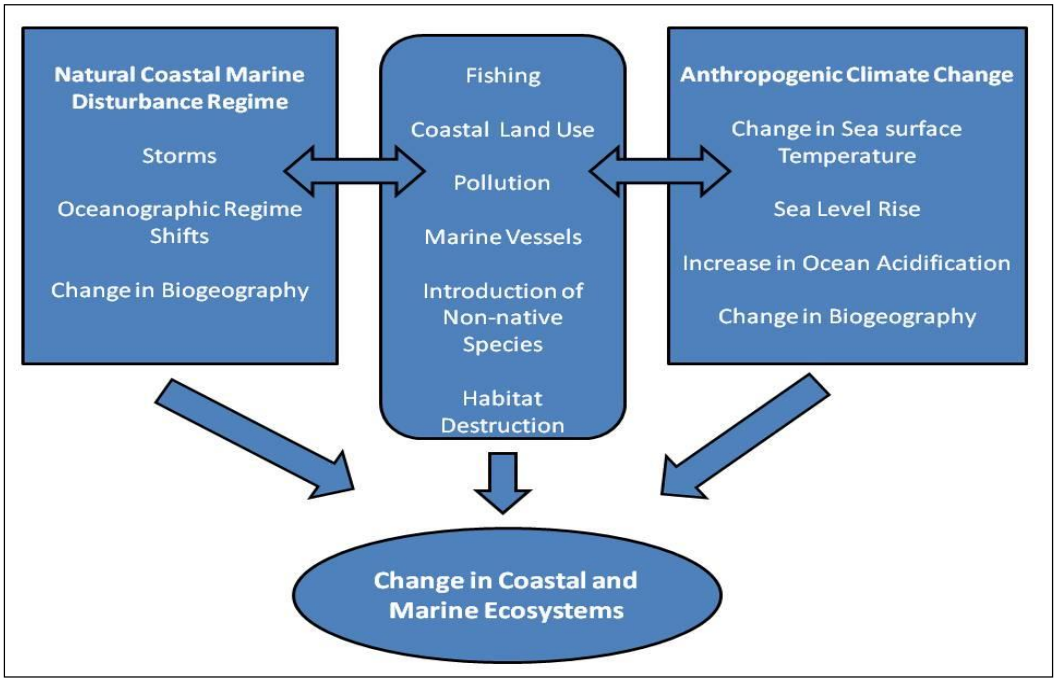
[48] CENTER FOR OCEAN SOLUTIONS, PACIFIC OCEAN SYNTHESIS: SCIENTIFIC LITERATURE REVIEW OF COASTAL AND OCEAN THREATS, IMPACTS AND SOLUTIONS (2009), *available at* http://centerforoceansolutions.org/PacificSynthesis.pdf

[49] STANFORD UNIVERSITY THE CENTER FOR OCEAN SOLUTIONS, ECOSYSTEMS AND PEOPLE OF THE PACIFIC OCEAN - THREATS AND OPPORTUNITIES FOR ACTION: A SCIENTIFIC CONSENSUS STATEMENT (2009), *available at* http://www.centerforoceansolutions.org/projects/pacific-ocean-initiative

[50] B.S. Halpern et al., *Understanding cumulative and interactive impacts as a basis for ecosystem-based management and ocean zoning*, 51 OCEAN AND COASTAL MGMT. 203 (2008); B.S. Halpern et al., *A global map of human impact on marine ecosystems*, 319 SCIENCE 948 (2008). Halpern and colleagues are currently working on the development of an Ocean Health Index (OHI), which is a new quantitative way to measure whether the ocean's health improves or declines over time.

Figure 4: The Synergistic Impacts of Multiple Pressures on Marine Ecosystems



Source: M.V. McGinnis (2011)

Each pressure and associated impact should be evaluated in relation to other pressures. For example, the multiple impacts of human beings on marine ecosystems (such as overfishing, marine and air pollution, habitat destruction, the introduction of non-native invasive species) exacerbate the ability of marine life to adapt to climate disturbance. Moreover, global climate change interacts with and accelerates the cumulative pressures on marine biodiversity. A range of climate-related factors influence marine ecosystem function, including a rise in sea surface temperature, changes in salinity, increasing acidification (caused by changes in oceanic pH), oceanographic regime 'shifts', and other factors associated with anthropogenic climate change, such as the general decline in ecological productivity.

Change in marine habitats is driven by disturbance brought on by pressures and associated impacts from human and natural factors. Change in habitat in turn changes the distribution and abundance of marine life, and the availability of marine resources, such as fished species.

1.7.1 Identifying Pressures on New Zealand's Marine Ecosystems

New Zealand has promoted a scientific understanding of the continental shelf and EEZ. The 'Species 2000' initiative attempted to identify every New Zealand species, although a number of species have yet to be identified.[51] Information on the offshore marine area has been gathered and synthesized by Land Information New Zealand (LINZ) and the National Institute of Water and Atmospheric Research (NIWA). In 2005, the Ministry for the Environment, the Ministry of Fisheries and the Department of Conservation commissioned (NIWA) to develop environmental classifications covering both New Zealand's EEZ and the Hauraki Gulf region collectively known as the Marine Environment Classification (MEC). In

[51] See: http://www.niwa.co.nz/news-and-publications/publications/all/wa/12-3/species and the three volume book series *New Zealand Inventory of Biodiversity*, edited by D. Gordon (Canterbury University Press, 2009).

addition, the Ocean Survey 20/20 is to be complete by 2020 by LINZ, and will represent an ocean survey that will provide New Zealand with information on its ocean territory. The geographic area covered by the programme is primarily New Zealand's EEZ, continental shelf and the Ross Sea.

Intertidal area along the coast of Wairarapa. McGinnis (2010)

The ecology of the Pacific Ocean and the impacts of human beings on marine ecosystems are important to consider as New Zealand moves toward a potential new era of marine ocean governance and resource use. Understanding the relationship between the human activities and marine areas can be understood as particular pressures. The relationship among key indicators is represented in the Pressure-State-Response (PSR) model, which is a useful way of linking pressures with policy responses. The PSR model includes the an analysis of 'pressures', which are classified into underlying factors or forces such as coastal population growth, urban and industrial activities, marine resource use, and climate-related impacts, such as sea level rise and associated coastal erosion or the warming of sea surface temperature. These pressures on marine ecosystems are often considered from a policy perspective as the starting point for ocean governance. This PSR analysis includes the use of available socio-economic, biophysical and other monitoring databases. With this in mind, it is important that baseline information on socio-economic values (both consumptive and non-consumptive) be well integrated into information on the biophysical characteristics of coastal and marine ecosystems.

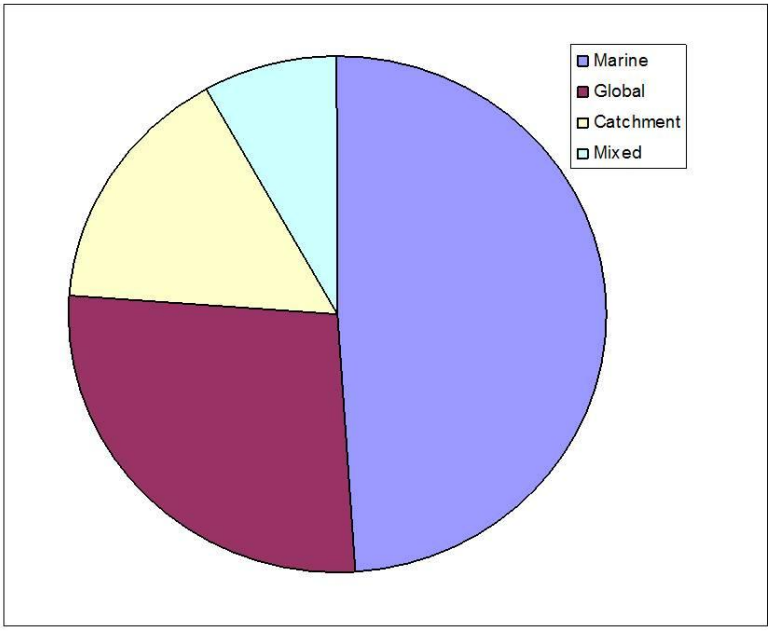
The 'state' refers to the condition of the marine ecosystems that result from the above pressures, e.g., the levels of water pollution including terrestrial inputs from coastal areas, the multiple-use of marine resources, coastal development, and the level of marine resource use. The state of marine ecosystems will, in turn, affect human health and well-being of society, as well as the ecological security of maritime cultures. For instance, increased coastal degradation can contribute to one or a combination of the following issues: decreased ecological production from coastal wetlands, decline in tourism, and decline in coastal habitats and associated marine life, including marine resources. It is important to have an

understanding of natural, climate-related, and anthropogenic pressures on coastal and marine ecosystems.

Indicators of state of coastal and marine ecosystems should be designed to be responsive to pressures, and at the same time facilitate corrective actions and management tasks. The 'response' component of the PSR model relates to the actions taken by governments and non-government organizations that are designed to ease or prevent negative marine impacts, to correct existing damage, or to conserve or enhance marine ecosystem health. Responses are derived from consideration of the pressures, state, and commensurate objectives developed in applying this information. These responses may include regulatory action, environmental or research expenditure, public opinion and consumer preference, changes in marine resource management, and the provision of environmental information. Responses are designed to act on the pressures but may at the same time also have an impact modifying the indicators of state.

MacDiarmid and colleagues note that the primary pressures on the marine ecosystems of New Zealand are associated with global climate change. As Figure 5 shows, there are also several pressures associated with catchment and marine resource use.

Figure 5: Relative Impact of Threats from Different Sources on New Zealand's Marine Habitats



Source: MacDiarmid et al. (2010)

With respect to other major threats, human activities in catchments that discharge into the marine environment are among some of the highest scoring threats to New Zealand's marine habitats. Foremost is increased sedimentation resulting from changes in land-use. It was the third equal highest-ranked threat over all habitats and was the highest-ranked threat for five coastal habitats, including harbour intertidal mud and sand, subtidal mud, seagrass meadows, and kelp forest. Other threats deriving from human activities in catchments include sewage discharge, increased nitrogen and phosphorus loading and heavy metal pollution. Three other

highly ranked (threats, algal blooms, increased turbidity, and oil pollution) stem in part from human activities in catchments. Seven of the threats to New Zealand marine habitats are directly related to human activities in the marine environment, including fishing, invasive species, coastal engineering, and aquaculture. The most important of these is bottom trawling which, overall, is the third equal highest-ranking threat. The second-highest ranking marine activity is dredging for shellfish which, although destructive, usually operates over a smaller spatial scale than bottom trawling. The third highest-ranking threat caused by direct human activity in the marine environment is considered to be that posed by invasive species.

Recommendation 1.3: As part of the creation of new performance-based standards: That the Pressure-State-Response model should be used in New Zealand to better understand the link and relationship between pressures or threats and the response of political systems to these threats and the changing status of marine ecosystems associated with the EEZ.

1.7.2 Marine resource use

The over-use of commercially valuable fishes to the point of biological[52] and economic collapse[53] is well documented. Overfishing is considered a primary factor contributing to the disruption and degradation of marine ecosystems. A vast majority of the commercially-valuable fishes of the world's oceans are traded in global markets, and are severely depleted.[54] A large share of fish production enters international marketing channels, with about 37 percent (live weight equivalent) exported in 2008.[55] Unique and sensitive marine ecosystems, such as the Ross Sea[56] of the Antarctic, show signs of decline. One factor contributing to this ecological decline of the Ross Sea is the overfishing the Antarctic toothfish, which is caught during the austral summer above the Antarctic Shelf (by countries such as New Zealand) and then exported and traded in international markets (e.g., to the USA and northern Europe). For example, over 90 percent of New Zealand's commercial fish landed are exported overseas.

According to several fishery biologists, a majority of the world's fisheries have been depleted to unsustainable levels.[57] The basis of the marine food chain has been fished-out by the substantive removal of large marine predators from most of the world's oceans.[58] Commercial fishers are fishing down to lower levels of the food chains of the world's oceans – over time fishers have shifted to prey species such as squid.[59] Commercial fishers are also likely impacting marine habitat areas, such as the benthic area, that are not well understood by scientists (Figure 6). The impacts of bottom trawling on New Zealand's benthic areas remain uncertain.

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[52] J.B. Jackson et al., *Historical overfishing and the recent collapse of coastal ecosystems*, 293 SCIENCE 629 (1998); B. Worm et al., *Impacts of biodiversity loss on ocean ecosystem services*, 787 SCIENCE 314 (2006).

[53] A.F. MCEVOY, THE FISHERMAN'S PROBLEM (1986).

[54] B. Worm et al., *Rebuilding Global Fisheries*, 325 SCIENCE 578 (2009).

[55] The UN Food and Agriculture Organization (FAO) provides an annual fact sheet on international fish trade and world fisheries in FAO, FACT SHEET: THE INTERNATIONAL FISH TRADE AND WORLD FISHERIES (2009), *available at* http://www.fao.org/fileadmin/user_upload/newsroom/docs/fact_sheet_fish_trade_en.pdf

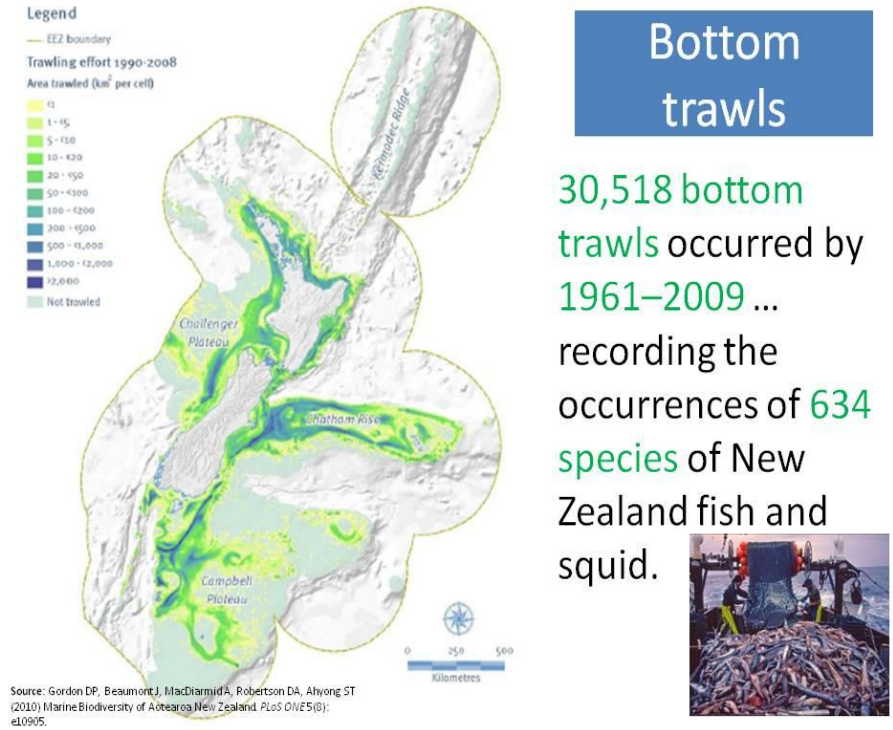
[56] D.G. Ainley, *A history of the exploitation of the Ross Sea, Antarctica*, 46 POLAR RECORD 233 (2010).

[57] R. Watson and D. Pauly, *Systematic distortions in world fisheries catch trends*, 414 NATURE 534 (2001).

[58] Jackson et al.

[59] D. Pauly et al., *Fishing down marine food webs*, 279 SCIENCE 860 (1998).

Figure 6: Bottom Trawls in New Zealand's Ocean Jurisdiction



Source: Gordon et al. (2010)

The shifts in prey species is based on increasing global demands for marine fish protein in Asian markets. A large share of fish production enters international marketing channels, with about 37 percent (live weight equivalent) exported in 2008.[60] With the increased wealth of many Asian consumers new markets are developing for aquaculture and wild fish stocks. With reference to the global collapse of major commercial fisheries, Pauly and Zeller write, 'Fishers, whose daring and ingenuity had, for centuries, justified our romantic view of their profession, [have] become cogs in the high-tech machine that almost instantly reduces any stock it touches to a shadow of its former self.'[61] Indeed, the history of marine life exploitation is one that leads to biological extinction of the species and/or the economic collapse of the fished species. Ludwig, Hilborn and Walters explain, '[T]here is a remarkable consistency in the history of resource exploitation: resources are inevitably overexploited to the point of collapse or extinction.'[62]

1.7.3 The Expanding Scope of Conflict

A member of Ministry of Fisheries with expertise in ocean policy notes the following with respect to New Zealand's current governance framework:

[60] The United Nations Food and Agriculture Organization (FAO) provides an annual fact sheet on international fish trade and world fisheries. FAO, FACT SHEET: THE INTERNATIONAL FISH TRADE AND WORLD FISHERIES (April, 2010) available at. http://www.fao.org/fileadmin/user_upload/newsroom/docs/fact_sheet_fish_trade_en.pdf

[61] D. Pauly and D. Zeller, *The Global Fisheries Crisis as a Rationale for Improving the FAO's Database of Fisheries Statistics*, 11 FISHERIES C. RES. REP. 1 (2003).

[62] D.M. Ludwig et al., *Uncertainty, resource exploitation, and conservation: Lessons from history*, 260 SCIENCE 17 (1993).

> New Zealand's brief history of human habitation has led to widespread and often irreversible change in the biophysical environment. Most of the wetlands were drained and de-forestation led to major gully and channel erosions and high amounts of sediment yield in the estuarine and marine environments. The scale of land-based effects on marine species is indeterminable. The legislation for managing the land-sea interface is widely acknowledged as having fallen short of its full potential. The government is promoting oil, gas and mineral exploration on land and at sea ... These developments may lead to further progress on an integrated system that covers all aspects of marine management that began in 2000. In any case, New Zealanders face important decisions regarding the tradeoffs between further resource utilisation and environmental protection.[63]

In marine areas, conflict is shaped by two interdependent factors: the level of marine resource use, and the proximity and/or access of users to marine areas. It is important to recognize that the scale and scope of conflict often shape the politics of marine planning and decision-making. The outcome of conflict is often predicated on the level of conflict between diverse participants in a decision-making situation. For example, the scope of conflict is shaped by different political contexts associated with marine life protection that includes user-user conflicts (e.g., commercial versus recreational fishing interests) and user-marine ecosystem conflicts (e.g., fisher versus marine mammal protection advocates). The larger the scale needed to sustain resource use and protect marine life the more politically contentious the process becomes. Political scientists have shown that one response from government to a high degree of conflict is to attempt to control the scope of conflict by limiting the range of diverse voices, values, and interests that are associated with a particular decision-making situation.[64]

As New Zealand continues to encourage development of marine areas, the political process will inevitably face an expanding scope of conflict between competing interests and government jurisdictions. The relationship between management sectors and users cannot be effectively and responsibly resolved without a more comprehensive and integrative approach to marine governance. The use of large-scale collaborative approaches that include multi-stakeholders and other participants may not resolve disputes over resource use or biodiversity protection. There is also the challenge of translating scientific knowledge and traditional ecological knowledge (TEK) into a form that is accurate and serviceable for policy, management, or education. An additional problem is that the Crown Research Institutes or CRIs support *client-based science* that often supports private interests, which may threaten the general public interest.[65] These issues are developed further in Section Three. Political processes are influenced by the values that are held by members of resource agencies, user groups and the public. Thus, planning is more than a scientific enterprise. Values, interests and beliefs matter in the marine planning and decision-making. There is often a lag between

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[63] R. Bess, *Maintaining a balance between resource utilisation and protection of the marine environment in New Zealand* (23 October 2009). Unpublished manuscript.

[64] M.V. McGinnis, *Learning from California's Experience in Marine Life Protection*, 26 OCEAN YEARBOOK 485 (2012); M.V. McGinnis, *Living up to the Brand: Greening Aotearoa's Marine Policy*, 8 POLICY QUARTERLY 17 (2012); M.V. McGinnis, *Mindfulness of the Oceanic Commons*, 20 PACIFIC ECOLOGIST 55 (2011); and, M.V. McGinnis, *Negotiating Ecology: Marine Bioregions and the destruction of the Southern California Bight*, 38 FUTURES 382 (2006).

[65] OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE, TOWARDS BETTER USE OF EVIDENCE IN POLICY FORMATION: A DISCUSSION PAPER (2011). As the report notes, 'In some cases, however, CRIs have entered into contracts with the private sector that limit their capacity to give such advice (e.g. around land use), and indeed they can find themselves being contracted to give advice contrary to the Crown's wider interests' *at* p. 14.

advances in science and integration of these advances into decision-making. The scientific community may not always answer the questions that matter to user groups because science may not understand such needs or recognize them as priorities. Understanding and appreciating the significance of the marine ecological functions is generally low among the general public, user groups, and decision makers. Important scale considerations, such as those associated with oceanographic and bio-geographic processes, may threaten special interests and traditional forms of ocean governance.

1.8 Cultivating an Ocean Constituency

Marine governance ultimately depends not only on the capacity and capability of institutions to address the synergistic impacts and pressures of multiple effects and uses but also on the cultivation of a broad ocean constituency in the public realm that supports a more integrative and holistic approach to marine planning and decision-making. New Zealand's rich indigenous history in combination with the maritime cultures of the country represents the foundation for the establishment of such an ocean constituency. Accordingly, one management challenge is to translate the diverse values that are held by the public into a comprehensive and holistic governance framework. Many of these values are an essential part of maritime story, mythology and lore.

One Māori myth describes Mount Taranaki as having an albatross feather. The feather is the symbol of a long white cloud, which is often seen slightly covering the top of the great sacred mountainous centre of the province. Women of the coastal tribe or iwi of the region wear an albatross feather in their hair to signify their connection, kinship, and relationship to the mountain and region. You can sense the strength of the mountain, the depth of the soil, the history of the culture, the change across the landscape.

Mount Taranaki. McGinnis (2010)

The majesty of the sea begins to awaken in you as you begin to walk along a wind-blown shore, with large volcanic rocks lining the coast. It is a rugged coast, with seabirds nesting in the sand and along the rocky shores and cliffs. It is as if you are walking towards something alive in the world.

The soil of New Zealand is deep in volcanic ash and the droppings of thousands of years of accumulation of bird guano. When Captain Cook arrived in New Zealand, his crew returned to the ship because they could not sleep: the bird chorus was too loud across the landscape. The richness of the soil caused by this mixing of guano and ash is the foundation for the richness of New Zealand's dairy industry, and an important foundation for the re-wilding of the native bush in the low country and hillsides. The hope is that the native threatened and endangered birds of this place in the South Pacific will return. But the morning chorus of birds during early spring rarely occurs in only a few of the wildest remaining places of New Zealand.

One day, driving along the coastal highway of Taranaki, the sun fell over the mountain, and the fence posts lining the coastal road became less visible, the boundaries between the sea and land less clear. In the foreground there were blue islands on our horizon. The lines between places are not as clear as we presuppose, the difference between peoples is obscured by the beauty of landscapes we inhabit, the wake up calls of bird songs, the river's path, and the ocean's whisper. In time, the landscape speaks, and the knowledge of the sea can change a person. Our understanding and appreciation of the distant places we visit can form the basis of new awareness of our home; the unfamiliar or unknown landscape can shape new insights about our sense of place and community. We can begin to find joy and comfort in small wonders that we often take for granted: the movement of birds in an oak canopy, the change in the direction of the wind, the first rain and the bounty of our local farmer's market. Earthly light: from darkness to fire to red poppies to *starry night*.

2. THE PLACE OF PRINCIPLES IN MARINE GOVERNANCE

'Move your paddle silently through the water'
— Māori saying

2.1 Introduction

Section One provided a brief overview of the ecology of New Zealand's marine areas and a summary of the major events that have contributed to the development of the country's existing marine policy. The diversity of New Zealand's marine life is based on a range of factors, including the general character of marine resource use and the uniquely diverse types of marine habitats associated with the islands within the country's ocean jurisdiction. A range of pressures and threats exist. Accordingly, the future health of marine ecosystems depends on the level or scale of marine resource use that is supported by the people of New Zealand.

The preservation of the ecological relationships and linkages are key elements to the maintenance of ecosystem services, and the maintenance of these services is based on the level and scale of economic development and impacts to marine life that depend on the country's EEZ. The current government is encouraging offshore oil and minerals development in the EEZ, and supports the development of marine farming in the territorial sea, among other offshore activities that may include future wind and wave energy. Thousands of marine vessels also transport goods, and can have impacts on marine life, including the introduction of non-native invasive species, air and marine pollution, noise-related impacts from vessel activities on marine organisms, and impacts from vessel strikes on whales and other marine mammals.

Furthermore, there are a number of bills pending and under consideration by policymakers that may change the future of marine planning, decision-making and policy.

This section begins with a description of critical issues, concerns and opportunities based on interviews of policymakers, planners, academics, members of private industry, scientists, resource users, and conservationists. Then the section provides a number of recommendations to strengthen and improve marine governance of the EEZ and extended continental shelf. A number of administrative principles, planning tools, and policy instruments are recommended in the sections below.

2.2 Critical Issues, Concerns, and Opportunities

2.2.1 Methodology

This section is based on two types of research: an extensive review of relevant, recent literature on the existing governance framework in New Zealand, indicating the importance of a number of principles to guide sustainable marine governance, and a series of confidential, one-on-one and group interviews, conducted in person or by telephone during 2010, with selected ocean stakeholders including academics, members of non-government organizations or NGOs, regional and national resource managers, members of the public service, and representatives of major ocean industries, such as offshore oil, commercial fishing, and mining interests. Most interviews lasted approximately one hour, while some were conducted for several hours across several days. The interviews drew from a common set of questions. Because the interviews were so varied, with participants from different

backgrounds and expertise in ocean policy, following a strict script was not useful. Instead, the conversation flowed in an uninterrupted pattern while covering as many core questions as possible.

In addition to the interviews, information and insights from participants in two public workshops are used in this section. The first workshop was held at the campus of Victoria University's School of Government, and was convened on 23 November 2010 on the subject of offshore oil development and mining. The workshop was attended by a diverse group of more than 70 people. A second two-day workshop was held in Auckland at annual event of The Society for Conservation Biology on 3-4 December, 2011. This workshop included a roundtable discussion over the future of marine governance in New Zealand with a range of participants from the Environmental Defence Society, the Ministry for the Environment, the Department of Conservation, the Ministry of Fisheries, environmental lawyers, iwi, members of NIWA, and scholars from the USA involved in marine zoning activities. A number of follow-up interviews were conducted by the author in May 2012 across New Zealand.

A primary theme of the interviews and workshop discussions was a general recognition of the need to change the way New Zealand manages human activities associated with the EEZ and continental shelf. This is as much a question of science as of values. There was general support for not only the adoption of some type of integrated, holistic and comprehensive permitting authority, but the need for New Zealand national government to develop new principles and approaches that support a multi-sector and ecosystem-based approach to marine governance. There was also a general sentiment that successful integrative ocean governance means overcoming particular institutional and structural challenges, such as those related to institutional capacity and capability, information sharing, regulatory authority, the role of science and scientists, new enforcement and monitoring strategies, and the need for collaboration and new partnerships between members of the scientific community. Another key emphasis was the need to cultivate leadership that supports policy innovation.

The documentary analysis supports an assessment of diverse principles that can support the creation of planning tools and policy instruments that are useful in the development of integrative, ecosystem-based marine governance. For example, there are bottom-up approaches to ocean governance that support place-based ecosystem management and planning, while other models support market-based tools and incentives to support the development and use of coastal and marine resources, such as fisheries, aquaculture, energy and minerals development. Top-down models also exist that support regulatory and non-regulatory approaches to marine conservation and biodiversity protection. This section provides a general overview of these principles, while the last section of this report describes policy instruments and planning tools that support a more sustainable approach to marine governance.

While the principles and associated tools and instruments used in marine governance vary it is important to recognize that there are also limitations to single models in integrative ocean governance. This section characterizes a number of basic principles that should be included in marine governance, and are based on an analysis of the regulatory and management of activities currently use by other countries. There are pros and cons in each of the models of ocean governance, which include regulatory and non-regulatory policy tools, management actions, planning elements, co-management and community-based decision making, and the provision of environmental information. A number of critical concerns were discussed during interviews. In particular, the expansion of marine areas for offshore oil development, deep

sea bed mining, and aquaculture remain the primary concerns that many people interviewed believe has yet to be addressed in a comprehensive way by government. There also remains a debate over the level of marine life protection provided by existing public policies.

A number of factors contribute to marine policy development, implementation and enforcement in New Zealand, including:

- General scientific uncertainty and a paucity of information with respect to the resources and the more general ecological features of the marine area, such as the benthic habitats of the continental shelf
- Māori interests, rights, and perspectives
- Increasing pressures from the multiple use of marine areas, including the impacts of terrestrial inputs from coastal waterways on nearshore marine ecosystems and resources
- The lack of an ocean constituency in the country, and public understanding of marine ecosystems
- The synergistic and cumulative impacts of natural variability and anthropogenic climate change on marine ecosystems
- The lack of institutional capacity to govern resources and address ecosystem issues across administrative jurisdictions and management sectors.

New Zealand does not have a strong maritime fleet and has limited control over the EEZ and continental shelf, such as deep ocean areas. It has grown increasingly dependent on international conventions for the performance of ships. One foreign diplomat interviewed for this report stated that the country is a 'good citizen' in the International Maritime Organization (IMO), and 'New Zealand focuses on promoting economic benefits from the marine area, and carefully weighs the economic costs and benefits of conventional agreement. If the risks are high and the costs are great, the country's policymakers are unwilling to sign conventions'. Domestic laws are required for conventions to go into effect after signing.

Commercial fishing and vessel transport remain the major uses that are regulated by government in the country's EEZ. During the past ten years a number of workshops have focused on improving and building on previous initiatives to strengthen ocean governance in New Zealand, with a particular focus on other types of marine resource use, including marine farming, alternative energy developments (such as wind, tidal and wave energy), offshore oil, and mining. One factor almost universally mentioned by interviewed individuals was the politics over the foreshore and seabed, and Māori obligations as one barrier to the development of EEZ policy. To some degree this issue has been resolved by the *Marine and Coastal Area (Takutai Moana) Act 2011*, which removes Crown ownership, declares the foreshore and seabed area a commons incapable of ownership, protects public use rights (access, recreation, navigation and fishing), and re-establishes the right of Māori to claim customary marine use rights and title.

Treaty obligations and rights of use and access associated with deeper marine areas of the EEZ and continental shelf, however, require political leadership and the will to resolve often political conflict over resource protection, rights to develop, and access. The current government has emphasized the need for enabling legislation to develop resources through legislation that would require environmental assessment of effects, including factors such as cumulative impacts of proposed activities, and balancing the potential future uses of the EEZ

with the value of marine life protection. A number of coastal and marine issues are currently on the political agenda in New Zealand, and are topics of public debate, including but not limited to the use of deeper ocean areas for industrial-scale aquaculture of shellfish and finfish, seabed mining, offshore oil development, the impacts of water pollution on nearshore areas, including habitat used by fished species.

Case studies of offshore oil and mining activities and marine protection are provided in this section, while Section Three focuses on marine farming or aquaculture, the land-sea interface, and the role of science in planning and decision-making.

The dynamic political process associated with marine governance includes two dimensions: an institutional dimension (governance), where ultimate authority and accountability for action resides, both within and among formal and informal mechanisms; and an analytical, active dimension (management), where analysis of problems leads to action. Certain procedural and structural issues in institutional design, including the need to develop appropriate planning tools and policy instruments, support democratic and evidence-based decision-making and managing. Many of these new planning tools and policy instruments should be supported by statute and new regulatory authority. For the future it is important to promote greater integration of policy and management processes within formal strategic planning in ocean governance in New Zealand. Scientific and government studies increasingly support a more integrative, adaptive, and ecosystem-based approach to ocean governance; the future policies for marine ecosystems will need to be founded on principles of comprehensive and integrated approaches to ocean management that can sustain the multiple values that are carried by healthy marine ecosystems.

A general summary of the beliefs expressed during the interviews are noted below and are followed by a sample of quotes from interviewees.

2.2.2 The fragmented ocean governance framework

New Zealand has no framework for ocean governance that cuts across sectors, values, and interests – there is no ocean policy that addresses spatial conflicts between users and ecosystem values, and this is especially the case in the marine area beyond 12 nm. Some typical quotes on this issue include:

- ‘There is no governance framework that cuts across sectors, values, and interests – there is no ocean policy that can remedy spatial conflicts’
- ‘We are losing accountability and responsiveness’
- ‘We need a public trust responsibility clearly defined for the global commons’
- ‘There is no point to creating new structures without institutional capacity and resources’
- ‘Sectors are going parallel, we need a more holistic approach’
- ‘There are no ways of reconciling competing rights for ocean space’
- ‘Government has not articulated its standards and criteria for ocean governance’
- ‘There are tensions between recreational and commercial fishing activities and Māori interests’
- ‘Marine policy is industry-driven, and there is a breakdown between marine industries and science’
- ‘There is a lack of incentives to develop comprehensive marine policy; the benefits of a comprehensive approach need to be made clearer’

- ‘There is some agreement on goals and objectives of new comprehensive ocean governance, but there is no agreement on outcomes desired’

2.2.3 The role of marine science and scientists

A paucity of baseline scientific information on the marine ecosystems associated with NZ is evident. There is no long-term comprehensive monitoring program to assess the ‘health’ or ‘integrity’ of the diverse marine ecosystems associated with the country. The use of science in policymaking, and whether it is used to challenge conventional resource management practice and use, is unclear. Many mentioned a lack of interface between scientists and policymakers. There is a perceived lack of consultation and buy-in when some marine resource decisions are made. Difficult marine issues are not often addressed in a ‘public’ process. As remarked by several individuals who were interviewed:

- ‘Science has been divisive since 1991: highly competitive, with very little integration across disciplines’
- ‘There is very little interface between scientists and policymakers’
- ‘We need to formalize the role of the human dimension in studies of resource management and use’
- ‘Managers are wary of discussing openly issues and concerns that challenge conventional practice’
- ‘Science is part of political horse trading; it supports one’s perspective in politics’
- ‘The rhetoric of the scientific process is that it is clean, but science has become an industry’
- ‘Research is under-funded, and industry gets taxed for research’
- ‘Policy and social capital today is based on the support provided in the 1970s and 1980s, and the professional class needed for ocean governance will end in ten years’
- ‘There is a need for a decision-making framework that addresses scientific uncertainties’
- ‘There is limited national-scale scientific information’
- ‘Information is not available and accessible’
- ‘Data is privatized but it is supposed to be publicly available’
- ‘Lack of communication across scientific communities threatens progress’
- ‘There has been an erosion in the role of science in planning and decision-making; people are terrified of unfavourable information; information is highly censored, and their planners are fearful of losing their jobs if they speak up’
- ‘The source of funding needs to be rethought to increase the certainty of scientific support’
- ‘There is a need for data and information-sharing to address increasingly complicated problems or issues’

2.2.4 Offshore energy development, fossil fuels, and minerals

Critical questions remain to be answered with respect to oil and minerals development in the EEZ. Is the resource worth mining? What are the possible/likely environmental impacts? Can the mining be done in a way that will minimize the environmental impacts? Interest in potential use of marine areas for alternative energy development (tidal, wave, wind, current) was also expressed. There is no regulatory framework to address particular physical constraints or potential cumulative impacts of proposed offshore energy (from exploration to

decommissioning of structures) or minerals (e.g., benthic areas) extraction in the EEZ. New Zealand needs an administrative framework that addresses health, safety, and environmental constraints in energy and minerals decision-making and planning. A lack of contingency planning and emergency response to potential offshore oil spills is been the subject of debate after last year's Rena disaster. There is also a lack of policy to address the decommissioning of existing offshore oil platforms and associated structures. As stated by interviewees:

- 'Sustainable wealth creation in minerals, oil and gas is not ecological sustainability'
- 'A more holistic approach to offshore minerals development is needed'
- 'The power of special interests – aquaculture, commercial fishing, minerals – are dominating the planning processes'
- 'Need expertise, credible professionals; we need independent regulators'
- 'Marine issues are contentious: we need an independent regulatory process'
- 'There is a lack of expertise or legal authority to implement environmental conditions across sectors and to enforce regulatory controls'
- 'The race of marine space includes quite polarized views and values, especially in the nearshore marine environment'
- 'There is a lack of depth in the public sector to address marine issues; distrust, conflict and fear drive the process'
- 'The capacity of the civil service to review permitting of oil and monitor existing activities are major problems'
- 'The emergency response is not clear, there are no contingency plans to address spills'
- 'The lack of cumulative impact studies across resource uses remains a major gap to fill in future legislation'
- 'There seems to be an overlap between the areas that can be mined offshore and those areas that are fished – this will need to be worked out'

2.2.5 Marine life protection

Some interviewees perceive a lack of a 'biodiversity protection' mandate in marine policy. For instance, marine reserves have been established to support 'scientific' values. Existing biodiversity protection goals as set forth in *The New Zealand Biodiversity Strategy* (February 2000) have not been achieved. With respect to the above government issues the following points were expressed:

- 'Levels of biodiversity protection are inadequate: there is a need to identify and protect special areas'
- 'There is a problem of getting space in aquaculture, so the future of aquaculture is uncertain'
- 'We need to upgrade our ability to protect marine life'
- 'There is lack of resources provided to monitor biodiversity'
- 'We need to work together to create partnerships across sectors and CRIs to monitor and protect marine life'
- 'The regulatory option in management and resource protection has been removed from the tool box'
- 'There is no mandate to remove a species once it has been introduced'

- ‘Biosecurity is addressed by multi-sectors and multiple agencies which complicates cross-sector problems like invasive species removal and prevention; there is no clear accountability and coordination across sectors’

2.2.6 Planning and Decision-making

There are a range of issues and concerns associated with administration, planning and decision-making, including the following:

- Regional councils lack the institutional capacity to effectively and responsibly address issues associated with the coastal-marine interface or, more generally, marine areas out 12 nm. The marine programmes (e.g., water quality testing, marine park designation, etc) established by regional councils vary dramatically, and are dependent on the levels of resources that are available.
- There is a perceived lack of ‘transparency’ in many sectors of resource decision-making, planning and policymaking. There have been multi-stakeholder processes, such as the process that led to the publication of *Fisheries 2030*, but there is a lack of agreement on management outcomes, etc.
- Some excellent examples of multi-stakeholder alliances and partnerships, include Fiordland Marine Guardians, Southern Sea Bird Solutions (international partnership), and the Marlborough Alliance. However, there is a lack of enabling legislation and fiscal support for the creation of community-based partnerships and alliances.
- There is a perceived problem with ocean management regarding the role of industry in planning and decision-making, and with the lack of ecological indicators that can support sustainable commercial practices, among other concerns.
- The ‘precautionary’ approach to marine planning and policymaking is not being developed.
- The lack of due process in planning and decision-making is apparent (e.g., lack of consultation and concurrence among diverse stakeholders in formal policymaking)
- There is an absence of political will, leadership or presence of a ‘policy fixer’ to move integrated ocean governance forward.

A sample of statements from a number of those interviewed follows:

- ‘There is a pattern of corporate ownership of the commons, and lack of place-based ownership’
- ‘Regional councils have very little impact on marine ecosystem planning’
- ‘The strengths of councils to address marine issues varies across regions’
- ‘There are risks associated with governmental fragmentation and single-sector approaches to policy’
- ‘There is a need for procedural values’
- ‘A lack of experimentation and innovation has left major battles over marine use to the future’
- ‘We need good freshwater policy to support marine planning’
- ‘Many are frustrated by the process and the lack of leadership to support a more precautionary approach’
- ‘We need to make a better connection between foreign affairs and domestic policy with respect to oceans’

- ‘There is a problem of gaining traction and interest in future ocean governance without a crisis; ocean governance is not on the agenda’
- ‘Allocation issues for marine areas are very different from those of how we address land use issues’
- ‘There is an information deficit: there is not enough science that is shared and communicated’
- ‘A potential problem exists when you increasingly rely on regional decision-making and at the same time centralize management and planning’
- ‘Regional councils have been captured by water interests and the dairy industry’
- ‘The lack of political will to change is the major impediment to progress in ocean policy’
- ‘There is very little expertise in oceans; there is no intellectual foundation’
- ‘A major overhaul in personnel working on the ground has taken place during the last several years’
- ‘Planning processes are closed’
- ‘There is a gap of professionalism; a shortage of maritime civil service’
- ‘The erosion of technical and environmental skills has taken place, and there has been no replacement of individuals who have left the public service’
- ‘Turnover rate is high among civil service employees’
- ‘The government has yet to be held accountable for their poor performance in ocean obligations within the EEZ’
- ‘One of the primary challenges is the stewardship of knowledge – the management, use and distribution of knowledge’
- ‘The lack of resources contributes to the lack of collaboration’
- ‘Systems capacity and governance are major issues’
- ‘We need leadership across sectors’
- ‘The bigger issues are allocation, access, use and rights’
- ‘The issue is how tensions and conflicts are managed’
- ‘Planning processes are difficult because of highly defensive staff’

Most of the concerns and issues were raised, and then assuaged, when further discussion of potential solutions and resolutions were elaborated on. Key opportunities and obstacles in implementing an integrative, ecosystem-based approach to marine governance remain. Each of the major issues noted above are described further.

2.3 Fragmented Government

Two central themes from the interviews is the general concern over the future of New Zealand’s management and governance framework, and the lack of a multi sector approach to ecosystem-based planning and management. The framework is currently diffused, decentralized, and highly fragmented with a range of activities managed by separate administrative jurisdictions and authorities (Figure 7). New Zealand has an array of policies, programmes, and agencies with marine responsibilities, but its current governance framework does not reflect international best practice.[66]

[66] See the research of scientists contributing to the project, Tagging of Pacific Predators, available at: http://www.topp.org/

Eighteen main statutes, 14 agencies, and six government strategies govern marine management and planning. The Resource Management Act (RMA) 1991 provides the framework or architecture for development of major national resource and environmental management decisions. New Zealand has concentrated on the implementation of marine policies and programmes that address marine transportation issues, such as the prevention of marine waste discharge and introduction of non-native species, and management of commercial fishing activities.

Defining basic principles and effective processes for improved marine governance should be a prerequisite to sound economic investment and ecological stewardship of the EEZ and continental shelf. Two forces are at work in ocean governance: the realization that highly valued ecological processes and species can be preserved only in large ecosystems; and the recognition that many ecosystems high in biodiversity value are and will continue to be used by humans.

Figure 7: Marine Management Sectors

A range of values carried by healthy marine areas are of more than merely instrumental value; some such values cannot easily be balanced or traded, such as the scientific, aesthetic, recreational, and ecosystem-based values of biodiversity and the health of marine areas. A complete characterization of these sectors, uses and values is beyond the scope of this report.

Recommendation 2.1: That policy instruments and planning tools that include a combination of community-oriented governance structures (such as collaborative decision-making), market incentives, and new regulatory tools, such as the creation of new permitting authority, be implemented to address future challenges in marine governance. That a more comprehensive, multi-sector approach to ecosystem-based planning and management be implemented in addition to new permitting authorities under the Environmental Protection Authority that is currently being developed. There is a clear and present need for a more integrative approach. New Zealand has yet to establish clear

enabling legislation that reflects international best practice in many aspects of the environmental decision-making, planning and management for the EEZ.

This section turns to a case study of offshore oil and marine mining, and an analysis of the Environmental Effects Bill of 2011. The section concludes with a characterization of several administrative principles that should be incorporated into New Zealand's marine governance framework for the EEZ and EEC.

2.4 Improving the Role of Science and Scientists

One need for New Zealand today is to create a marine policy based on a comprehensive set of administrative and management principles to guide marine governance. These principles should be based on the best available scientific information, advancement in new technologies and decision-making tools, and international best practice with respect to policy instruments and planning tools.

Interdisciplinary science is increasingly documenting the complexity of marine ecosystems, and the often-subtle linkages and relationships that influence and shape the health and ecological integrity of ecosystems. For example, the growing concern over the impacts of climate-related changes to marine systems, such as pH changes in the ocean, has been documented in offshore New Zealand.

The interaction of human society and the planet is a coupled nonlinear complex system. Those who take complex systems apart to study the parts miss some of the important phenomena; they must look at the whole. If a sector-by-sector approach is adopted, the many-faceted components of marine ecosystems may be poorly integrated into governance. A holistic view of marine ecosystems supports a management and planning approach that is multi-sector, multi-scalar, and multi-disciplinary. The management challenge is not an issue of controlling natural phenomena, such as the currents or the winds; it is human behaviour and the range of impacts that we have on these systems.

Future marine governance should be based on advances in the marine sciences and technologies that are changing the direction and approach to planning and decision-making. New technologies, such as geographic information systems (GIS), and complicated models of the ecology of large ecosystems are being used to assess the general health of ecosystems; these assist in collaborative planning and stakeholder-based decision-making, and support a more comprehensive understanding of the diverse human impacts and cumulative threats to ecosystems. An ecological threshold is the point at which a relatively small change in natural and human-induced conditions causes a rapid disturbance in an ecosystem. When an ecological threshold has been passed, the ecosystem may no longer be able to return to its previous state. The trespassing of an ecological threshold often leads to rapid change of ecosystem health. They key to a sustainable approach to marine ecosystems is to maintain the health and integrity of marine ecosystems. One approach to maintaining ecosystem health is a comprehensive assessment of cumulative impacts and the synergistic effects of human and natural activities on marine ecosystems, and craft institutional responses, such as mitigation and enhancement strategies with respect to the anthropogenic impacts.

Accordingly, it is important to develop planning tools and policy instruments that can support administrative principles. This often requires specific statutory language that can support further development and implementation of a comprehensive marine governance framework.

Administrative principles should support the gathering and synthesis of baseline ecological and socio-economic information for marine areas, and the evaluation of effects across diverse spatial and temporal scales (e.g., evaluation of effects based on short-term and long-term trends in the health of ecosystems). This requires an understanding of impacts across management sectors in planning and decision-making over resource use. The long-term maintenance of these ecosystems and the services they provide to human society is one priority in an ecosystem-based approach to planning and management.

With respect to environmental assessments, economic tools have been developed and are being used that strengthen understanding of the multiple values carried by healthy marine ecosystem services. Values to ecosystems are not purely economic or of use-value. There is a range of non-consumptive and natural values (including cultural values) associated with ecosystems. These non-consumptive values are often difficult to assess and quantify, so are left out of the evaluation of costs and benefits of a proposed marine activity. Economic tools are being used to assess the values of these services and to integrate this information into planning and decision-making, including the use of information on non-consumptive values in environmental impact assessments.

Historically, agencies and local communities have received a portion of revenues generated from the private use of public resources, putting them in a bind as they grow dependent on the funding and jobs created by industry. Consciously or not, environmental goals and the scientific enterprise can be short-changed under these circumstances. This is not to say that government should forego the collection of a fair return on the use of the commons and public resources. Rather, revenues should be pooled in a larger fund, along with general tax revenues, and distributed to agencies and affected communities according to budget requirements, to decouple funding from decision making.

Recommendation 2.2: That the role of science and scientists in marine planning and decision-making be strengthened to include statutory language that requires:

The creation of an Ocean Protection Council, an Ocean Science Trust; and an Interdisciplinary Coastal and Marine Science Advisory Council to support the EPA and Regional Councils in important marine conservation and marine resource use issues.

Separate funding of such bodies from that of decision-making.

In many countries scientists are involved in marine biodiversity planning and adaptive decision-making, and are acting as expert advisors in each stage of the marine planning process.[67] The Environmental Effects Bill should include statutory language to formally include scientists in planning and decision-making. New Zealand can learn from the experience in California. For example, in addition to fostering collaboration between scientific, government and non-government organizations that strengthens planning efforts under way in California[68] lawmakers passed the California Ocean Protection Act in 2004 and established the California Ocean Protection Council.[69] The Council is tasked with

[67] M.V. McGinnis and C.E. McGinnis, *Adapting to Climate Impacts in California: The importance of civic science in local coastal planning*, 39 COASTAL MANAGEMENT 225 (2011).

[68] The California Marine Spatial Planning Project is coordinated by Stanford University's Center for Ocean Solutions, *available at* http://www.centerforoceansolutions.org/initiatives/marine-spatial-planning/california-marine-spatial-planning-project.

[69] 23 Cal Pub. Res. Code § 35500 et seq. (2004). One goal of California policymakers is to take a multi-faceted approach toward fully incorporating science into ecosystem-based planning and decision-making. In creating the California Ocean

coordinating state activities related to the protection of ocean ecosystems.[70] In addition to the Council, California established under the California Ocean Resources Stewardship Act of 2000 the California Ocean Sciences Trust. The mission of the Trust is to foster collaboration and make sure that the best science available is incorporated into ocean policy and management decisions.[71] These programmatic initiatives focus on the integration of scientific information and scientists in marine governance in the state. Similar advisory bodies can assist the EPA in the planning process. Indeed, a number of policymakers and scientists have recommended the creation of a special Ocean Commission or Royal Ocean Commission to assist New Zealand government in future marine policy.

2.5 Offshore Oil and Mining

As of 2011 the existing offshore production takes place in Maui A and B – 1979; Pohokura – 2004; Tui – 2007; Maari/Manaia – 2009; and Kupe – 2010. Oil production represents the 4th largest export earner (2009), employing roughly 1500 direct employees, with $985M in company tax and paid royalties. The Maui field produced $3B in export earnings in 2009. Overall, the infrastructure for existing offshore oil production and associated onshore activities include: five offshore facilities; ten onshore facilities; offshore and onshore pipelines; and the marine space used for development. For instance, the Kupe field covers about 15 hectares. The Maui platform is at a depth of approximately 110m located 35km offshore. The gas being developed is 3km under the seafloor. There remain concerns that New Zealand is not equipped to address the risks of a major oil spill off Taranaki.[72]

The petroleum exploration permit for 52707 Petrobras off the east coast of North Island represents an area of 12,330 km^2 in marine waters up to 3000m deep. The potential for future offshore oil and gas development has recently received major media attention and increasing scrutiny of the oil industry's activities, given the oil spill in the Bay of Plenty and the major catastrophe in the Gulf of Mexico. There remains major public opposition to oil drilling and increasing pressure to protect additional marine areas from the impacts of potential oil spills.[73] As Zuur from World Wildlife Fund-New Zealand writes, 'And if New Zealand is serious about being a world leader in environmental protection, we must also have laws in place setting out principles and standards for managing marine resources and the ocean environment as a whole'.[74]

Protection Council, the California Ocean Protection Act states that '[a] goal of all state actions shall be to improve monitoring and data gathering, and advance scientific understanding, to continually improve efforts to protect, conserve, restore, and manage coastal waters and ocean ecosystems' California Ocean Protection Act, 26 CAL.PUB.RES.CODE § 35510(b)(4) (2004).

[70] California Ocean Protection Act § 35615(a)(1). *See also* THE CAL. OCEAN PROT. COUNCIL, A VISION FOR OUR OCEAN AND COAST: FIVE-YEAR STRATEGIC PLAN (2006).

[71] The California Ocean Protection Act requires the establishment of a scientific advisory committee that includes scientists from a range of disciplines and provides independent and timely analysis using best available science [113 Cal. Pub. Res. Code § 35615(3) (2004)]. The creation of the California Ocean Sciences Trust serves this purpose. The California Ocean Science Trust works with Sea Grant to manage the California Ocean Protection Council's funds for research. Research funds are being used to support ecosystem-based research that has direct applicability to regional ecosystem planning and management.

[72] Rob Maetzig, *Taranaki at risk of a major marine spill*, TARANAKI DAILY NEWS (4 February 2011) at 5.

[73] *East Cape oil-drilling plans raise concerns*, NEW ZEALAND HERALD, 13 October 2010. See also Kim Knight, *What lies beneath*, SUNDAY STAR TIMES (29 May 2011) at C4-C5.

[74] Bob Zuur, *Think first, drill later*, THE DOMINION POST (23 June 2010).

Marine areas are being explored for offshore oil activity off Taranaki, the Great South Basin, and the East Coast of North Island; gold placer deposits may be mined off the west coast of New Zealand; and sea bed minerals may be further explored and developed, including iron sands, precious metals, and phosphates. The political fallout of proposed offshore oil development is also becoming more acute, with protests and civil disobedience on both sides of North Island occurring in 2010 and 2011. Future activities may include energy generation, aquaculture, carbon capture and storage, and biodiscovery. These future activities will likely be assessed under a future environmental effects policy.

New Zealand legislation governing environmental and safety aspects of offshore oil exploration and development includes the following components:

- Navigational safety
- Maritime security
- Discharges into the sea and to air
- Oil spill planning, preparedness, and response
- Dumping at waste at sea
- Liability for oil pollution damage
- Protection of submarine cables and pipelines.

The following key regulatory components and statutes are currently in place to address offshore oil activities.[75]

- Environmental protection is governed by The Resources Management Act 1991, which sets forth a consent regime for marine areas out to 12nm; and the Maritime Transport Act 1994 (MTA), which applies to areas beyond 12nm and includes issues of navigational safety and oil spill planning and response.
- Safety is governed by the Health and Safety in Employment Act 1992, and the MTA for navigational safety, search and rescue.
- Maritime security requirements are set forth in the Maritime Security Act 2004.
- The Biosecurity Act 1993 establishes a framework for preventing non-native invasive species from entering territorial waters from the primary vectors of introduction, marine vessels.
- The Crown Minerals Act 1991 provides access to offshore marine areas and mineral reserves.
- The Continental Shelf Act 1964 covers exploration and exploitation of the EEZ and extended continental shelf, including the granting of licences for prospecting and mining.

Central government has significantly expanded prospecting for offshore oil and marine mining development for a number of reasons. One goal is to maximize the economic return to the Crown. Oil was nationalised in 1937. A second reason is the global demand for oil exports and associated revenues. Gas produced offshore is also shipped to shore and then reticulated around North Island. This gas is used to supplement power generation in the country. In addition, fossil fuels are a major export commodity. Methanol contributed to the export economy. Dairy production has increased dependence on fertiliser for domestic use –

[75] MARITIME NEW ZEALAND, INFORMATION SHEET (1 June 2010). The information sheet describes New Zealand's legislation governing environmental and safety aspects of offshore petroleum exploration and production.

and fertiliser production depends on fossil fuels. Industry also depends on fossil fuels as a major source of heat to produce goods.

The Ministry of Economic Development (MED) has leased marine areas for offshore oil exploration.[76] New Zealand is surrounded by eight massive sedimentary basins. The largest, and the one geologists say has the greatest potential, is the Great South Basin. The current explorers of leased marine areas are: Discovery Geo, Global Resources, L&M Energy, TAG, Kea Petroleum, Anadarko, Petrobras, Westech, Horizon Oil. The current producers and explorers are: AWE, Todd, OMV, Origin, Greymouth, NZOG and Shell. One issue of contention is royalty associated with the development of these marine areas. Current rates set by the national government are set relatively low, when compared to other oil developing countries, in order to attract companies to explore in the country. The Crown is also encouraging oil development by investing $35M in MED for frontier seismic surveying operations.

There is currently a demand for oil development in deeper seas. As one participant in the workshop on offshore oil and gas development noted, 'Global demand will drive changes and interest in this country. Thus it is appropriate that Crown looks to changing regulations and levies. We would argue that impacts are small with number of platforms and pipelines. Risk of spill is low, with high potential impacts in deeper waters. So the political challenge is a risk and reward game.' An oil industry member interviewed for this study maintained, 'We could manage consenting regimes both inside and outside 12nm better. It would not be useful to have two agencies dealing across an imaginary boundary. As long as we deal with these developments in silos, we will have a disconnect. We are on the right track, but the Crown needs to be leader.'

The MED has recognized a number of institutional constraints associated with future offshore oil and gas activity. In a recent agency review conducted in 2010 MED found that there are limited resources available at present to meet statutory needs. The current institutional capacity and capability is insufficient to meet objectives for petroleum and mineral estate. There is also difficulty in attracting and retaining skilled staff with the necessary professional expertise in offshore minerals development. More staff and resources are needed over the next 2-3 years.

In addition, a recent MED study of international best practices found several common characteristics of overseas regimes: environmental impact assessments and public notification; preparation of an environmental and safety case; insurance and liability requirements; and inspection and notification-based enforcement.[77] New Zealand's current regulatory regime has focused on enabling oil development and has yet to put in place the necessary planning and administrative practices to adequately assess the multiple risks and effects of future offshore oil and gas development of marine life and other marine resource users.

With respect to the offshore oil and gas development and iwi claims, there remain a number of issues to be addressed and reconciled.[78] In February 1997 the first claim included the Te Atiawa, Ngati Tama, Ngati Mutungu and Ngati Maru**.** The Māori tribes sought compensation

[76] MED, NEW ZEALAND PETROLEUM RESERVES (August 2010).

[77] MED, COMPARATIVE REVIEW OF HEALTH, SAFETY AND ENVIRONMENTAL LEGISLATION FOR OFFSHORE PETROLEUM OPERATIONS (September 2010). Final Report.

[78] *Give Māori a better say on deep-sea oil*, TRIBUNAL (31 January 2011)

for illegal confiscations of their lands in the 19th century as a part of Waitangi land claim settlements. Among the issues reviewed were Māori rights to natural resources before 1840. Iwi wanted some of the royalties generated from the oil activities associated with their historic lands. The outcome of first claim in September 1999 was as follows:

- Te Atiawa - no settlement up to the present
- Ngati Tama - deeds settlement signed 25th September 1999
- Ngati Mutungu - deeds settlement signed 25th September 1999
- Ngati Maru – no settlement up to the present
- No rights to oil / gas resources / revenues have been granted.

A second claim commenced in December 1999. The Nga Ruahine filed a claim of ownership for an offshore oil and gas field [Kupe] that lies next to the tribe's ancestral lands. In June 2000, the claim was joined by Ngati Kahungunu (East coast iwi). The Ngati Kahungunu's statement of claim asked the tribunal to find that the Petroleum Act 1937 and the Crown Minerals Act 1991 have breached the principles of the Treaty of Waitangi by failing to recognize Ngati Kahungunu's customary rights to petroleum resources. It also sought a recommendation that the Crown should pay compensation. Ngati Kahungunu also wanted the tribunal to recommend that all relevant legislation and policy be amended to allow the iwi to exercise rangatiratanga and kaitiakitanga over the petroleum resources within its region. It noted in the claim that the Crown should also revoke all prospecting, exploration and mining permits within its rohe, which is one of the largest tribal areas in the country. In November 2003, the government formally rejected a Waitangi Tribunal recommendation made in May that Māori should be compensated for the 1937 nationalization of petroleum. The government's decision was, in part, based on its fear that other private land owners would file claim to share of petroleum revenues, which would call into question Crown ownership of other minerals on private land.

A third claim was made in May 2010 by Nga Ruahine Otaraua (a hapu of Te Atiawa), Ngati Kahungunu, and Nga Hapu o Poutama. The claim included concern that the Crown Minerals Regime and the Resource Management Act give Māori no real say when oil companies want to drill. The crux of their argument is based on administrative procedures and inadequate consultation between the developers of oil and the iwi affected. The iwi claim that they have suffered major environmental, historical and cultural disadvantage and damage to their wahi tapu. They also claim that the Resource Management Act has been ineffectual in protecting their sites of significance. There has been no outcome from this third claim as of the writing of this section.

Overall, the relationship between iwi claims and existing offshore oil and gas development off Taranaki includes the following factors:

- A shift in emphasis from the oil ownership rights / revenue share in 1997 to revenue share / retribution in 2000 to inadequate consultation in development process in 2010
- The involvement of five of Taranaki's eight iwi throughout the three claims
- Silent iwi: Taranaki (no settlement yet), Ngati Ruanui (settlement on May 12th 2001), Nga Rauru (settlement on November 27th 2003).

Marine mining in the short term is limited by technical and economic feasibility and other constraints.[79] But as the technology for marine mining development continues to improve, the potential economic return from proposed marine mining activities continues to foster interest from industry, public debate and economic speculation on the part of the industry. Marine mineral areas are depicted in Figure 13. The range of economic returns from potential mining activity in New Zealand's marine environment varies considerably. The Crown is funding and supporting the exploration of a range of minerals, including the extraction of deep-sea methane hydrates, the first such development in the world. The environmental impact of marine mineral resource development and mining, however, remains very uncertain and will be influenced by technology. Scientists have only begun to understand the ecology of the benthic areas of the country.

Yet, despite this scientific and technological uncertainty, large areas of New Zealand's EEZ have been permitted and leased by MED for marine mining exploration. For instance, Trans-Tasman Resources Ltd received an additional licence in January 2011 to prospect for iron ore in the continental shelf; the licence granted by Crown Minerals covers 3,314 sq kms of areas off the west coast of North Island. London-based Neptune Minerals has three prospecting permits covering more than 50,000 sq km of New Zealand's continental shelf, northeast of the Bay of Plenty.[80] As with proposed offshore oil and gas activity, there remains a strong and building opposition to these activities in many places. It is not uncommon to see 'No Marine Mining' signs posted along coastal towns such as Raglan. The potential mining of sensitive areas associated with the Kermadecs and mining of iron sands off the west coast of North Island are specific concerns raised by a number of those interviewed.

Particular ecological concerns are associated with the impacts and effects of mining operations on the sea floor or benthic areas. Existing Benthic Protected Areas (BPA) do not protect these designated areas from marine mining. Even though the Kermadecs are part of the existing BPA network, marine mining is not restricted. Marine ecosystems, including life at the seabed of every depth of the ocean floor, have yet to be explored and inventoried. The significance of these marine areas is poorly understood.

Deep sea mining can threaten these fragile ecosystems.[81] Dr. Malcolm Clark, a scientist with NIWA who has extensive experience in studying the benthic and deep sea areas around New Zealand, states, 'We need to describe the natural seafloor biota before any changes are caused by human activities, and to evaluate the full spatial footprint of the predicted impacts.'[82] Yet, commercial fishing (as noted in Section One) has extensively fished the continental shelf and sea floor of New Zealand's EEZ. The impacts of commercial fishing activity should be carefully evaluated and assessed with respect to current and future disturbance of the benthic marine areas by the mining and offshore oil and gas industries. There are likely synergistic and cumulative effects on marine ecosystems caused by commercial trawling operations and other resource-related exploration and development activities. The figure shows the types of disturbance from marine mining activities. Impacts on the benthic areas can affect marine life across diverse food webs and depths of the sea, including disturbance of the ecology associated with water columns.

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[79] James M. Broadus and Porter Hoagland III, *Marine Nonfuel Minerals in the US Exclusive Economic Zone: Managing Information as a Resource*, 13 OCEAN & SHORELINE MANAGEMENT 275 (1990).

[80] Anthony Doesburg, *Hot prospects in deep water*, NEW ZEALAND HERALD (16 November 2009).

[81] NIWA, *Ocean's treasure*, WATER & ATMOSPHERE (February 2011) *at* 10-19.

[82] Id., p. 17.

Lessons should be learned from the development of marine mining technologies in other marine areas. Today Nautilus is working in Papua New Guinea (PNG) to advance technology in support of sulphite mining off the sea floor. As with PNG, New Zealand is located in a very fragile ecological zone in the world having high biological diversity. Off the coasts of Indonesia, Malaysia, the Philippines, Solomon Islands and Papua New Guinea, the Coral Triangle covers almost 1.6 billion acres—an area equal in size to half of the USA. Its waters hold an array of over 600 reef-building coral species—which encompasses 75 percent of all species known in the world. Nautilus is the first company to commercially explore the ocean floor for mineral deposits. The technology being explored in PNG is new and has never been used elsewhere in the world. PNG will be the first country used as an experiment on the efficiency of this technology. This process of extracting ore from the seabed, taking it to land, processing and extracting its minerals there, and then returning the waste into a sea that has already been disturbed through excavation by the same project already indicates a potentially significant effect and impact on the sensitive habitats.

There remain a number of major issues and concerns associated with proposed offshore oil, gas, and minerals exploration and development in New Zealand. The recent oil spill in the Bay of Plenty has intensified the debate over this marine resource use. The past several years have also reflected a rise in activism and civil disobedience with respect to these marine uses. A sample of relevant general issues and concerns expressed by individuals interviewed for this report are:

- Consultation & Concurrence – there is a lack of due process and democratic procedures in the current regime for the planning and decision-making over existing and future proposed use.
- Assessment of Constraints – there is a lack of a comprehensive and integrative approach to assess effects and the synergistic impacts of the range of activities associated with offshore oil, gas and marine mining activities (from exploration to development to decommissioning) at each stage of the planning and permitting process (environmental assessment, permitting, enforcement, and monitoring).
    - The assessment of risks associated with these proposed activities remains highly fragmented and poorly integrated.
    - There is a lack of baseline information that can be used to assess effects and risks across sectors, including offshore oil activity.
    - The synergistic effects of exploration and development have not been evaluated and assessed (e.g., the effect of marine noise from oil exploration on marine species, the impact of vessel traffic associated with oil development and other marine activities, the costs and benefits of decommissioning existing offshore oil structures, including pipelines and drilling rigs, among others).
    - There is a lack of scientists, professionals and other experts who can support planning and decision-making in the current ocean governance regime.
    - There is a lack of enforcement and monitoring of existing offshore oil and gas activities.
- There is lack of clarity in the assessment of benefits and costs associated with the methods of analysis of future permitting and consent.

- Important issues associated with sensitive species and marine habitats have been poorly considered in the current enabling regime that supports offshore oil and gas and marine mining activity.
- The goals of adaptive planning and the use of a precautionary approach to policymaking are made more difficult in light of the lack of science.
- Important issues of environmental justice and the rights of iwi have yet to be addressed by national government in the permitting of exploratory activities and existing offshore oil and gas activity.
- A number of institutional issues and concerns associated with funding and staffing has yet to be clearly addressed in statutory language.
- The capability of New Zealand to respond to an oil spill in marine waters is significantly being challenged today in light of the oil spill in the Bay of Plenty.

2.5.1 Troubled waters

Today, New Zealand has a window of opportunity to change marine policy to better reflect international best practices and standards of planning, decision-making, and governance. This section emphasizes the importance of principles in administration, planning and policymaking to strengthen and improve marine governance. Several core elements must be put into practice at some point to support a more integrated approach to marine governance, such as: recognizing connections within and across ecosystems; utilizing an ecosystem services perspective; protecting core elements of marine areas to preserve biodiversity and to sustain ecosystem services; addressing cumulative impacts; managing for multiple objectives and values; addressing diverse scales of management consistently and adaptively; and embracing change, learning, and adapting.

One question is whether or not the Rena disaster will contribute to public policy innovation to address and respond to future risks and threats from marine resource use. A range of issues are relevant, from the type of policy instruments used and the tools required to: assess environmental effects, determine the risks associated with resource use, evaluate the cumulative and synergistic impacts of natural and human impacts, and protect the level of marine life required to ensure the health and integrity of marine ecosystems. As in the past, true change requires political leaders – or what is referred to by scholars as 'policy entrepreneurs or fixers' – who are willing to take the necessary risks, garner public support for new ideas and policy solutions, create broad alliances that support change, weather the storm of critique and disenchantment, and forge ahead to address the challenges of governance in a context of social turmoil.[83] The history of marine catastrophes caused by oil-related disasters indicates most oil disasters are caused by marine vessels, and the larger spills are engineered disasters caused by problems with offshore oil and gas structures.

Substantive policy innovation and change are not necessarily by-products of a crisis. There remain substantive long-term impacts from the Rena disaster: as with most disasters in the marine environment, the social-ecological costs are often under-reported and poorly evaluated, and economic costs are under-estimated and poorly understood. Maritime communities in the USA and in other places have not recovered from the impacts of long-past oil spills and other

[83] Policy entrepreneurs or 'fixers' play a fundamental role in defining solutions to environmental problems, and can open up windows of opportunity to strengthen and improve national ocean policy. See Robert Knecht, Biliana Cicin-Sain, and Jack Archer, *National Oceans Policy: A Window of Opportunity*, 19 OCEAN DEVELOPMENT AND INTERNATIONAL LAW 113, 126 (1988).

catastrophes. This fact should not be overshadowed by New Zealand's interest in marine economic development of the country's EEZ.

The world witnessed British Petroleum's catastrophic oil spill in the Gulf of Mexico. In the shadows surrounding the oil catastrophe resides the ethical compromise of industrial-scale use of marine areas and the burgeoning impacts of anthropogenic climate disturbance. With reference to the spill, Freudenberg and Gramling note, 'Despite our habit of referring to oil 'production', the reality is that the twentieth century was an unprecedented exercise in oil 'destruction'.'[84]

There has been a concerted effort to develop tools that can assess the threats to marine ecosystems and to manage for the multiple values carried by ecosystems, such as new zoning and spatial planning tools. New tools that support ecosystem-based planning are being adopted across the world, including marine zoning strategies, marine spatial planning for large marine ecosystems, and designation of marine protected areas. New partnerships have emerged to support these planning initiatives, including collaborative partnerships between members of government agencies, non-governmental organizations, private interests, conservationists, and scientists. Many of these tools are described in this report.

In the past forty years the impacts of oil catastrophes have received worldwide coverage, especially when a spill threatens the economic well-being of a human settlement near a marine area, such as a port of entry. Many spills have gone unreported. The social turmoil and political conflict associated with a spill often includes a discussion over the failures of marine policy and government's response to a spill – the question of who is to blame for the spill can cloud the real political challenges of a failed policy or failure to implement a policy. The broader social issues and ecological concerns brought on by the impacts from a spill may lead or contribute to major change and policy innovation. The history of marine policy in the USA, for example, reflects a series of governmental responses to catastrophic oil spills. Many federal and state environmental laws and programmes were created in response to the 1969 oil spill off the coast of Santa Barbara, California.[85] Offshore oil development began in Santa Barbara, California in the late 1880's. A century ago, California was the world's top producer of oil;[86] the coastal landscape of southern California included thousands of onshore oil rigs. As oil moved farther offshore, the ecological risks of industrial oil development intensified. The public's perception of risk and fear over offshore oil development also deepened. The memory of 1969 is a driving force behind the diverse ecological movement, and contributed to the development of marine

[84] WILLIAM R. FREUDENBERG AND ROBERTGRAMLING, BLOWOUT IN THE GULF 4 (2011).

[85] J.T. LIMA, THE POLITICS OF OFFSHORE ENERGY DEVELOPMENT. PH.D. DISSERTATION, UC Santa Barbara (1994). (Lima shows that technological development supported the movement of onshore oil development to marine areas. In addition, Lima notes that as offshore development moved offshore, conflict between local, state and federal governments led to the development of ocean policy. He also shows that the 1969 oil spill offshore Santa Barbara, California was one major contributing factor to the development of state and federal environmental policies and programmes.) *See also* R.J. Wilder, *Cooperative Governance*, *Environmental Policy*, *and Management of Offshore Oil and Gas in The United States*, 24 OCEAN DEV. & INT'L L. 41 (1993), and NATIONAL COMMISSION ON THE BP DEEPWATER HORIZON OIL SPILL AND OFFSHORE DRILLING (2011) *at* 23.

[86] L. NEVAREZ ET AL., PETROLEUM EXTRACTION IN SANTA BARBARA COUNTY, CALIFORNIA: AN INDUSTRIAL HISTORY. OCS Study MMS 98-0048 (1998).

policy in the state.[87] Over forty years after Unocal's catastrophic oil spill in the Santa Barbara Channel, California is recognized as a leader in the development and implementation of policies and programmes that embrace the management goal of marine biodiversity protection.[88]

Policy innovation may be one consequence and reaction to the commercial vessel grounding and oil spill in the marine waters of the Bay of Plenty. Commercial vessels remain a primary threat to island countries and marine ecosystems. Marine pollution from commercial vessels, including oil spills, remains a major concern across the world's oceans. Marine commercial vessels are also the leading vector for the introduction of non-native invasive species. Vessel strikes also contribute to the mortality of marine mammals.

But progress toward a more holistic, comprehensive, multi-sector, and ecosystem-based approach to marine planning and decision-making remains unclear at the time of the writing of this report. Scientists, environmental non-governmental organizations, and concerned policymakers can play a key role in policy innovation, and provide the necessary guidance, vision, leadership, and ideas to change the course of a country's marine planning, decision-making, and policy. In time the media's and public's interest in the spill may recede like a mirage in the desert despite the long-term impacts of an oil spill.

Oil spills from offshore oil activities and marine vessels are part of the history of oil development and the transportation of goods by the sea. Most spills are from marine vessel accidents. The risks associated with future oil development will contribute to the need to develop costly remediation and response plans and programmes supported by professionals, experts, and technocrats who are able to assist in the development of these plans and programmes.

There is also a substantive need for marine planners and managers to carefully consider the socio-ecological costs and benefits of resource development and their associated impacts in the EEZ. Costs and benefits will vary in accordance to the values people hold in diverse places. In some places careful evaluation of costs and benefits will take place in a highly charged political environment and in a context where scientific information is not freely accessible and where plans and decisions are made under conditions of scientific uncertainty. While interest in economic development for so-called 'low probability high risk' offshore oil and mining activities exists today on the part of government elites, spills and accidents is one inevitable consequence of industrial-scale marine resource use. The high level of public fear and risk associated with these types of marine activities will remain issues that policymakers and developers will need to take into consideration.

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[87] BILIANA CICIN-SAIN AND ROBERT W. KNECHT, THE FUTURE OF US OCEAN POLICY: CHOICES FOR THE NEW CENTURY 40 (2000). See general descriptions of the social and ecological impacts of the spill see ROBERT EASTON, BLACK TIDE: THE SANTA BARBARA OIL SPILL AND ITS CONSEQUENCES (1972) and A. NASH, D. MANN & P. OLSEN, OIL POLLUTION AND THE PUBLIC INTEREST: A. STUDY OF THE SANTA BARBARA OIL SPILL 24 (1972).

[88] CALIFORNIA RESOURCES AGENCY AND CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, PROTECTING OUR OCEAN: CALIFORNIA'S ACTION STRATEGY (2004) at i, *available at* http://resources.ca.gov/ocean/Cal_Ocean_Action_Strategy.pdf.

2.6 The Environmental Effects Bill of 2011 and the EPA

The Environmental Effects Bill establishes preliminary goals and objectives with respect to setting up a new statutory requirement that includes the assessment of environment effects associated with future marine activities and uses in the EEZ and continental shelf.

This section's emphasis is on a number of recommendations that can strengthen and improve the bill, and to offer a range of tools and administrative principles that can enhance the institutional capacity and capability in marine governance. The current bill (as of October 2011) attempts to fill a major gap in the framework to govern marine activities in the EEZ and continental shelf, and includes the following statutory provisions:

- It puts in place a consenting regime for proposed marine activities in the EEZ and continental shelf.
- The consenting regime requires an assessment of environmental effects and will enable consent to be declined if the risks and potential environment adverse environmental effects are too significant.
- The role of the EPA will be expanded to manage the new consenting process.
- All applications for marine consents are to be publicly notified.
- Marine activities will be considered permitted, discretionary or prohibited.
- There will be spatially identified marine areas that are off limits to specific activities.

For example, to assess the environmental effects of a proposed wave energy project, the following factors in Figure 8 among others, should be included in a comprehensive environmental impact assessment.

Figure 8: Likely & Potential Ecological Issues Associated with a Wave Energy Project

1. Ecological energy balances and flows	Consequences of energy extraction and physical presence of devices in the sea should be assessed, e.g. changes in vertical mixing may lead to changes in offshore and coastal habitats/features and subsequent effects to biological communities
2. Disturbance to seabed habitats	Anchoring, mooring/foundation installation, operation, and maintenance equipment, and other seabed disturbances can lead to disturbance/destruction of seabed habitats.
3. Disturbance to water masses	The scale and implications of changes to such factors as nutrients, temperature, light levels, turbidity (suspended sediments), surface waves and current patterns should be considered.
4. Shoreline disturbance	Activities that have the potential to cause change to the coastline such as erosion/deposition and change in character, either directly or indirectly should be considered.

5. Behavioural changes in wildlife	Test activities have the potential to affect the distribution of wildlife. The potential influence of activities and facilities on wildlife, in particular endangered species, marine mammals, seabirds, and sea turtles should be considered.
6. Contamination of water, seabed and wildlife (including fish stocks)	Contamination may result from effluent discharge, chemical discharge / leaching / leaks, oil discharge leaks, sewage discharge, dumping of waste. All potential sources, planned or accidental should be considered.
7. Wildlife entanglement, entrapment and collision	The potential for damage and entrapment of wildlife, in particular marine invertebrates, fish, mammals, and birds, should be addressed in relation to structure, operation, season, and location. Impacts may include entanglement or collision with any blades / rotors, jamming in joints, and entrapment.
8. Underwater sound, light and vibration	Test devices and associated activities are likely to produce sound, light and other disturbances that may disturb and affect the behaviour or the well being of marine life. Although the exact cause-and-effect relationships can be difficult to determine, there is interest in this issue from regulators and stakeholders.
9. Electromagnetic and electrical effects	Some organisms, e.g., elasmobranch fish (sharks, rays and skates), are particularly sensitive to electric and electromagnetic fields generated from electric cables.
10. Greenhouse gas emissions and contribution to climate change	Consideration should be given to potential greenhouse gas emissions e.g. from fuel use or construction, installation, or maintenance of technology.

Peart and colleagues at the Environmental Defence Society identify a number of weaknesses in the current EEZ legislation framework, including:

- No mechanism to provide cohesive policy and to integrate decision-making within the EEZ
- Weak implementation of the environmental provisions of several major marine policies
- No legislative framework for the creation of a network of marine protected areas within the EEZ
- No independent oversight or review of marine plans.[89]

[89] RAEWYN PEART, KELSEY SERJEANT, AND KATE MULCAHY, GOVERNING OUR OCEANS: ENVIRONMENTAL REFORM FOR THE EXCLUSIVE ECONOMIC ZONE, EDS Policy Paper (April 2011).

Recommendation 2.3: That the procedural processes for planning and decision-making should be strengthened to include the following the use of new planning tools, such as:

Creation of Living Permit to Ensure Adaptation and Learning. A living permit would allow for new information to be gathered and synthesized during the monitoring phase that can be used by policymakers to ensure that the impacts of marine activities do not significantly impact public health, safety and environment. Similar permitting tools have been used in the USA for offshore oil and gas activities. With respect to the consent, the intent of the living permit is not closure via the planning and regulatory processes but recognition of the need for further information during the operation and activity of particular aspects of marine resource use, such as the health related impacts of the use of a pipeline or the environmental effects on habitats from the operation of a structure.

Integrated Risk Assessment that will strengthen assessment across different activities. A major failure of risk assessment is the compartmentalization of risk analysis into particular aspects of a marine resource use, such as offshore oil exploration and development. Given the fact that large-scale offshore oil activities are often supported by a number of sub-contractual arrangements, one planning tool to assess risks is to integrate across different activities. This planning tool is being used in the United Kingdom and Norway to strengthen the analysis and assessment of risks for offshore oil and gas activities.

Independent Production and Review of Environmental Assessment to be performed by the lead government agency or department. A major concern in environmental assessment is the independence, reliability and credibility of the information used in the analysis. In the USA, proposed developers and industry are responsible for conducting an environmental impact assessment for marine resource use. These environmental assessments are contracted out by the lead agency or department and not by the industry. In addition, special advisory bodies can be used to support the independent review of environmental assessments.

With respect to the Environmental Effects Bill and the potential for significant marine resource exploration and development of the EEZ and EEC, this section supports a number of recommendations to strengthen the founding administrative principles for sustainable marine governance. This analysis is based on a comprehensive review of international best practice in marine governance, and offers a range of policy tools and planning instruments.

2.7 Biodiversity Protection: The Importance of Marine Protected Areas

In order to understand the importance of cultural heritage and maritime ecology, we need to place the islands we depend on in a proper context. Marine resource use is changing in New Zealand. New Zealand has not protected marine habitats within its EEZ to the level or extent supported by marine conservation scientists. Marine life is increasingly vulnerable to changes in atmospheric and oceanic conditions brought on by large-scale climate disturbance. New Zealand is a relatively small country responsible for a large EEZ, and given the lack of resource for marine management and planning will need to establish creative and adaptive plans and programmes in future governance.

As with other islands, New Zealand is vulnerable to shortages of water, food insecurities, ecological scarcity, changes to our climate, and other potential threats and pressures. The next generation will likely see the end of cheap fossil fuels, and with so-called ‘peak oil’ concerns, the maintenance of the global trade and growth in export industries will be challenged with

dramatic rises in fuel and energy costs. Well over 90 percent of New Zealand's exports are by marine vessels, which are the primary cause of oil spills across the world, and are also the primary vectors of non-native marine species. The maintenance of ecological and economic security is based on the maintenance of the ecosystem services provided by healthy ecosystems – the soil, clean water and air, among other services – and the capacity and capability to address the synergistic threats, pressures and vulnerabilities brought on by human use and climate disturbance.

The issue of the scale or level of marine life protection in New Zealand remains an issue of debate that reflects different values and interests held among scientists and managers of the marine ecosystems of New Zealand. [90] A range of planning tools and zoning strategies, including the designation of Marine Protected Areas (MPAs) and other protection and management measures, have been used in New Zealand. The New Zealand Marine Protected Area Policy is currently one of the major drivers of biodiversity protection developed, in part, to deliver the country's obligations under the Convention on Biological Diversity. Key components of the MPA Policy are:

- A consistent approach to classification of the marine habitats and ecosystems
- Mechanisms to co-ordinate a range of management tools
- Inventory to identify areas where MPAs are required
- A nationally consistent basis for planning and establishing new MPAs.[91]

The New Zealand Marine Protected Area Policy does not currently allow for establishing marine reserves outside the territorial sea.[92] A discussion of the full suite of protection measures that are available or in place, such as marine mammal sanctuaries, seamount closures, marine components of nature reserves, is beyond the scope of this report.[93] Yet, it is important to recognize that marine reserves are just one example of the type of protective measures used in New Zealand. New Zealand has created particular plans to protect species,

[90] There remain significant differences of opinion over the existing level of marine life protection provided by marine reserves and other protective measures. These differences are primarily based on the different criteria and values used to scientifically assess the level of coverage of existing protective measures. For instance, the level of protection provided by Benthic Protected Areas in the EEZ remains a major issue of scientific debate. A recent report by B.R. KNIGHT, R. SNEDDON, W.M JIANG, NEW ZEALAND'S MARINE PROTECTED AREAS: CLASSIFICATION UNDER THE IUCN PROTECTED AREA SCHEME (Prepared for Ministry of Fisheries, Cawthron Report No. 2042, 2011) notes a large amount of sea area protected under the criteria established by the International Union of the Conservation of Nature (21.22percent for territorial waters and 30.59percent of the New Zealand EEZ). This is a very large increase from figures commonly quoted for New Zealand marine protected areas by other marine scientists and DOC (7percent and 0.3percent respectively). The report highlights some of the weaknesses and ambiguities in New Zealand's classification system. This debate over the level or scale of protection should be resolved by a more integrated, coordinated and ecosystem-based approach to marine life protection. A more comprehensive and ecosystem-based monitoring program to assess the effectiveness of the existing protective measures is warranted, with particular focus on the substantive long-term ecological outcomes of these protective measures on biodiversity that should include a range of indicators, such as the abundance and distribution of marine mammals and birds.

[91] DEPARTMENT OF CONSERVATION AND MINISTRY OF FISHERIES, MARINE PROTECTED AREAS POLICY AND IMPLEMENTATION PLAN (2005) available at http://www.biodiversity.govt.nz/seas/biodiversity/protected/mpa_policy.html#mpapolicyplan

[92] The Marine Reserves Act 1971 allows marine reserves to be set up within the 12-mile limit. It is important to note that changes incorporated in the Marine Reserves Bill that have been under consideration for ten years set forth establishment of marine reserves in the EEZ. The Bill, published in June 2002, is available at: http://www.doc.govt.nz/upload/documents/about-doc/role/legislation/marine-reserves-bill.pdf

[93] See B.R. Knight et al. (2011), op cit.

such as the listing of marine species as protected under the Wildlife Act. Other protection and management mechanisms can or have been established in the EEZ, including marine mammal sanctuaries and fisheries closures, such as seamount closures and benthic protected areas (BPAs). There are also other protected measures in place, such as the marine components of nature reserves. The existing range of protective measures is ambiguous and unclear.

The ultimate success of existing protective measures can be found in the trend in the abundance and distribution of important keystone species, such as marine mammals. There is growing uncertainty about the future of special status species including the Maui dolphin, New Zealand sea lion and other keystone species. Linklater indicates that ongoing decline of Maui dolphin, one of the most endangered marine mammals of New Zealand, shows that current measures are not sufficient to protect the breeding population. Linklater notes:

> If we lose Maui dolphin it is likely that the effects will cascade through the food chain to radically change the community of plants and animals off our coasts. The loss of fish predators like dolphin can actually reduce ocean productivity for fisheries in the long-term ...We need to understand that the loss of dolphin can be a bad thing for the economy as well as a bad thing for the quality of our environment and our enjoyment of it ... The slowness with which the fishing industry and our political representatives act is a part of the problem.[94]

A keystone species is one that has a disproportionately large effect on its environment relative to its abundance. Marine mammals and sea birds play a critical role in maintaining the structure of a coastal and marine ecological community, affecting many other organisms in an ecosystem, and helping to determine the types and numbers of various other species in the community.

Currently there is increasing debate in the country over the need for stronger biodiversity protection measures, and whether or not the existing range of protective measures supports the value of marine life protection.[95] Sea birds and marine mammals are especially vulnerable to many marine activities such as offshore oil and gas activity, commercial fishing operations, and climate-related disturbance. The scientific literature on the benefits of MPAs also shows that the expansion of reserve networks and other protective measures, including the use of marine zoning strategies, is needed as a climate adaptation strategy.[96] Scientists show that small marine reserves and other protective measures rarely protect keystone species, such as sea birds and marine mammals, which are vulnerable to large-scale changes in the marine environment.[97]

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[94] Wayne Linklater, *Maui dolphin—act now or lose a species*, VICTORIA NEWS (Published 14 March 2012). With respect to other New Zealand marine mammals, see B.C. Robertson and B.L. Chivers**,** *The population decline of the New Zealand sea lion Phocarctos hookeri: a review of possible causes*, 41 MAMMAL REVIEW 253 (2011).

[95] See note 66.

[96] R.T. Kingsford and J.E.M. Watson, *Climate Change in Oceania: a synthesis of biodiversity impacts and adaptations*, 17 PACIFIC CONSERVATION BIOLOGY 270 (2011).

[97] MPAs will need to be designated as one tool among a range of other policy instruments. In addition, MPAs can contribute to an ecosystem-based approach to coastal marine governance by reducing the adverse impacts of climate disturbance, but this contribution is based on the scale, design and management of connected networks rather than individual protected areas. *See also* G. KELLEHER, GUIDELINES FOR MARINE PROTECTED AREAS (1999). Kelleher argues that MPA design and governance should be used in conjunction with other

The current level of marine life protection provided by existing statutes and plans is also an issue of continued debate. A number of studies have noted that New Zealand has thus far designated less than 10 percent of its marine area as MPAs. By the end of 2010 only 0.3 percent of the EEZ and 7.6 percent of the territorial sea was protected in some type of MPA, and most of this protection exists in the Kermadec Marine Reserve and the Auckland Islands Marine Reserve: these two areas represent approximately 99 percent of the total existing protected area in New Zealand marine waters.[98] The existing marine reserves associated with Kermadec Islands protect marine life and natural features within the territorial sea around the Islands. With respect to the benthic protected areas in the EEZ, scientists indicate that these areas are of low habitat value for biodiversity protection.[99]

The Department of Conservation and former Ministry of Fisheries recently completed a gaps analysis and inventory of marine protected areas in New Zealand waters (one of the key tasks under the New Zealand Marine Protection Act Policy).[100] That study provides a list of marine areas that meet the protection standard defined in the New Zealand Marine Protected Areas Classification, Protection Standard and Implementation Guidelines, and which can therefore be considered to be marine protected areas. The completion of the analysis and inventory will likely inform future implementation of marine protected areas and other protective measures in the ocean jurisdiction of New Zealand.

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management strategies, such as stronger limits on the use of fisheries, sustainable coastal development, the reduction in nutrients and other forms of land-based pollution. There has also been a characterization of the importance of MPAs as potential areas for future refugia in D. HERR AND G.R. GALLAND, THE OCEAN AND CLIMATE CHANGE: TOOLS AND GUIDELINES FOR ACTION (2008). See also B.S. Halpern et al., *Placing marine protected areas onto the ecosystem-based management seascape*, 107 PNAS 18312 (2010) who describe the importance of MPAs as a tool for the further development and implementation of coastal marine ecosystem-based planning and marine zoning. Halpern and colleagues found that fishing activities are responsible for more than fifty percent of the overall impact to coastal marine ecosystems across the world, and that in some areas, more than eighty percent of the cumulative impact on ocean health comes from over-fishing *at* 18314. Additional support on the need for large networks of MPAs for birds and mammals can be found in A. Hastings and L.W. Botsford, *Comparing Designs of Marine Reserves for Fisheries and for Biodiversity*, 13 ECOL. APPL. S65 (2003); C.M. Roberts et al., *Application of Ecological Criteria in Selecting Marine Reserves and Developing Reserve Networks*, 13 ECOL. APPL. S215(2003); and GLOBAL OCEAN PROTECTION: PRESENT STATUS AND FUTURE POSSIBILITIES (C. Toropova, I. Meliane, D. Laffoley, E. Matthews & M. Spalding, eds., 2010). The 2010 Global Oceans Protection Report accounts for the level of protection of New Zealand waters. There remains some discrepancy over the level or scale of protection provided by the marine reserves that have been established in the ocean jurisdiction of New Zealand.

[98] In 2007 New Zealand declared over 1 million km^2 of Benthic Protection Areas in off-shelf waters. These sites were declared for biodiversity protection and while their focus is to prevent trawling on the benthos and overlying 100 m, there are also regulations on fishing activities in the entire water column. These sites are in the World Database on Protected Areas (WDPA). The WDPA lists the Kermadec Benthic Protection Area, extending over some 617,000 km^2, as the world's largest MPA.

[99] Leatherwick, J. et al., *Novel Methods for the Design and Evaluation of Marine Protected Areas in Offshore Waters*, 1 CONSERVATION LETTERS 96-99 (2008). See also LEATHERWICK, K. JULIAN, AND M. FRANCIS, EXPLORATION OF THE USE OF RESERVE PLANNING SOFTWARE TO IDENTIFY POTENTIAL MARINE PROTECTED AREAS IN NEW ZEALAND'S EXCLUSIVE ECONOMIC ZONE, NIWA Client Report HAM2—6-064.

[100] DEPARTMENT OF CONSERVATION AND MINISTRY OF FISHERIES, MARINE PROTECTED AREAS CLASSIFICATION, PROTECTION STANDARD AND IMPLEMENTATION GUIDELINES (2008) available at http://www.biodiversity.govt.nz/pdfs/seas/MPA-classification-protection-standard.pdf

2.7.1 Marine Protected Areas (MPAs)

The ecological benefits of MPAs to biodiversity and fisheries management vary according to the scale of the network of the reserve design put in place. [101] After years of contesting the government's designation of 19 seamounts as protected areas, seafood industry leaders proposed their own 'Benthic Protected Areas' encompassing 31 percent of country's EEZ. There remains some disagreement over the level of biodiversity protection provided by resource managers in the EEZ, and whether or not New Zealand needs to strengthen the Marine Protected Areas Policy and Implementation Plan (MPA Policy), which is a project led by the Ministry of Fisheries and the Department of Conservation.[102] Pew's Global Oceans Legacy Project, for example, supports the creation of six major marine reserves that would vastly increase the area of ocean under marine reserve protection. One of the Pew's Oceans Legacy target areas is a proposed 630,000-square-kilometer reserve that would protect the waters around New Zealand's remote Kermadec Islands.

The loss of biodiversity increases socio-ecological vulnerabilities that are linked to changes in ecosystem function, complexity, and structure.[103] Some dangerous consequences for biodiversity and human beings will likely be triggered and will persist for long periods of time even if greenhouse gases (GHG) emissions were substantively cut. Note, significant cuts in GHG emissions will not bring quick relief to the myriad pressures on marine biodiversity. Biodiversity loss increases cultural vulnerabilities associated with changes in ecosystem function, complexity, and structure, and contributes to the challenge of the maintenance of ecological security. Marine life protection remains an important part of an ecosystem-based approach to marine governance.[104]

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[101] There is extensive scientific literature in support of this. See, for examples, Steven D. Gaines, Sarah E. Lester, Kirsten Grorud-Colvert, Christopher Costello, and Richard Pollnac, *Evolving science of marine reserves: New developments and emerging research frontiers*, 107 PNAS 18251 (2010) and S.E. Lester, B. S. Halpern, K. Grorud-Colvert, J. Lubchenco, B. I. Ruttenberg, S. D. Gaines, S. Airamé, and R. R. Warner, *Biological effects within no-take marine reserves: a global synthesis*, 384 MARINE ECOLOGY PROGRESS SERIES 33 (2009).

[102] When New Zealand's National Institute of Water and Atmospheric Research (NIWA) assessed the industry proposed Benthic Protected Areas (BPAs) in New Zealand's EEZ using advanced reserve selection software, their report concluded that '…despite their large geographic area, the focus of this proposal on existing areas that have both very low fishing value and low fish diversity, makes it a poor option for the long-term protection of demersal fish diversity in New Zealand's EEZ.' J. LEATHERWICK, K. JULIAN, AND M. FRANCIS, EXPLORATION OF THE USE OF RESERVE PLANNING SOFTWARE TO IDENTIFY POTENTIAL MARINE PROTECTED AREAS IN NEW ZEALAND'S EXCLUSIVE ECONOMIC ZONE, NIWA Client Report HAM2—6-064. A NGO analysis of the Southern Indian Ocean BPAs indicated that much of the voluntarily closed areas were in depths below 2,000 m where bottom trawling was unlikely to occur, available at http://www.savethehighseas.org/publicdocs/Indian-Ocean-map.pdf. It is suggested that this concern underscores the necessity of having a clear and open process for selection and designation of MPAs, one that is based on the best available science, data that are shared by all, and includes industry and conservation organizations as part of the process, with the support of governments that can patrol and enforce the applicable regulations. For a characterization of the diverse value orientations associated with the role of science and scientists in marine reserves decision making in New Zealand, see DAVID N. WILEY, INCREASING THE SOCIAL POWER OF SCIENTIFIC INFORMATION USED FOR DECISIONS ON MARINE PROTECTED AREAS IN NEW ZEALAND (Published by Fulbright New Zealand, August 2011).

[103] See, for example, UNESCO, LINKS BETWEEN BIOLOGICAL AND CULTURAL DIVERSITY (2009); J. Barnett and W.N. Adger, *Climate change, human security and violent conflict,* 26 POL. GEOG. 639 (2007); and J. Barnett, *Security and climate change*, 13 GLOB. ENV. CHANGE 7 (2003).

[104] MPAs will need to be designated as one tool among a range of other policy instruments. In addition, MPAs can contribute to an ecosystem-based approach to coastal marine governance by reducing the adverse impacts of climate disturbance, but this contribution is based on the scale, design and management of connected networks rather than individual protected areas. *See also* G. KELLEHER, GUIDELINES FOR MARINE PROTECTED AREAS (1999). Kelleher argues that MPA design

Recommendation 2.4: That the Marine Protected Areas Policy and Implementation Plan (MPA Policy) be amended to consider the cumulative and synergistic impacts of increasing marine resource use in the EEZ. The Plan should carefully incorporate new scientific information and planning tools on the benefits of marine reserves as an instrument to protect marine life and habitat. In addition, the maintenance of ecological security requires that cultural forms of ecological knowledge (that include indigenous value systems) and biodiversity are protected. A conceptualization of sustainability is needed in the Environmental Effects Bill – one that embraces an ecocentric value orientation that includes the importance of preserving 'biocultural heritage'. Increasingly, the importance of maintaining both biological and cultural diversity, place or, more generally, the importance of recognizing the irrevocable connection between people and place is being recognised. This is particularly important with respect to New Zealand, with its diverse cultural characteristics that include the traditional knowledge and language of Māori.

New Zealand needs to establish a representative network of marine protected areas using new scientific information and technologies.[105] The passage of enabling legislation in support of the designation of a network of marine protected areas should supplement the further development of a more comprehensive EEZ governance framework. Marine areas that are essential habitat areas for nesting birds, for example, should be considered as refugia where marine activities, such as oil development, will not pose threats. Areas used by whales and other marine mammals should also be carefully identified and protected. Adequate buffer areas should also be designed and designated to further the protection of these important marine areas. The scientific merit of MPAs includes the following major findings.

- The designation, enforcement, and monitoring of comprehensive networks of MPAs can represent an important regulatory tool to curb the over-exploitation of marine resources and potentially mitigate the impacts of climate change.[106]
- The benefits of MPAs can accrue to a broad range of taxa, including migratory species, if the reserve network is large enough and includes quality habitat areas, including foraging or feeding areas.[107]

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and governance should be used in conjunction with other management strategies, such as stronger limits on the use of fisheries, sustainable coastal development, the reduction in nutrients and other forms of land-based pollution. There has also been a characterization of the importance of MPAs as potential areas for future refugia in D. HERR AND G.R. GALLAND, THE OCEAN AND CLIMATE CHANGE: TOOLS AND GUIDELINES FOR ACTION (2008).

[105] B.S. Halpern et al., *Placing marine protected areas onto the ecosystem-based management seascape*, 107 PNAS 18312 (2010) who describe the importance of MPAs as a tool for the further development and implementation of coastal marine ecosystem-based planning and marine zoning. Halpern and colleagues found that fishing activities are responsible for more than fifty percent of the overall impact to coastal marine ecosystems across the world, and that in some areas, more than eighty percent of the cumulative impact on ocean health comes from over-fishing *at* 18314.

[106] J. Lubchenco et al., *Plugging a Hole in the Ocean: the Emerging Science of Marine Reserves*, 13 ECOL. APPL. S3 (2003). *See also* S.D. Gaines et al., *Evolving Science of Marine Reserves: New Developments and Emerging Research Frontiers* 107 PROC. NAT'L ACAD. SCI. 18251 (2010). Gaines and colleagues note that the capacity of MPAs to foster ecological resilience in the face of climate disturbance and other threats remains uncertain and warrants further study. *Id*. at 18253. The scholars also make an important point: 'MPAs are implemented without an explicit consideration of fisheries management outside the closures and the resulting influence on MPA performance. How fisheries management strategies should change in response to spatial closures and conversely, how marine reserve planning should better incorporate information about fisheries management in the surrounding waters are critical questions that warrant new thinking and research.' *Id*. At 18254. For a comprehensive list of scientific articles on marine protected area design and development, *see* CAL. DEP'T OF FISH AND GAME RES. AGENCY, MPA LITERATURE SUMMARIES (2010), *available at* http://www.dfg.ca.gov/mlpa/science2.asp#lester2010.

- The number of documented examples of marine reserves that can increase biomass and native species diversity is rapidly increasing across the world.[108]
- Within areas protected from consumptive activities (e.g., fishing), rapid increases in abundance, size, biomass, and diversity of animals occur virtually regardless of where reserves are sited.[109]
- Larger marine reserves can support more species across their respective ranges.[110]
- A growing body of literature documents the importance of the design of marine reserves as a key determinant in effective biodiversity protection.[111]
- Marine reserves can provide insurance and resilience in an uncertain world with unpredictable environmental fluctuations.[112]
- Marine reserves are important tools that support marine ecosystem-based planning.[113]
- Marine reserves can protect biodiversity and marine resources, such as fisheries.[114]

Despite the advancement of marine conservation science and the increasing use of MPAs across the world's ocean,[115] the scale of biodiversity protection provided by New Zealand and other countries remains relatively insignificant.[116] There remains an urgent need to protect large habitat areas of marine ecosystems from the impacts of fishing and other extractive activities, such as mining and offshore oil development. Accidents from commercial vessels (including noise, air pollution, water pollution, and vessel strike impacts) remain major threats to islands and associated biodiversity. Few countries have set aside the level of representative marine habitat (e.g., sandy bottom, rocky reef substrate, kelp areas) within a

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[107] S.E. Lester & B.S. Halpern, *Biological Responses in Marine No-Take Reserves versus Partially Protected Areas*, 367 MAR. ECOL. PROG. SER. 49, (2008).

[108] *See generally* C.M. ROBERTS & J.P. HAWKINS, FULLY-PROTECTED MARINE RESERVES (2000): WORLD WILDLIFE FUND ENDANGERED SEAS CAMPAIGN, N. Y. & INT'L UNION FOR CONSERVATION OF NATURE (IUCN) WORLD COMM'N ON PROTECTED AREAS (IUCN-WCPA), ESTABLISHING MARINE PROTECTED AREA NETWORKS – MAKING IT HAPPEN (2008).

[109] L.W. Botsford et al., *Principles for the Design of Marine Reserves*, 13 ECOL. APPL. S25, (2003); C.M. Roberts et al., *Effects of Marine Reserves on Adjacent Fisheries*, 294 SCI. 1920 (2001).

[110] A. Hastings and L.W. Botsford, *Comparing Designs of Marine Reserves for Fisheries and for Biodiversity*, 13 ECOL. APPL. S65 (2003); C.M. Roberts et al., *Application of Ecological Criteria in Selecting Marine Reserves and Developing Reserve Networks*, 13 ECOL. APPL. S215(2003).

[111] L.W. Botsford, F. Micheli, & A. Hastings, *Principles for the Design of Marine Reserves*, 13 ECO. APPL. SUPP. S25 (2003)

[112] G.W. Allison, S.D. Gaines, J. Lubencho, & H.P. Possingham, *Ensuring Persistence of Marine Reserves: Catastrophes Require Adopting an Insurance Factor*, 13 ECO. APPL. SUPP. S8, S8 (2003).

[113] B.S. Halpern, S. E. Lester, & K. L. McLeod, *Placing Marine Protected Areas onto the Ecosystem Based Management Seascape*, 107 PROC. NAT'L ACAD. SCI. 18312 (2010).

[114] S.N. Murray, R.F. Ambrose, J.A. Bohnsack, L.W. Botsford, M.H. Carr, G.E. Davis, P.K. Dayton, D. Gotshall, D.R. Gunderson, M.A. Hixon, J. Lubchenco, M. Mangel, A. MacCall, D.A. McArdle, J.C. Ogden, J. Roughgarden, R.M. Starr, M.J. Tegner & M.M. Yoklavich, *No-Take Reserve Networks: Sustaining Fishery Populations and Marine Ecosystems*, 24 FISHERIES 11 (1999).

[115] GLOBAL OCEAN PROTECTION: PRESENT STATUS AND FUTURE POSSIBILITIES (C. Toropova, I. Meliane, D. Laffoley, E. Matthews & M. Spalding, eds., 2010).

[116] S. CHAPE, M. SPALDING & M. JENKINS, THE WORLD'S PROTECTED AREAS: STATUS, VALUES, AND PROSPECTS IN THE TWENTY-FIRST CENTURY (2008) and C. Toropova et al., *supra* note 194. For additional information on the 2010 Biodiversity Targets, see SECRETARIAT OF THE CBD, http://www.cbd.int/2010-target/; L.J. Wood et al., *Assessing Progress Towards Global Marine Protection Targets: Shortfalls in Information and Action*, 42 ORYX 340 (2008) (providing projections of potential growth in MPA designations over time, and showing that CBD targets are unlikely to be met for several decades); M. Spalding et al, *Towards Representative Protection of the World's Coasts and Oceans – Progress, Gaps and Opportunities*, 1 CONS. LET. 217 (2008).

network of MPAs that is needed to protect key components of marine ecosystems.[117] Few MPAs are large enough or in designated in appropriate marine areas that can protect sea birds, marine mammals or migrating pelagic species.

Recommendation 2.5: That the creation of enabling legislation as set forth in the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill require a new EPA to evaluate and assess the environmental effects of proposed marine activities, such as offshore oil development, and should be supported by additional strengthening and improving of existing marine life protection policies and programmes. The range of threats to marine mammals should be carefully evaluated in future environmental assessments. In some cases, the marine and coastal areas used by marine mammals will warrant further protection and buffer areas should be created to ensure these species, including nesting birds, are provided additional support. Similar protective measures have been adopted in the USA and other places.

Marine noise from vessel activities and the use of sonar technology for exploring offshore oil are examples of under-evaluated impacts to marine life and should be explored further by marine scientists in New Zealand, given the importance of the marine areas associated with the country for marine mammals. An additional threat is vessel strikes that should be carefully considered in future environmental assessments. Collision with ships is a key mortality factor for large whales, many of which are endangered. An increase in the rate of detected collisions between whales and ships in the past few decades corresponds to an increase in the number, size and speed of ships over the same time period. Without intervention the problem is expected to be exacerbated as already high levels of oceanic shipping continue to rise.

2.8 Principles of Marine Governance

This section provides a general characterization of a number of principles of marine governance drawn from an analysis of international best practices for this policy domain. These principles are based on an evaluation and review of contemporary literature on the subject of integrative, ecosystem-based planning and policymaking. To strengthen and improve marine governance in New Zealand, the following principles are described in this section, and particular planning tools are recommended to support them:

- Public Trust Doctrine – clarification and institutionalization of a public trust doctrine in statutory language for the EEZ
- Maintaining Ecosystem services – clarification and the development of planning tools to strengthen the capacity to analyze and mitigate cumulative impacts from human activities in the EEZ and territorial waters
- Compatible Use – the need for the development of compatible use criteria with planning tools and methodologies to implement proposed statutory obligations
- Integrative Planning – clarification and the development of statutory goals that can improve multi-sector and ecosystem-based approaches to planning and decision-making for the EEZ, including the creation of institutional capacity and capability across regional councils and national government jurisdictions to strengthen the capacity for integrative risk assessment

[117] As noted earlier, New Zealand has yet to set aside ten percent of its marine area as MPAs, and the existing BPAs do not protect sensitive marine habitats and areas from other extractive activities. See J. Leathwick et al., *Novel Methods for the Design and Evaluation of Marine Protected Areas in Offshore Waters*, 1 CONSERVATION LETTERS 91, 96-99 (2008).

- Enforcement and Monitoring
- Ocean Leadership.

These principles support the development of a more comprehensive, ecosystem-based approach to planning and decision-making. Clarification and development of statutory goals in support of ecosystem-based principles are needed.

2.8.1 The Public Trust

Among the legal obstacles to consider in any revision of the current regulatory framework six issues need to be addressed: (1) the absence of a clearly defined 'public trust doctrine' associated with marine areas of the EEZ and continental shelf that support common property resource management; (2) unclear development of Māori rights and uses within the EEZ; (3) poorly defined standards that fail to reduce conflicts among competing users of public resources; (4) poorly defined agency jurisdictions leading to delays in defining applicable standards or regulations; (5) redundant regulations due to overlapping agency responsibilities; and (6) inappropriate restrictions designed to protect marine habitat areas.

Though the public trust concept can be found in the legal systems of many countries, it robustly manifests in the USA and the British Commonwealth countries,[118] where it has historically protected the public's rights to fishing, navigation, and commerce in and over navigable waterways and tidal waters. In its most basic form, the doctrine obliges governments to manage common natural resources, the body of the trust, in the best interest of their citizens, the beneficiaries of the trust. Public rights over the foreshore and seabed are recognised at common law as the rights of navigation and fishing.[119]

In New Zealand private rights to the foreshore and seabed frequently relate to use and occupation rather than ownership, and they are seldom alienated by the Crown. Today the public trust doctrine is integral to the protection of coastal ecosystems and beach access. Securing the place of the public trust doctrine in New Zealand oceans management would be valuable, given the immense pressure to exploit EEZ resources, the failure of the current fragmented governance framework, improved scientific understanding of the interconnected nature of ocean ecosystems, and the growing demand for sustainable management of ocean resources. The public trust doctrine can provide the missing catalyst for national marine governance in New Zealand; the doctrine can also provide a unifying concept for the country's marine governance framework. Bringing public trust law into the national ocean management discussion helps clarify that ultimately the controlling duty of the governmental trustee is to act as a long-term steward of the public trust. Protecting public uses of trust resources ultimately requires protecting ecosystems. In turn, protecting ecosystems often requires limiting access and use to sensitive and unique marine areas. Under a public trust mandate, national ocean managers could allocate access to marine resources as long as the corpus of the trust was not substantially impaired. A clear extension of the public trust doctrine to the EEZ would help the government manage the oceans in a more cohesive, sustainable way.

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[118] M. Turnipseed et al., *The Silver Anniversary of the United States' Exclusive Economic Zone: Twenty-five years of Ocean Use and Abuse, and the Possibility of a Blue Water Public Trust Doctrine*, 36 ECOLOGY L.Q. 1 (2009).

[119] Robert A Makgill, *Public Property and Private Use Rights: Exclusive occupation of the coastal marine area in New Zealand*, WATER AND SUSTAINABILITY IN AUSTRALASIA (Klaus Bosselmann and Vernon Tava, eds. New Zealand Centre for Environmental Law Monograph Series, Vol. 3, Auckland, 2011).

Recommendation 2.6: That ocean waters, coastal waters, and ocean resources be managed to meet the needs of the present generation without compromising the ability of future generations to meet their needs. The most robust public trust doctrine for ocean resources should be established through recognition of a national public trust doctrine via statutory establishment of a strong suite of public trust principles. The establishment of statutory laws would enable citizens, ocean management agencies, and courts to best apply the public trust doctrine to the long-term stewardship of ocean resources. National ocean resources could benefit greatly from protection afforded by a public trust concept.

2.8.2 The Maintenance of Ecosystem Services

One goal of marine governance is to sustain and maintain the ecosystem services provided by healthy systems. New planning tools are available that can quantify the values of ecosystem services. For example, a decision-making tool developed at Stanford University is InVEST.[120] InVEST can be used to support environmental impact assessments insofar as the non-consumptive values associated with ecosystem services can be integrated into comprehensive environmental assessments. InVEST is a family of tools to map and value the ecosystem services that are essential for sustaining and fulfilling human life. InVEST enables decision-makers to assess the tradeoffs associated with alternative choices and to identify areas where investment in natural capital can enhance human development and conservation in terrestrial, freshwater, and marine ecosystems.

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[120] INVEST (http://www.naturalcapitalproject.org/InVEST.html) seeks to quantify the values associated with ecosystems. No clear understanding of these values currently exists in New Zealand.

Department of Conservation's *PlanBlue*

DOC's Marine Unit is developing key science themes under *PlanBlue*, a new strategy for ecosystem-based management of the marine environment.[121] Under *PlanBlue* three research themes are explored: marine conservation planning, ecological integrity, and mapping and mitigation of threats to the marine environment. The development of marine ecological indicators to assess the integrity of marine ecosystems and the services they provide is an encouraging sign that the country has begun to develop a strategic plan to assess ecosystem services and maintain the integrity of marine ecosystems. DOC's effort to strengthen and improve understanding of the ecosystems services provided by healthy marine ecosystems should be supported because the strategy is a reflection of international best practice in the area of marine planning and decision-making.

SeaSketch, which is a platform for collaborative ocean GeoDesign,[122] is currently being used in the Hauraki Gulf to develop what is likely to be the first marine spatial plan in New Zealand. SeaSketch builds on the use and experience in California's marine protected area designation process that included the use of MarineMap. MarineMap is being used to develop SeaSketch by McClintock and colleagues at the University of California Santa Barbara. In SeaSketch, users are able to (1) initiate a project by defining a study region, (2) upload map layers from existing web services, (3) define 'sketch classes' such as prospective marine protected areas, transportation zones or renewable energy sites, (4) author sketches and receive automated feedback on those designs, such as the ecological value or the potential economic impacts of a marine protected area, and (5) share sketches and discuss them with other users in a map-based chat forum.

In DOC's Marine Conservation Planning theme, SeaSketch is being used as the decision-making tool under *PlanBlue*. To understand the threats and pressures on the Hauraki Gulf, DOC is working closely with stakeholders and regional councils to the incorporate the use of SeaSketch in future planning activities. SeaSketch can collate and map information on uses of the marine environment, with goals of understanding the impacts of these threats on ecosystem goods and services that can be used to inform marine planning. In addition, DOC is developing indicators of ecological integrity that will be applicable across diverse marine ecosystems of New Zealand, and will validate the use of these metrics in one of the country's more pristine locales, Port Pegasus, Stewart Island. SeaSketch is being used by the Marine Unit of the Department of Conservation that provides scientific research, monitoring and advice services on the protection and restoration of priority marine species and sites for the Hauraki Gulf. These are promising first steps toward marine ecosystem-based planning and development. The Hauraki Gulf planning effort may be an important pilot project for marine spatial planning in the country, and could provide valuable lessons in decision-making. The planning effort should be encouraged and supported across the relevant management jurisdictions and by non-governmental organizations and private interests.

An important part of maintaining ecosystem services is to strengthen and improve the various tools to assess the cumulative effects of proposed marine activities in the EEZ. SeaSketch can

[121] Sean Cooper and Carolyn Lundquist, *Marine Conservation in New Zealand*, Presentation at the Marine Science Institute, University of California Santa Barbara, February 10,2012.

[122] For a characterization of SeaSketch, see: http://mcclintock.msi.ucsb.edu/projects/seasketch

be used in a more comprehensive decision-making approach so that managers can better respond to the multiple threats and pressures associated with human use and associated impacts. In addition, a number of tools are available to evaluate and address cumulative impacts. Similar tools have been in use for decades in many countries around the world. Marine policy should include statutory language in support of the use of contemporary tools to assess the cumulative impacts and synergist effects of marine resource use.

There is no single definition of cumulative effects. In the USA, the National Environmental Protection Act regulations define cumulative effects as, 'The impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions.'[123] Canada's Cumulative Effects Assessment Practitioners Guide defines it as, 'changes to the environment that are caused by an action in combination with other past, present and future human actions.'[124] In New Zealand a cumulative effect is not specifically defined in the Resources Management Act or the legislation for the EEZ. But the definition of 'effect' does include 'any cumulative effect which arises over time or in conjunction with other effects – regardless of the scale, intensity, duration, or frequency of the effect.'[125]

These definitions share many characteristics, including recognition of the temporal scale, the spatial scale, and synergistic effects of proposed activities. One problem of traditional environmental assessments is that they rarely account for non-use values in the consideration of cumulative effects. Non-use values, such as the protection of biodiversity, existence values, cultural values, and aesthetics, may be overlooked in the analysis. In addition, addressing cumulative effects should mean that the regulating authority will review impacts from all sectors. As described by Andrews in her study of New Zealand's EEZ policy in 2008, 'One of the weaknesses of New Zealand's current governance regime for the EEZ is that it is fractured and managed on a sector-by-sector basis. Assessing cumulative effects means that the regulating authority will be looking across sectors so a comprehensive review of uses and anticipated future uses can be analyzed.'[126]

> **Recommendation 2.7:** That a comprehensive multi-sector approach be created to gather baseline information to be used in the assessment of environmental effects and to assess the cumulative effects of proposed offshore marine activities that include the use of tools to value ecosystem services and non-consumptive values.

The assessment of cumulative effects can also be strengthened by advancement in new decision-making tools that are based on identification of pressures, the status of habitat, and the institutional response to these pressures. Scientists at the CRIs, including NIWA, and other scientific organizations, such as the Cawthron Institute, should be encouraged to develop these types of planning tools to strengthen the capacity to assess cumulative effects of proposed activities in the EEZ. UNEP is currently supporting a program to better assess

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[123] NEPA, 40 C.F.R. §1508.7.

[124] G. HEGMANN, CUMULATIVE EFFECTS ASSESSMENT PRACTITIONER'S GUIDE, Prepared by AXYS Environmental Consulting Ltd. (1999) at Section 2.1.

[125] Resource Management Act 1991, Part 1, Section 3.

[126] KATHERINE ANDREWS, GOVERNING THE EXCLUSIVE ECONOMIC ZONE: THE OCEAN COMMONS, CUMULATIVE IMPACTS AND POTENTIAL STRATEGIES FOR IMPROVED GOVERNANCE (Published by Fulbright New Zealand, 2008) at 26.

the health of oceans by developing an *Ocean Health Index* (OHI)[127] that will include an assessment of multiple pressures or stressors on marine ecosystems, including an analysis of the cumulative impacts associated with a range of pressures on marine ecosystems that contribute to a decline in the ecosystem goods and services that all life depends on.[128]

> **Recommendation 2.8:** That New Zealand establish an Ocean Health Index (OHI) in conjunction with the development of new EEZ policy. It may be one useful tool to better understand the cumulative and synergistic impacts of marine resource use over time. An OHI can also be based on recognition of thresholds of significance and tipping points that are key considerations in ecosystem-based planning and decision-making. The OHI is a new quantitative way to measure whether the ocean's health improves or declines over time. It is a composite index based on indicators drawn from international agreements, intergovernmental panels and other high-level recommendations regarding marine conservation and resource use. Its indicators measure the most critical ocean stressors (climate change, fisheries, habitat destruction, pollution and invasive species) as well as their effects on the ocean's ability to provide ecosystem services and to support human well-being. Trends in the value of OHI and its indicators stimulate deliberate, performance-based ocean improvement by helping managers and the public to (1) identify unfavourable ocean trends, (2) select the most strategic goals and actions to reverse them, and (3) evaluate the success of remedial actions through data-driven outcomes assessment. The OHI can thus play a focal role in efforts to re-build the ocean's ability to support abundant populations, rich biodiversity, robust ecosystem services and improved human well-being. The OHI should be developed in conjunction with current international efforts to establish such an index. The OHI will likely be a new world standard for gauging ocean health – a measuring stick to show whether our efforts to improve ocean governance and health are successful. It will guide decision makers in the actions they take and raise global public awareness and support for ocean conservation. Accordingly, the creation of an OHI will be a valuable tool in performance-based evaluations in marine governance in the near future.

2.8.3 Compatible Use and Kaitiakitanga

The current philosophy of national government supports the objectives of a *Bluegreen* agenda, which is reflected in a June 2011 speech by the Honourable Dr Nick Smith, the previous Minister for the Environment (MFE) at the annual meeting of the Environmental Defence Society:

> National's approach to environmental governance is based on the following Bluegreen objectives: Fostering a sense of commitment to a shared national interest in *sustainable development*; Effectiveness in getting results; Long-term consistency; Reducing delay and cost; Better use of technical information ... New Zealand's marine environment is an integral part of our national identity and contributes significantly to our economy - including fishing, aquaculture, oil and gas, tourism, transport and

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[127] UNITED NATIONS ENVIRONMENT PROGRAMME, DEVELOPMENT OF THE METHODOLOGY AND ARRANGEMENTS FOR THE GLOBAL ENVIRONMENT FACILITY TRANSBOUNDARY WATERS ASSESSMENT PROGRAMME (TWAP) LARGE MARINE ECOSYSTEMS AND OPEN OCEAN COMPONENTS (August 2010).

[128] The approach used by Halpern and colleagues at the US National Center for Ecological Analysis and Synthesis (NCEAS) will include an analysis of impact scores for LMEs, including: the depiction of the top threats within each LME; the least and most impacted areas within each LME; vulnerability maps for each LME; and distributions of land-based impacts and hotspots. A similar model will be used by the UN.

> telecommunication links. However, our systems for managing environmental impacts fall under different statutes and regulations. *Consistent standards and restrictions are not applied across all activities* ... It's not only the environmental risk we run - these factors could also constrain further economic growth from New Zealand's extensive marine resources ... The Government will explore ways to improve environmental management in the EEZ, which will *enable us to benefit from the economic potential of New Zealand's EEZ while protecting the environment ... To lift the long-term performance of the economy, we need to reduce red tape and remove the barriers that prevent resources from being used most productively* ... Stage Two of the reforms will continue the focus on managing our resources more effectively and efficiently *to deliver both economic and environmental benefits* [emphasis added].[129]

There are a number of important points in the statement by the then Minister for the Environment. One management goal is to strike a 'balance' between competing and often conflicting users of marine ecosystems. Another emphasis in the statement is the priority of regulatory streamlining to support of economic development of marine resources. Achieving the management goals of striking a balance between competing marine uses; assessing multiple and cumulative environmental effects of proposed resource use; and receiving the benefit of marine life protection is made more difficult in a context of scientific uncertainty. There is a paucity of scientific information on the values of marine ecosystems of the EEZ and continental shelf. Less than five percent of the sea floor has been studied and a range of species have yet to be identified. In addition, information on the socio-economic values associated with marine areas is lacking. Few studies have been conducted to assess the ecosystem services of marine areas, including the non-consumptive and natural values carried by marine systems. Therefore, there is a current lack of baseline information on the EEZ and EEC. One fear is that the lack of baseline information will lead to an under-evaluation and assessment of environmental effects and impacts from proposed marine resource use.

In addition, The Environmental Effects Bill of 2011 represents an 'effects-based' approach to assessing environmental impacts, and emphasizes the need to balance the values of environmental protection and resource use. The Bill encourages a precautionary approach to marine planning and adaptive decision-making. Yet the statutory language with respect to how to implement a precautionary and adaptive approach to decision-making and planning remains unclear in the Environmental Effects Bill. The clear intent of the bill is to strike a balance between competing uses and environmental values. In many ways, this type of enabling legislation for economic development can lead to a zero-sum game where there are winners and losers with respect to resource allocation and the scale or level of protection provided to marine areas. The bill also notes the need to further refine and amend the current marine life protection bill. Overall, in the absence of scientific information on the values associated with marine ecosystems, it is difficult to balance use-values with less tangible ecological values, such as the non-consumptive values that are supported by healthy marine habitats. The general trend is to support economic development without a clear understanding and recognition of the ecological values (e.g., ecosystem goods and services) that may be threatened as resources are increasingly used and developed.

One goal of management is to sustain use of the environment across generations. The value of intergenerational sustainability is consistent with the traditional ecological

[129] http://www.voxy.co.nz/politics/speech-smith-next-steps-bluegreen-agenda/5/50837

knowledge of iwi and the importance of kaitiakitanga.[130] Kaitiakitanga is recognized as an important part of environmental management and planning in New Zealand, and is noted in legislation as follows: '[T]he exercise of guardianship by the tangata whenua of an area in accordance with tikanga Māori in relation to natural and physical resources, and includes the ethic of stewardship' (Resource Management Act 1991 s 2); and 'The exercise of guardianship; and, in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate tangata whenua in accordance with tikanga Māori' (Fisheries Act 1992 s 2). Article II of the Treaty guaranteed that iwi/hapu would retain the authority of rangatiratanga to continue to exercise kaitiakitanga.

Whakatane Harbour Mouth. M.V. McGinnis (2010)

There has been growing concern that the present legal definitions do not reflect the intent and practice of kaitiakitanga. According to Volkerling, kaitiakitanga contains many elements:

- mahi tapu – god given and handed down through our tipuna
- founded in whakapapa - the relationship between everything and everybody in the natural world – there is no distinction between people and their environment
- exercised on behalf of, and for the benefit of all who are related through whakapapa
- a set of inalienable responsibilities, duties and obligations that are not able to be delegated or abrogated
- a web of obligations: to the taonga, to the atua and to ourselves and our uri. Kaitiaki have a responsibility to provide for everyone and ensure everyone benefits
- independent of 'ownership' in a European sense; as on land, kaitiaki responsibilities are independent of others who hold 'ownership' or use rights under the law; for example, although as kaitiaki, iwi/hapu may 'own' only a percentage of the total marine farming space in a region under existing law, they still hold kaitiaki responsibilities over the whole area in accordance with tikanga

[130] The author is indebted to Keir Volkerling and discussions with iwi on the importance kaitiakitanga. See KEIR VOLKERLING, KAITIAKITANGA AND INTEGRATED MANAGEMENT (26 October 2006).

- seamless and all encompassing – making no distinction between moana and whenua
- given effect at whanau and hapu level
- expressed in ways that are appropriate to the place and to the circumstances, according to tikanga
- wider and more complex than existing legal definitions
- given practical effect by:
    - exercising control over access to resources
    - sharing the benefits of the use of those resources
- enabled through rangatiratanga, which includes the authority that is needed to control access to and use of resources, and to determine how the benefits will be shared. This means that it can be expressed in part through the concepts of 'ownership', 'property', 'title' or 'stewardship' – however, it is much wider than any of these.[131]

The principle of compatible use is an administrative principle of ecological stewardship that, in some ways, reflects the multiple values that are carried by kaitiakitanga. Management decisions often include priorities of resource use and development. In the absence of an evaluation of non-consumptive and natural values carried by ecosystems, an analysis of environmental effects can translate into an outcome that favours short economic gain. A longer-term perspective is needed in marine policy. The balance and trade-offs between the multiple-uses of marine resources may not address the cultural and ecological needs that support the maintenance of healthy ecosystems. The challenge is to determine whether a proposed use in association with existing uses or actions in the EEZ is 'compatible' with the maintenance of ecosystem services and the maritime heritage associated with important marine areas. When an increased level of current use becomes 'incompatible' managers and planners need to prioritize resource protection. The adoption of a compatible use criterion, as opposed to an approach that purely enables resource development, supports a precautionary approach to environmental assessment and decision-making.

> **Recommendation 2.9:** That New Zealand pass a National Marine Sanctuaries Act to allow the creation of national marine sanctuaries. The oil spill offshore Santa Barbara, California, led to the creation of major state and federal policies that support increasing the protection of marine areas, including the passage of the National Marine Sanctuaries Act of 1972. The Act requires the establishment of marine sanctuaries in the EEZ of the USA, and the Sanctuaries Program now includes 13 designated sanctuaries. The Act also prioritizes the protection of marine life in accordance with an ecosystem-based approach. In many ways, the sanctuary policy in the USA can be considered the most progressive statute to protect ecosystems in the country. The Act also requires that marine resource use in sanctuary waters be 'compatible' with the goal of resource protection. Compatible use is a very different approach to resource use; it requires that any use can take place if it does not threaten the marine life of a sanctuary.

A compatible use criterion for marine governance would prioritize the protection of sensitive natural and cultural areas as refugia. There is a lack of region- or- ecosystem-specific adaptation policy in New Zealand that can support climate refugia areas and prevent the loss of biodiversity. Recent recommendations in the scientific literature emphasize the need to identify and protect climate refugia areas across ecological regions or biomes. This is

[131] Id.

especially the case in marine transition areas that include a mosaic of two or more ecosystems. Accumulating evidence emphasizes the importance of protecting climate refugia that have historically supported ecological resilience during periods of dramatic climate disturbance, such as long-term changes in environmental conditions.

In addition, scholars note the value of protecting both diverse cultures and traditional forms of knowledge that are linked to ecosystems.[132] A new conceptualization of sustainability has emerged, with such concepts as 'cultural landscapes', 'historical ecology', and 'biocultural heritage' highlight the importance of biodiversity and cultural diversity.[133] Traditional ecological knowledge and language are irrevocably connected to the presence of animals, plants and insects. The loss of biodiversity is linked to the diminishment of indigenous knowledge and place-based language. The scholarship on biocultural heritage emphasizes the interdependence between biological and cultural diversity, place or, more generally, the importance of recognizing the interdependence of local people and places. As Volkerling notes, 'The spiritual component of traditional ecological knowledge has important consequences for traditional environmental management and kaitiakitanga: caring for their lands and resources relates directly to the wisdom of acknowledging the spirituality and influential powers in all things, including the earth'.[134]

> **Recommendation 2.10:** That a compatible use criterion be integrated into new legislation for the EEZ to facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities. This statement is unambiguous insofar as it prioritizes a 'primary purpose' of resource protection, and could be put in place for special habitat and cultural areas.

To further support the value of kaitiakitanga a system of standards or framework to determine whether or not a use should be allowed if it has not already been categorically prohibited or restricted should be developed. Statutory language in support of a compatibility use criteria should be adopted and determined on a case-by-case basis, using planning tools to manage uses based on a set of standards for acceptable resource. Existing marine policy lacks a clear emphasis on iwi maritime values. For example, an activity's compatibility may depend on the following issues and concerns:

- The activity maintains the natural biological communities in the national marine sanctuaries, and protects, and, where appropriate, restores and enhances natural habitats, populations, and ecological processes.
- The activity enhances public awareness, understanding, appreciation, and wise and sustainable use of the marine environment, and the natural, historical, cultural, and archaeological resources.
- The activity supports, promotes, and coordinates scientific research on, and long-term monitoring of, the resources of marine areas.

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[132] F. BERKES, SACRED ECOLOGY (2008). See also WALKER PAINEMILLA, K., RYLANDS, A B., WOOFTER, A., & HUGHES, C. 2010. INDIGENOUS PEOPLES AND CONSERVATION: FROM RIGHTS TO RESOURCE MANAGEMENT (2010).

[133] UNESCO, LINKS BETWEEN BIOLOGICAL AND CULTURAL DIVERSITY (2007) at 8.

[134] As cited on Volkerling, op cit. See also M. Roberts, *Kaitiakitanga: Māori perspectives on conservation*, 2 PACIFIC CONSERVATION BIOLOGY 16 (1995).

- The activity facilitates, to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities.
- The activity assists in the development and implementation of coordinated plans for the protection and management of important cultural areas.
- The activity will not substantially injure sensitive resources and qualities.

To measure an activity's level of compatibility with the aforementioned criteria, a scale can be developed to evaluate how well each activity is aligned with an individual criterion. For example, a scale of compatibility can include:

- *Negatively Compatible* – This activity is actively detrimental to the purpose or goal.
- *Minimally Compatible* – This activity provides little, if any, support for the purpose or goal.
- *Moderately Compatible* – This activity supports the purpose or goal, but does not have a primary purpose that is directly aligned with the criterion.
- *Highly Compatible* – This activity significantly supports the purpose or goal. It is close to a one-to-one match with the purpose or goal.
- *Not Applicable* – This activity has a negligible effect, either positive or negative, on the purpose or goal.

A compatible use criterion can be used with traditional environmental impact assessments to consider carefully the unique and sensitive cultural and natural areas within the EEZ. Note that such a criterion does not emphasize the use of an area, but the proposed activity's compatibility with the priority goal to maintain, sustain and preserve ecologically and culturally significant areas that are identified.

2.8.4 Enforcement and monitoring

At-sea enforcement is particularly difficult due to the vast space, challenging conditions, difficulties in detection, lack of clear enforcement mandate (especially on the high seas), and expensive equipment needed to conduct enforcement operations. Dockside or onshore enforcement may be comparatively less expensive and easier to conduct, but experience has shown that these measures alone cannot achieve effective compliance. The nature of ocean resources and the human activities conducted at sea make it necessary for nations and individuals to cooperate in order to improve ocean compliance and enforcement.

Recommendation 2.11: A number of recommendations are made below:

That regional collaborative approaches to achieve compliance be strengthened. Shared databases and web-based dissemination of information can help to overcome the challenge of information dissemination by providing easy access to information. The Monitoring, Control and Surveillance Network (MCS Network) is one web-based approach that allows enforcement officers to share information about suspicious fishing vessel activity. Dissemination of positive or negative lists of vessels through regional management organizations is another web-based data-sharing approach.

That the use of market-based approaches to achieve compliance be increased. Certification programmes take advantage of consumer choice to drive sustainable practices. Catch certification can also be a useful tool to ensure that catches are legal: for example, the Northeast Atlantic Fisheries Commission requires a catch certification for fisheries products to be imported. For example, the creation of environmental certification or

labelling systems, which provide information to consumers regarding the environmental impact of a product, can provide incentives for increased compliance. Eco-labelling programmes should include compliance measures to ensure labelled programmes or industries are in compliance with the certification.

That political will be increased to expand compliance and enforcement programmes through non-governmental approaches. NGOs and business associations can have an important role in promoting compliance and in enforcing, complementing government agencies and international institutions. For example, many NGOs lead campaigns to raise public awareness about high profile illegal fishing activities such as those occurring in the Patagonian toothfish fishery and encourage consumers to avoid purchasing fish from potentially illegal operators. Also, in the case of the toothfish fishery, legal fishing industry operators have launched a website that publicizes information about alleged illegal fishing operations. Collaborative efforts by the shipping industry, through organizations such as the Maritime International Secretariat Services Limited (MARISEC) and InterTanko, have been established to help facilitate compliance through education-based approaches.

That compliance through increased public participation and education be encouraged. Programmes to increase public participation can also increase compliance rates by raising public awareness, creating, pressure groups, and heightening transparency, accountability, and monitoring. Tools that can effectively demonstrate to stakeholders the costs of coastal and marine degradation can increase the willingness to take steps to conserve ocean resources. Accounting systems that demonstrate the value of coastal preservation are useful for monitoring the impact of human activities on water resources and identifying the economic valuations, costs, and social impacts of management systems. By defining the value of ecosystems, stakeholders can more concretely see the costs and benefits of preserving the environment, thereby increasing willingness to comply with regulations. Scenario development and integrated assessment modelling tools, like those used to predict climate change and the impact of greenhouse gases, can be used to examine alternative perspectives regarding consequences for stakeholders.

That integrated control measures be promoted. Most countries have extremely limited resources to devote to promoting compliance or effectively and vigorously enforcing their ocean and coastal laws. Moreover, these resources are often allocated sectorally to fishing, commercial shipping, energy development, and so forth. Integrated control measures can enhance compliance and enforcement by helping to validate data through cross-referencing information. In addition, integrated control measures can help to use scarce financial, personnel, and technical resources more efficiently and effectively. An ongoing EU pilot project in the Mediterranean illustrates the potential, through integrating marine surveillance systems. The project aims to validate and show that in practice bringing together information collected from various maritime surveillance systems and fusing them into a common operational picture creates cross-border and cross-sectoral advantages and can lead to more effective government actions against illegal activities. Ongoing projects are already testing integrated solutions based on emerging capabilities such as e-navigation, satellite observation, etc.

That penalties be increased to reflect damage to the resource and deter continued violations. 'Command-and-control' methods, in which governments prescribe desired management through regulations and standards, can work effectively when implemented along with sufficient penalties and threat of enforcement. The certainty and severity of the penalties imposed must be sufficient to deter would-be violators. In many instances, however, penalties are nominal and readily incorporated into the cost of doing business. Moreover, penalties are rarely applied. A large body of experience in setting effective penalties – as

well as options for creative alternative penalties – from the sectors outside the specific ocean context can inform the reform of penalty regimes.

Technical tools can aid in enforcement and achieve compliance. For example, tamper-resistant recording systems, alarms, and printouts to verify equipment operation, valve position, flow, incineration, and ship's position can ease the challenges of vessel pollution enforcement. Vessel monitoring systems (VMS), remote sensing, database systems, and technical assistance programmes help to achieve compliance and enforcement in fisheries, as well as with respect to illegal discharges and dumping. However, in many cases, technological disparities (including the lack of internet access) hinder the dissemination of information to countries and fishing communities, preventing optimal implementation of policies. While new technologies can be expensive, over time these costs may drop and provide more inexpensive means to conduct monitoring, surveillance, and enforcement operations.

2.8.5 The importance of ocean leadership

Institutional capacity and capability is often a product of leadership and political will. Ocean leadership requires the development of a broad vision and skills to be able to address the thorny issues related to oceans, coasts, biodiversity, and climate in an integrated manner, understanding the interrelationships among issues and the impacts of uses and activities on the marine environment and on each other. An ocean leader will have the ability to understand the complex interplay among international, national, and local policies and politics. The ocean leader will have a deep appreciation of the meaning of ocean stewardship and of public benefit from sustainable ocean use and of his/her personal responsibility to future generations and to the global community in this regard. The leader will also have the capacity to think, act, and negotiate strategically to advance stewardship of oceans at national and international levels. The leader will have the capacity to negotiate strategically with other countries and the private sector to insure that the ocean resources in the areas of his/her national jurisdiction are used sustainably and for the benefit of the country's public and especially of its coastal communities. The ocean leader will have sufficient knowledge and understanding of marine science, economics, public administration, and politics to enable him/her to formulate and implement ocean policies in an effective and efficient manner and with lasting benefits to the public and to coastal communities.

Recommendation 2.12: That in-service training and ocean awareness workshops be developed to foster the continued development of current ocean leaders, and the skills they need to develop and implement appropriate policy measures to manage oceans sustainably.

2.9 Summary

Addressing pressures and threats to marine ecosystems and maritime cultures on a sustainable basis requires capacity at different levels: in government, in the private sector, in NGOs and at the community level. Government agencies need skilled staff with professional expertise who can manage the human impacts to marine areas from resource use. There is currently no graduate program for marine management and science in New Zealand. The institutional capacity and capability of future marine life protection and marine resource use of the EEZ and EEC should be based on the cultivation of a new era of professionals who have an understanding of the new tools that can support decision-making and planning. Marine

resource management is necessarily an intergovernmental and interdisciplinary activity. Professionals in marine management and planning need three primary traits: the ability to *communicate* to a broad audience of user groups, sectors and scientists; the capacity to *integrate* across sectors and disciplines to support a broader, ecosystem-based perspective in planning and decision-making; and *leadership skills* to cultivate stronger alliances and collaborative social networks that can sustain community-based and place-based planning and decision-making.

> **Recommendation 2.13:** That New Zealand create a state-of-the-art professional graduate program in Marine Affairs that emphasizes an interdisciplinary approach to marine science, planning and policy.

Marine management and planning is fundamentally a question of scale – one that should combine an understanding of the land-sea interface. Yet, the scale of management rarely reflects the interactions between human use and the impacts of human activities on marine systems or the complex relationships that exist and cut across coastal and marine systems. Western traditions of environmental management have failed to live up to the traditional maritime heritage and indigenous knowledge systems that understand these connections and support these relationships.

Scale influences the way we perceive the things of the natural world. In a boat or under water we may see in detail the interaction of marine life and coastal-dependent species, such as the sooty shearwater, sea lions, and commercially valuable species such as squid. With a satellite image our perceptions and observations change. We may see the larger-scale interactions between a river's plume of sediment well beyond a coastal area bought on by a heavy rain event, or the subtle but substantive changes in sea surface temperature that influences the abundance of plankton and marine life. With technological advances in satellite digital imagery, our understanding of the scale of the impacts human beings have on marine ecosystems is expanding. When we combine observations of both larger and smaller scale interactions we may be able to identify the relationships between changes in sea surface temperature, the abundance and distribution of plankton, and the presence of a fished species. Yet management concerns rarely reflect this complex interaction. Our observations and capacity to manage marine areas are based on the scale of interactions we identify. Our western language of technique and sector mastery fails to live up to the primordial story and knowledge of the peoples who inhabited and relied on coastal landscapes.

In this sense, the stories and traditional knowledge of maritime places are passed on throughout the generations. We have much to gain from the traditional peoples. While this report has focused on Western ideals and governance, the knowledge and values of diverse iwi reflect a deep understanding of the importance of stewardship of special places and the irrevocable connection between people and places. Stewardship of the oceanic commons is essential – and it is not just a question of science or law. While our understanding of nature includes western models of science, resource management and governance, we should embrace the primordial connection carried forward by the story of maritime peoples and the values that uphold and sustain a deeper connection to place, the river, the mountain, the coast, and sea.

With a deeper appreciation of the scale of relationships and linkages in marine systems as indicated above, management conceptions should change to encompass a broader array of factors that include oceanographic processes, biological concerns, and the climate-related stressors on these systems. Management begins at the boundaries we draw. It is based on the

various perceptions, values, and beliefs that human beings have about the natural world. With scientific and technological advancement, we are beginning to understand the scale of biophysical interactions that influence and shape the health and integrity of marine areas. Ironically, the more we begin to understand the complexity of the systems of relationships that influence our resource use and the character of marine areas, the more significant our human impacts become. As our understanding of the characteristic scale of biophysical systems expands, our understanding of the complexity of ecosystem dynamics and processes diminishes – we begin to acknowledge that we make decisions about future resource use with limited scientific knowledge. A good example is the fact that we know very little about the deep bottom of the sea floor or the benthic habitats that many unique species depend on, yet we continue to exploit this marine area for fishes and invertebrates without the necessary information of our effects on these ecosystem relationships.

As our understanding of biophysical relationships change so too must our management of marine areas adapt to changes in scientific information to reflect a deeper understanding of the interdependencies that exist between ecological relationships and linkages. Normative principles of management such as the maintenance of ecosystem health and integrity begin to take on new meanings and relevance for planning and decision-making, while the goal to sustain an ecosystem's 'goods and services', for instance, are reflected in a burgeoning era of ecosystem-based marine management. We increasingly understand that the environmental laws of the 20th century will not be adequate to address and adapt to the pressures and problems we are facing in the new century. Greening economic production and consumption as described within a new management framework includes a more integrative approach to marine ecosystem-based planning and management.

As the United Nations Environmental Program's *Restoring the natural foundation to sustain a Green Economy: A century long journey for ecosystem management* noted, 'Natural ecosystems provide the life-support systems for humans, and the natural foundation for a sustainable green economy, yet their health is under increasing threat ... Ecosystem Management can help retain the balance between economic growth, societal development and ecosystem health to ensure long-term sustainability.'[135] A new era of marine management is developing, and New Zealand has the unique opportunity to learn from contemporary international best practice in this area. This new management era is influenced by changes in the biophysical science, technologies, and administrative values. As this report has noted, a number of challenges and opportunities exist today to better reflect this international best practice.

New Zealand is a testing ground for the future of innovative marine planning and management. With leadership and policy innovation, the great promise is that other countries can learn from the New Zealand experience in marine management. But the country must have the courage to experiment with new management strategies and tactics that embrace an emerging ecosystem-based approach to marine integrative planning and decision-making. Marine management begins with the jurisdictions and boundaries we draw at diverse scales. These boundaries and jurisdictions rarely reflect the complexity of ecosystem linkages and

[135] UNITED NATIONS ENVIRONMENTAL PROGRAM (UNEP), RESTORING THE NATURAL FOUNDATION TO SUSTAIN A GREEN ECONOMY (UNEP Policy Brief 6, 2011). The need for the development of ecosystem-based marine planning and management to foster a 'green economy' is also found in UNEP, FAO, IMO, UNDP AND IUCN, GREEN ECONOMY IN A BLUE WORLD (2012) available at: www.unep.org/greeneconomy and www.unep.org/regionalseas

relationships. The management of a particular fished species, for instance, may fail to acknowledge and plan for the disturbance that is caused by changes in ecological productivity, including stressors and pressures brought on by climate-related events and the use of other resources by other sectors. More often than not, the scale of management is based on a particular sector or species, such as a commercially valuable species or habitat. In order to sustain the commercial use of a particular species, other ecological and socio-economic factors should be considered by managers and planners that are often reflect multiple scale issues and multiple species interactions. Food web dynamics, predator-prey relationships, the synergistic effects of cumulative impacts and pressures, and other factors influence the abundance and distribution of a fished species.

Marine management ultimately depends on the relationships and interactions that we perceive and understand. Marine planning and decision-making, therefore, is predicated on our perceptions of these relationships. The management concern is fundamentally a question of what we can control; we can control only human behaviour and associated impacts. The relationships and linkages that exist in marine ecosystems are complex and non-linear, and are therefore difficult to determine or predict. Political processes may also be dynamic and complex and are influenced by diverse scales of social interactions and relationships, such as global trade alliances and increasing demands for marine resources abroad. Management occurs under conditions of high scientific, economic, and political uncertainty. As a consequence of scientific uncertainty, values, beliefs, and worldviews matter in marine planning and decision-making. Management is not only a scientific enterprise but is shaped by social, economic, and political relationships that reflect diverse value orientations, interests, and perceptions of the natural world in a heterogeneous society.

Section Three turns to an exploration of the land-sea interface, with a general analysis of marine aquaculture and coastal land-uses in New Zealand. Marine aquaculture production is closely linked to coastal land-use activities. Terrestrial runoff and pollution can determine the productivity of nearshore marine waters, including marine farming operations. Land use activity, such as farming and ranching and suburban development, influence terrestrial, aquatic and marine ecosystems. Most marine farming and aquaculture takes places with the territorial sea close to shore.

Section Three builds on the principles and planning tools and instruments described in this section, and expands on the principles of ecosystem-based planning and decision-making. Based on the ecological processes that influence marine ecosystems, a more integrated approach to ecosystem-based planning and management is described with respect to New Zealand's existing marine governance framework. Section Three characterizes the range of administrative principles and planning tools that support an integrative, ecosystem-based approach to marine planning. While this section has emphasized the important value of non-consumptive values, including the importance of biodiversity preservation, and the assessment of cumulative environmental effects of proposed marine activity, the next section explores the merit of an ecosystem-based approach to protect the economic values associated with marine areas.

3. OF THE LAND AND SEA: MOVING TOWARD A BLUE ECONOMY

Nā Tāne I took, ka mawehe a Rangi rāua ko Papa, nāna I tauwehea ai, ka heuea te Pō, ka heuea te Ao.

It is by the strength of Tāne, that sky and earth were separated, and light was born.

In 1780, an English vessel sailing along the coast of Jamaica ran aground in a sea of green turtles, millions of turtles. For a time, the humans were hindered by the sea of turtles waiting for their inevitable return to the beach, and to forge the next generation. Such an abundance of turtles! Their heads are breaking the sea's surface. Imagine the smell of turtles out beyond the horizon. Imagine the coral of the reefs blooming of colours. Big fish swimming. The explosion of marine life exists along a changing depth of blue hue, under a full moon sky that exists before the sun sets.

Today, along the most of the beaches that green sea turtles once gathered, there is silence, a silenced sea. The British Empire mined the beaches, coastal inlets and lagoons for the sea turtles of the greater Caribbean Isles. It was a major export to England and Europe in the 19th Century. Our museums are full of the large shells of sea turtles; our western fables tell the stories of the former maritime abundance and the bounty of sea turtles—in turtle soup. In maritime museums, the turtle's shell represents the signs of a soon-to-be-lost race of marine life. Shells so large you can crawl into them. Great sea turtle shells are like the wings of an albatross or a great palm tree casting a shadow along the coast.

Sharks follow the path of the albatross and the path of sea turtles. These are paths animals have cleared for human beings to follow. The green sea turtle is referred to as honu in Polynesian, and represents 'a spirit of change'. Honu is a spiritual and metaphoric guide that travels the world's oceans; a shared totemic emblem that symbolizes the diverse ways people and places co-exist. The wildness is the ecological context in which honu's path takes place – it is the space that is not embraced or understood by the Cartesian consciousness. It is a path that reflects a material and conscious transcendence of Cartesian ways and habitats.

We can find that other animals can provide a lifeline that reconnects people and places across seascapes. It is the other animals, plants and insects that can guide our way. As in the past, learning from other animals has been the key to survival and adaptation. In the path of other animals, we find a greater ecology of understanding. The oceanic path of honu reminds us of the cultural and ecological power of wildness, the fragile world we live in, our shared fate, and the human struggle to survive and adapt to the changes in ocean ecosystems. To survive, we need to expand our sense of time and space to incorporate the needs of other places and other peoples in our daily lives.

A journey across the sea is often expressed in the gift of maritime story. The story of honu across the Pacific is reflected in the colours of the turtle's carapace or shell: Her body has been changed by the sea. Her body reflects the winds, waves and winds of a long journey. She is shaped by a journey that connects one sea to another. Her journey depends on an irrevocable connection between diverse places and peoples of the Pacific. She lives a life at sea. The mooring of her body is linked to a deep blue line of oceanic symbiosis and evolution. The fire of this deep blue sea is her island or coastal place for earthly renewal. She has survived our nets and our developed coastlines.

The story of the great sea turtle is a reminder of the fragile coastal and marine system we depend on for survival. The turtle waits offshore, in the shallow seas along the coastal islands of the South Pacific. It is not yet just a memory. I am floating face-up to the sky. A coral reef is below. The clouds above resemble the turtles afloat in this sea with me.

3.1 Introduction

This section builds on the previous one to develop the concept of integrative marine ecosystem-based planning and management further by examining the case study of aquaculture,[136] and the factors that influence its further development of the industry. Aquaculture development is a major economic focus of government and the industry but this development is influenced by a range of socio-ecological factors, including the influence of the land-sea interface. The section includes a review of the important land-sea interface with respect to the potential socio-economic and ecological impacts on marine activities (including marine farming) and ecosystems.[137] Understanding and addressing these impacts and pressures is one essential characteristic of a more integrative approach to marine planning and decision-making. The section also includes a summary of interview data on the role of science, scientists and values in aquaculture policymaking. The section concludes with a general overview of the importance of integrating the values of economic development, ecology, and equity.

The coastal zone of New Zealand extends into marine areas, evident by the effects and influences of terrestrial inputs, which may include sediments, nutrients and water pollution from rivers and streams.[138] A different perception of the coastal zone emerges with larger-scale biophysical observations, information, and data. Yet there are also smaller-scale impacts on marine habitats and species from large-scale interactions and relationships. Marine habitats are influenced by oceanographic, biological, and climate-related factors. In addition, scientists show that terrestrial inputs influence coastal and marine ecosystems and marine activities, such as marine aquaculture. To sustain marine farming and aquaculture, resource managers need to recognize the ecological relationships that exist between the land, coast and marine systems. Failure to recognize and address the diverse scales of biophysical processes and associated effects may have significant economic and ecological consequences.

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[136] Parts of this section on aquaculture policy and the role of scientists in aquaculture policy development were co-authored by Meghan Collins, who was a graduate student research assistant on this project during 2010-2011. *See* M. COLLINS, WHAT IS THE RELATIONSHIP BETWEEN SCIENCE AND POLITICS IN AQUACULTURE? A NEW ZEALAND CASE STUDY IN ENVIRONMENTAL CONTROVERSY (Master's Thesis, Victoria University Wellington, New Zealand, 2012) and M. Collins, *What is the relationship between science and democracy? New Zealand aquaculture, environmental controversy and science*. Paper Prepared for the Inaugural Asia-Pacific Science Policy Studies Conference (2012).

[137] OCEANS POLICY SECRETARIAT, THE LAND-SEA INTERFACE, WORKING PAPER FIVE (March 2003). The paper notes, 'Ecological integrity of the oceans can be threatened by pollution from land-based activities, both through direct discharges such as sewage and stormwater, and through non-point source pollution of rivers hundreds of kilometers from the coast,' at page 2.

[138] Mark T. Gibbs, Alistair J. Hobday, Brian Sanderson, Chad L. Hewitt, *Defining the seaward extent of New Zealand's coastal zone*, 66 ESTUARINE, COASTAL AND SHELF SCIENCE 240 (2006).

Hurunui River. Michael Vincent McGinnis (2010)

With respect to the management of the coastal zone, New Zealand is unique with respect to governance of the land-sea interface. It is one of the few countries in the world to have developed a regional governance framework that includes the catchment and associated territorial waters (including marine areas out to 12 nm).[139] Most coastal states draw an artificial boundary that divides management jurisdictions for terrestrial, coastal and marine areas. These administrative boundaries remain a fundamental problem in the development of integrated, ecosystem-based coastal and marine planning. A good example is the problem of developing and implemented integrated coastal zone management (ICM) in Europe.[140] These management jurisdictions and administrative boundaries adopted by coastal states often exacerbate the problem of fragmented governance and contribute to the lack of institutional capacity and capability to sustain and maintain ecological integrity. Few countries have developed a management jurisdiction that combines a catchment with marine areas.

In contrast, New Zealand is a state that has the capacity to govern resource use and associated impacts across the land and sea interface.[141] Makgill and Rennie note:

> [T]he definition of environment under the Resources Management Act (RMA) of 1991 includes ecosystems. That means that a proposed activity must also be considered in terms of its adverse effects on an ecosystem under section 5(2)(c). The

[139] R. A. Makgill and H. G. Rennie , *A Model for Integrated Coastal Management Legislation: A Principled Analysis of New Zealand's Resource Management Act 1991,* 27 THE INTERNATIONAL JOURNAL OF MARINE AND COASTAL LAW 135, 165 (2012). Makgill and Rennie describe key components of Integrated Coastal Management (ICM) policy, and show how the Resource Management Act 1991 implements ICM in New Zealand. They also provide a comprehensive overview of the basic tenets of ICM, and the key planning tools that support ICM. The authors also describe the ability of ICM to address conflict in light of New Zealand's experience with the RMA.

[140] M.V. McGinnis, *Addressing Biodiversity Loss in a Changing Climate: The Significance of Coastal Marine Ecosystem-based Policy in the Euro-Mediterranean, US, and California*. TRANSATLANTIC METHODS FOR HANDLING GLOBAL CHALLENGES: MANAGING BIOSAFETY AND BIODIVERSITY IN A GLOBAL WORLD (A collaborative project supported by a UN grant to the University of California, Berkeley Center on Institutions and Governance and Leuven Centre for Global Governance Studies, Belgium, 2010).

[141] Makgill and Rennie, 2012.

> ecosystem approach is also present in the division of regional councils' spheres of authority into catchments. Catchments are the ecological conduit for the passage of water to the coast. Understanding land-water relationships is the starting point for appreciating the need for holistic management of regions using natural boundaries. The primary determinant of the health of any near-shore marine ecosystem is run-off from contributory catchments. Chemical contamination from run-off results in the overfeeding and, frequently, the poisoning of estuaries. Regional councils … have responsibility under the RMA for the integrated management of natural and physical resources within their regions. Their regions include both the land catchment and the offshore environment out to the 12-nautical-mile territorial sea boundary.[142]

The passage of the RMA was a product of policy and institutional innovation that began in the late 1980's. Driven by a growing free-market ideology, inspired leadership, the widespread desire to shrink central government, and an overly complex and prescriptive regulatory system, New Zealand restructured its environment legal framework and local government structure.[143] An extensive stakeholder consultation effort led to an unprecedented alignment among business, government, and the public interest community in support of the reforms. Under the government sector reforms, more than 800 governmental and quasi-governmental agencies were dismantled or reorganized. In their place, three primary central government agencies and 86 local government authorities (comprised of 12 regional councils based on catchment boundaries, and 74 territorial authorities called district or city councils) were established, which were collectively responsible for all aspects of environmental, natural resource, and land use planning and management. In addition, over 55 statutes and 19 sets of regulations were eliminated and replaced by a single legislative enactment – the RMA – encompassing environment, natural resources, and land use beneath one umbrella for the purpose of promoting the 'sustainable management of natural and physical resources.'[144]

The catchment-based approach to environmental planning is a unique feature of New Zealand governance. Makgill and Rennie maintain, 'The catchment-based structure of the regional councils, who have primary responsibility for the coastal environment, facilitates ecosystem integration between inland areas and the coastal environment … New Zealand's RMA is a model of best practice in ICM legislation.'[145] Sustainable management was defined in a way that addressed social, economic, and cultural considerations, meeting the needs of future generations, safeguarding the life-supporting capacity of natural resources and ecosystems, and avoiding, remedying, or mitigating the adverse environmental effects of human activities.

Since the passage of the RMA, there have been major changes in general types of land-uses across New Zealand. One major change is the passage of a new coastal policy statement.[146]

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[142] Id., p.149.

[143] N.J. Ericksen, *New Zealand Water Planning and Management: Evolution or Revolution*. In INTEGRATED WATER MANAGEMENT: INTERNATIONAL EXPERIENCES AND PERSPECTIVES *(*Bruce Mitchell, ed., London: Belhaven Press, 1990).

[144] For a comprehensive review of the RMA provisions, see MakGill and Rennie, 2012.

[145] Makgill and Rennie, 2012, p.164.

[146] For a further discussion of recent coastal policy development with respect to the resource management, the Crown, private rights and public obligations, see: R. Makgill and H. Rennie, *The Marine and Coastal Area Act 2011*, RESOURCE MANAGEMENT JOURNAL 1 (2011) and R. Makgill, *Feeling Left out at Sea? Navigating No Ownership, Customary Rights and Resource Management* in MARINE AND COASTAL AREA ACT: DEMYSTIFYING THE HYPE (New Zealand Law Society, Wellington 2011), pp. 27–64.

There are also more subtle changes in the general character of the landscapes across New Zealand. The small family farm has given way to large-scale industrial use of the lands of New Zealand for dairy production. This change in land-use runs up against the pastoral romanticism of the family ranch sustained across generations. It is this image of the small family ranch that is one cornerstone of the '100% Pure' brand that is perpetuated by New Zealand; it remains a major draw for the tourist industry the country depends on.

A number of recent studies on the water quality of New Zealand's waterways indicate that some rivers and streams are deteriorating as a consequence of pollution from intensive agriculture and changes in the scale and type of land-use activities. *The Natural Resources Sector Briefing to Incoming Ministers* notes a number of management problems, including:

- setting and enforcing limits on the sources of diffuse impacts on water quality is difficult
- few catchment-level water quality standards are currently set
- managing water quality, especially diffuse sources, is complex and creates difficulties for all stakeholders.[147]

Indeed, the effects on marine and freshwater systems are well documented.[148] Scientific studies indicate the following general concerns:

- lowland rivers in agriculturally developed areas have been subjected to high nutrients, turbidity and faecal contamination, leaving them in a poor condition
- Streams in areas of dairy farming, especially where poor practises of shed effluent disposal have been used, are in particularly poor condition, and the intensification of farming associated with dairying in general has also been related to increasing levels of nutrients, sediments and faecal bacteria
- alteration and destruction of habitats and ecosystems
- effects of sewage on human health
- widespread and increased eutrophication
- decline of fish stocks and other renewable resources
- change in sediment flow due to hydrological changes.

It is time to promote a *blue economy* that can protect the integrity of the brand. The future of New Zealand's economy and ecology may depend on a fundamental management shift toward a more holistic, integrative, and ecosystem-based approach to marine planning and decision-making.

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[147] MINISTRY FOR THE ENVIRONMENT, THE NATURAL RESOURCES SECTOR BRIEFING TO INCOMING MINISTERS (2012) available at: http://www.mfe.govt.nz/publications/about/briefing-incoming-minister-2011/index.html

[148] M.A. MORRISON, LOWE, M.L.; PARSONS, D.M.; USMAR, N.R.; MCLEOD, I.M., A REVIEW OF LAND-BASED EFFECTS ON COASTAL FISHERIES AND SUPPORTING BIODIVERSITY IN NEW ZEALAND. (New Zealand Aquatic Environment and Biodiversity Report No. 37, 2009). With respect to the impacts on aquaculture, see, for example: C.D. Cornelisen, P.A. Gillespie, M. Kirs, R.G. Young, R.W. Forrest, P.J. Barter, B.R. Knight and V.J. Harwood, *Motueka River plume facilitates transport of ruminant faecal contaminants into shellfish growing waters, Tasman Bay, New Zealand*, 45 NEW ZEALAND JOURNAL OF MARINE AND FRESHWATER RESEARCH 477 (2011).

3.2 The Coastal – Marine Interface

During heavy rain events the coastal zone extends inland to include the biophysical processes of a catchment or a basin, and the river's plume extends offshore into marine waters. A marine farm at times is in a river's freshwater plume. A river's plume includes sediment and nutrients that may come from farms. Sediments and added nutrients can disturb marine habitat and associated biodiversity. In this way human activities on land contribute to the ecological productivity of marine farms. Marine aquaculture is an excellent example of an economic activity influenced by the changes in the land-use activities, the character of coastal processes, such as the health of coastal wetland habitat, the biophysical processes of marine ecosystems, including the currents, and the general ecological processes of marine systems. The production of aquaculture is dependent on the ecology of freshwater inputs and aquatic ecosystems, and in this sense, is influenced by land-use activities, including agricultural production and operations. Recognizing the dynamic connections and complex linkages that exist across the landscape and seascape, aquaculture and agriculture, is an essential management concern.

Ideally, an integrative approach to marine governance should take into consideration the many factors that cut across agency jurisdictions and resource sectors. Without a more integrative approach, spatial conflict between users and the maintenance of marine ecosystem health becomes more difficult. Marine management is based on the boundaries and jurisdictions drawn in a fluid medium that is complex, dynamic, and ever-changing. More often than not, these economic, political, and administrative jurisdictions are artificial and fail to reflect the ecological connections and linkages that influence the biodiversity and resource use of coastal and marine areas. Overall, an integrative, ecosystem-based approach to marine governance should include careful consideration of the impacts of various land use activities on marine areas. The country's interest in expanding economic development and production of agriculture (such as dairy) and aquaculture becomes more problematic without a more integrative, ecosystem-based approach to coastal and marine planning, decision-making, and management. This section begins with a brief introduction to the importance of the land-sea interface in marine planning and management, with a particular focus on marine farming and aquaculture. Failure to address the impacts of terrestrial inputs on marine activities, such as aquaculture, may have significant economic and ecological effects. Based on interviews of key stakeholders and policymakers in this sector, the section describes the need for a more integrative approach to marine planning, decision-making and management. There is an important role for independent and credible scientists and local traditional knowledge in the further development of this sector. With this in mind, this section describes the value of a more integrative approach to marine planning and decision-making, with a case study of marine farming. A number of planning and strategic elements are described that can contribute to an ecosystem-based approach to marine governance in New Zealand.

A combination of human and natural factors influences the ecology of coastal and marine ecosystems in New Zealand.[149] For instance, coastal wetland ecosystems depend on a

[149] For a general summary of impacts, see P.A. Gillespie, R.W. Forrest, B.M. Peake, L.R. Basher, D.M. Clement, R.A. Dunmore and D.M. Hicks, *Spatial delineation of the depositional footprint of the Motueka River outwelling plume in Tasman Bay, New Zealand*, 45 NEW ZEALAND JOURNAL OF MARINE AND FRESHWATER RESEARCH 455 (2011) and P.A. Gillespie, R.W. Forrest, B.R. Knight, C.D. Cornelisen and R.G. Young, *Variation in nutrient loading from the Motueka River into Tasman Bay, New Zealand, 2005–2009:*

dynamic equilibrium between freshwater and saltwater. If a creek is dammed, the freshwater flow to the coastal wetland is diminished. Increased sediment loads can also contribute to changes in coastal and marine systems. If freshwater flows are altered in a coastal watershed, important nutrients may not reach a lagoon or estuary. As the relationship and mixing of saltwater and freshwater is altered, the abundance and distribution of wetland-dependent species, such as shorebirds and several marine resources decline. Land-use and other terrestrial activities that occur many miles inland can influence not only in coastal areas, such as wetlands, but also shape marine ecological productivity. Examples of these impacts include salt water intrusion into historically freshwater areas, nutrient over-enrichment, and changes in sedimentation patterns that influence marine ecosystems and marine resource use. To preserve overall ecosystem integrity, it is imperative to link management measures regarding oceans and coasts to the management of river basins and watersheds.

For example, the production of marine farming for shellfish is shown to follow trends in marine productivity that are often influenced by terrestrial inputs, such as nutrient loading and river flows. Examples of categories of impacts (all of which affect catchments) include, but are not limited to:

- Filling and diking wetland habitats
- Damming, diverting, and channelizing creeks for flood control
- Damming and importing water for water supply purposes
- Grazing of livestock
- Introduction of invasive exotic plants and feral animals
- Conversion of permeable surfaces to impermeable as a result of development
- Encroachment of development into floodplain.

The impact of pollution in coastal marine ecosystems is directly related to the level and type of urban, industrial, suburban and agricultural development. The addition of inorganic nitrogen (nitrate, ammonium) to estuarine systems, for example, can stimulate algal growth in coastal and marine ecosystems. Algal mats in channels and on tidal flats can reduce the abundance and diversity of invertebrates (e.g., worms, clams) living on the mud, inhibit birds feeding behaviour, and reduce oxygen concentration in the water column during algal growth and decay. The input of nitrate into tidal channels creates the potential for a rapid deterioration in water quality during periods of reduced (neap tide series) or no (inlet closure) tidal flushing. Under these conditions, nutrients rapidly accumulate, contributing to excessive algal growth. This process may be exacerbated by the activity of fauna in coastal systems, such as a marsh, that consume oxygen and excrete ammonium. Thus, nutrient input into coastal and marine ecosystems can be potentially detrimental to biodiversity and ecosystems services. For instance, marine farming and aquaculture is sensitive to the ecological processes that include inland waterways, aquatic, coastal and marine systems.

In general, change in the pastoral character of New Zealand has taken place during the last decade (e.g., from small scale sheep farming to large-scale dairy production). This change in land-use activity contributes to the ecological and economic productivity of marine farming and aquaculture. The growth of these industries is interdependent on one another.

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implications for the river plume ecosystem, 45 NEW ZEALAND JOURNAL OF MARINE AND FRESHWATER RESEARCH 497 (2011).

3.3 Case Study: Marine Farming

Depending on policy innovation in the sector, New Zealand will likely enter into a new era of aquaculture and marine farming. Given increasing demands for seafood in international markets, aquaculture will likely be expanded in marine areas of the country. It is important to note, however, that a rise in aquaculture production (across the world's ocean) will not result in the decline in the demand for wild fish stocks. The demand for wild fish stocks and aquaculture products is increasing worldwide. Nevertheless, the Food and Agriculture Organization (FAO) is sounding an alarm on gradual declines in wild catch fishing production and depletion of stocks, while being careful to note that growth in the global aquaculture industry seems poised to overtake capture fishing as the world's leading source of seafood.[150]

Marine farming and aquaculture takes place in an environment that includes the factors that influence the coastal-marine interface. While the growth of marine farming and aquaculture in New Zealand follows a similar pattern of global growth in the industry, it cannot be sustained without a more concerted effort to link marine activities to coastal and terrestrial activities, such as land-uses for agriculture, ranching and urban growth. From 1985-2005, the average annual growth rate of the aquaculture industry was 13 percent.[151] Overall export volume increased in the 1990s.[152] Based on legislation currently under consideration in Parliament, major growth in the aquaculture industry could take place within the decade.

Aquaculture in New Zealand is distinct from many other areas because it emphasises niche export markets and quality (i.e., high-value) exports, as opposed to lower value or subsistence-oriented production.[153] The diverse industry has expanded not only commercially, but also to some extent socially, as evidenced by tourism attractions related to aquaculture and by the aquaculture species food festivals at the top of South Island.[154] The growth of the aquaculture industry is an economic priority supported by government because of its potential to contribute to gross domestic income. The government's goals for growth in aquaculture include $1 billion revenues by 2025, effectively tripling the $390 million current figures.[155] This growth is based on estimated projections that include increased production volumes, and is predicated on substantive spatial expansion of marine areas used by the industry from the current 5,700 ha to 16,000 ha of 'suitable marine space'. Growth in the

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[150] FOOD AND AGRICULTURE OF THE UNITED NATIONS, THE STATE OF WORLD FISHERIES AND AQUACULTURE 2008 (FAO Fisheries and Aquaculture Department, 2009).

[151] MINISTRY OF ECONOMIC DEVELOPMENT. OUR BLUE HORIZON. AQUACULTURE STRATEGY. (Wellington, NZ. 2007).

[152] M. Harte and R. Bess. *The role of property rights in the development of New Zealand's marine farming industry*. FISHRIGHTS 99 CONFERENCE: USE OF PROPERTY RIGHTS IN FISHERIES MANAGEMENT 2. (R. Shotton, ed., FAO and Fisheries Western Australia, 2000), at 331-337.

[153] C. MURRAY AND G. MCDONALD. AQUACULTURE: ECONOMIC IMPACT IN THE AUCKLAND REGION. JOINTLY PREPARED BY THE AUCKLAND REGIONAL COUNCIL AND MARKET ECONOMICS LTD. FOR AUCKLAND REGIONAL COUNCIL (Auckland Regional Council Document. Technical Report 009, 2010).

[154] C. DAWBER, LINES IN THE WATER: A HISTORY OF GREENSHELL MUSSEL FARMING IN NEW ZEALAND (River Press, 2004).

[155] G. Brownlee, *Funding boost for New Zealand aquaculture*. BEEHIVE NEWS RELEASE (19 January 2010) available at: http://www.beehive.govt.nz/release/funding-boost-new-zealand-aquaculture

industry is projected to create jobs and include economic spill-over effects in the service industry.[156]

The guiding management principles of the Aquaculture Strategy (from the AQNZ) support the use of market-based tools and incentives, major government investment in the industrial growth of the sector (including marine science, technology, and engineering), and the adoption of co-management and self-management strategies for the industry. These major tools embrace a deregulatory approach to grant consent for aquaculture development; the approach combines the role of regional councils and central government. In addition, one foundation to economic development is based on marketing strategies that embrace the production of aquaculture products as 'clean and green'. Farmed king salmon, marketed in Europe, is characterized by the industry as a product from the 100% pure ocean waters of the country. Yet, there is increasing scientific evidence that suggests the marine waters are, at times, polluted. Marketing sustainability is a key facet to the future of aquaculture development. One challenge is whether the existing value-added component to the marine farming industry, which is based on the *100% Pure New Zealand* brand, can be sustained and supported without a more integrated approach to the maintenance of coastal and marine ecosystems. Integration of the ecological and economic values carried by marine areas is key to the future of both aquaculture and agriculture. Other human activities, such as offshore oil development, marine mining, commercial fishing activity, habitat destruction, among other factors, can influence the future growth and sustainability of the aquaculture industry.

The history of aquaculture is one based on the importance of linking the production to the brand of *100% Pure New Zealand* that is a leading factor in the marketing of products overseas. The importance of creating new markets for aquaculture products is based not only on the increasing demand for protein from the ocean but the capacity of public and private institutions to resolve conflict between marine resource uses and the value of maintaining a healthy marine system. Consumers of marine products are increasingly interested in sustainably harvested or green products. Increasing marine resource uses can contribute to increased competition for marine areas, and may also create tipping points for ecosystem change. As in the past, new markets are likely to emerge in Asia for new products, such as sea cucumbers. As new markets emerge, we are likely to see a diversification of the types of species that are produced. Increasing conflict over marine space may also occur as marine activities for aquaculture is expanded in marine areas that may also include marine mining, offshore oil development, renewable energy development, tourism, and other uses.

Key species farmed today are the Greenshell mussel, Pacific oyster, and king salmon. Cultivation of only four species of mussels was permitted until 1991, and in the following seven year, 30 more species were added.[157]

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[156] MINISTRY OF FISHERIES. INFORMATION SHEET 1. AQUACULTURE LEGISLATION AMENDMENT BILL (NO 3) - OVERVIEW OF THE REFORMS (2010); AQUACULTURE UNIT; NEW ZEALAND AQUACULTURE COUNCIL, NEW ZEALAND AQUACULTURE STRATEGY (2006).

[157] H.G. RENNIE, A GEOGRAPHY OF MARINE FARMING RIGHTS IN NEW ZEALAND: SOME RUBBINGS OF PATTERNS ON THE FACE OF THE SEA (Ph.D Thesis, 2002) at 492.

Figure 9: Aquaculture Industry Farm Statistics (2006)

Species	Number of Farms	Total Hectares Marine Space	Tonnes Harvested
Green lipped mussels	645	4,747	97,000
Pacific oyster	230	750	2,800
King salmon	23	60	7,721

Source: NZ Aquaculture Council Annual Report in NZ Government (2007)

The three primary aquaculture products are mussels, oysters, and king salmon. Shellfish are the most extensively cultivated species in the country. Green lipped mussels, also known as Greenshell™ are farmed mainly in Marlborough Sounds (approximately 75 percent of production) and in the Coromandel region (approximately 20 percent of production). The green lipped mussel was listed in the Seafood Choices Alliance, comprised of organisations such as Greenpeace, WWF, and others, as one of the 'Sweet 16 Best Seafood Choices for 2005'.[158] In the USA, it was also included as the Blue Oceans Institute's top ocean-friendly species. A number of oyster species have also been cultivated, with the Pacific oyster the primary species. The Pacific oyster is non-native and is cultivated mainly in Northland, the Firth of Thames, and to a small extent in Marlborough. Salmon aquaculture exemplifies the production of a high-value species. The main species is King (or Chinook) Salmon, which comprises 27 percent of the total aquaculture production value in the country.[159] This species was introduced almost one hundred years ago and is native to the Cloud River in northern California. This species, endemic to the greater Sacramento River Basin, is currently listed as endangered in the USA, and on the verge of biological collapse.

In the 2010 Global Aquaculture Performance Index (GAPI) assessment, NZ ranked very high for ecologically sustainable salmon production due to the industry's relatively low production intensity, low reliance on capture of wild fisheries, and avoidance of antibiotics and pariciticides.[160]

3.4 Drivers of Aquaculture Policymaking

Public and private institutions play an active role in aquaculture governance. The Ministry of Agriculture and Forestry (MAF Fisheries) oversees the marine permitting process for aquaculture, and is in charge of promoting aquaculture. Thus MAF Fisheries is both *a regulator* and *a promoter* of the industry. These two managerial 'hats' are difficult to wear simultaneously, since there may be a perceived conflict of interest. MAF Fisheries also supports regional councils by providing information, advice and formal assessments for aquaculture applications and coastal plans that also pertain to fisheries matters. This role entails determining potential conflicts between aquaculture and fishing.[161] MAF Fisheries has established an Aquaculture Unit to head the future development of the sector. One purpose of

[158] L. Holton, *Greenshell mussels top 'friendly' seafood list*. 9 NEW ZEALAND AQUACULTURE MAGAZINE (2006).
[159] MINISTRY OF FISHERIES. FISHERIES 2030: NEW ZEALANDERS MAXIMISING BENEFITS FROM THE USE OF FISHERIES WITHIN ENVIRONMENTAL LIMITS (2009).
[160] J.P. VOLPE, M. BECK, V. ETHIER, J. GEE, A. WILSON. GLOBAL AQUACULTURE PERFORMANCE INDEX (2010).
[161] NZ GOVERNMENT. GOVERNMENT'S ROLE IN AQUACULTURE (2006) available at: http://www.aquaculture.govt.nz/governments_role.php

the unit is to coordinate across diverse interests in aquaculture production and to 'strengthen relationships' among relevant stakeholders, with a primary focus on strengthening the partnership between private interests and central government. The unit works closely with central government agencies, representatives from regional councils, and other interests (NGOs, iwi, industry).[162] MAF Fisheries is also responsible for implementing the Māori Commercial Aquaculture Claims Settlement Act 2004.

Currently, regional councils and authorities have jurisdiction over marine farming activities within the territorial sea in accordance to the Resources Management Act (RMA), which pertains to planning and the rights granted for use of space. The RMA is effects-based legislation that covers both terrestrial and coastal marine ecosystems. The coastal marine area is defined (s 2 of the Act) as the area from mean high water springs to the territorial sea boundary. Most activities that occupy exclusive use of space, such as aquaculture, are prohibited. Use and occupation of the coastal marine area is allowed only when a plan allows or when resource consent is granted, following s 12(1) and s 2. The RMA also protects the natural character of the coastal marine area and is accessible by the public as a matter of national importance, following s 6(a) and (d). Section 9 lays out the effects-based approach, whereby adverse environmental effects of an activity should be avoided, remedied or mitigated. Local councils are responsible for processing resource consents for cases of unpermitted activities, which devolves a great deal of administrative responsibility to local government.[163] Residents may make submissions on consents to demonstrate support or disapproval for proposed projects. Regional coastal plans may define certain values that localities would like to protect and levels of acceptable levels of change. Coastal planners in councils rely on scientific information to evaluate aquaculture as a potential use of coastal space and assess the potential effects of aquaculture on other coastal users. More detail is provided on how the planning processes under the RMA function to allocate space and maintain environmental standards in the results section.

In addition to the requirements under the RMA, the National Coastal Policy Statement (NZCPS) 2010 lays the groundwork for decision-makers to manage the use of coastal and marine areas. With respect to aquaculture, Policy 8 calls for regional policy statements and coastal plans to provide for aquaculture activities in 'appropriate places'. This policy stipulates that coastal development should consider effects that would make water quality 'unfit' for aquaculture. The NZCPS 2010 has seven objectives, five of which pertain to spatial conflict. The objectives reflect instrumental, utilitarian, ecosystem, and amenity values for coastal marine ecosystems, such as safeguarding the integrity and function of ecosystems, enabling people and communities to provide for well-being, and enhancing public space.

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[162] D. LEES, AQUACULTURE UNIT – AN OVERVIEW. MINISTRY OF FISHERIES INFORMATION SHEET (2002) available at: http://www.fish.govt.nz/NR/rdonlyres/978387CB-955A-4F39-9F4C-C0C33D2B260E/0/W_5349MOF_InfoSheet06.pdf

[163] Rennie, 2002, op; cit.

Figure 10: Key Aquaculture Policy and Legislation

Legislation	Purpose	Functions	Planning mechanisms using science
New Zealand Coastal Policy Statement (NZCPS) 2010	Define parameters and considerations for regional coastal policy statements (RMA 1991 s60)	Coastal management, including providing for aquaculture in 'appropriate places' (NZCPS Policy 8)	Coastal development should consider effects that would make water quality 'unfit' for aquaculture (NZCPS Policy 8)
Regional coastal policy statements	Define parameters and considerations for regional coastal resource management	Carry out specifications in NZCPS and address regionally-specific issues	Specific to region (e.g., Aquaculture Management Areas established in Tasman and Waikato districts)
RMA 1991: Spatial allocation by consenting	Allocate space to different users Grant consents on a case-by-case basis following effects-based planning (s9) Avoid, remedy or mitigate adverse effects (s9)	Evaluate effects of aquaculture on other users where conflict arises Assess effects of aquaculture on the coastal environment, requiring an Assessment of Environmental Effects (AEE) before consents are granted (s88 and s92)	Must consider sustainable management implications, actual and potential effects, and consequences for NZCPS and regional/district plans (s104) using the best available information (s10) 'Environmental effect' can be positive or negative, temporary or permanent, cumulative, high probability or low probability with high impact (s3) Consider landscape, amenity, visual, economic, ecosystem, social, health, cultural, spiritual or historic factors in AEE and strategic assessments (s32) Receive submissions from stakeholders in the coastal marine area
RMA 1991: Monitoring and evaluation	Oversee ongoing effects to environment Avoid, remedy or mitigate adverse effects (s9)	Establish consent conditions for monitoring and evaluation	Receive monitoring datasets and assess effects Enforce standards established in consent conditions In cases of uncertainty over effects, councils collect information to adaptively manage environmental effects

RMA 1991 and Judicial planning processes: Environment Court	Specialist court for RMA and planning issues	Enables stakeholders to appeal a council decision (RMA Schedule 1)	Draws on scientific expertise through expert witnesses / Friends of the Court
Aquaculture Reform (Repeals and Transitional Provisions) No. 3 Act 2011 AND Fisheries Act 1996	Address spatial conflict between aquaculture and fishing	Assess impact of aquaculture on fisheries (commercial, recreational and customary)	Regional coastal planners now assess impacts of aquaculture on fishing and fisheries resources under the Reform No. 3 2011 MAF Fisheries does the undue adverse effects (UAE) test on fishing under Fisheries Act. Performed within 20 working days of regional councils assessment of above effects. MAF can make consent conditions pertaining to fishing

Sources: NZCPS (2010), RMA (1991), MAF Fisheries (2011)

Another key statutory requirement is the Māori Commercial Aquaculture Claims Settlement Act 2004. Under this Act, 20 percent of aquaculture space is allocated to the Te Ohu Kai Moana Trustee, Ltd, through which it will be allocated to iwi. This is a significant step toward greater Māori involvement in aquaculture, and it demonstrates the importance of Māori as stakeholders in allocation of coastal marine areas.

The most recent reforms are motivated by the fact that the '2000s were a lost decade for aquaculture' where the Technical Advisory Group (TAG) was set up by the Minister for the Environment to 're-start' the industry.[164] The resulting legislation, the Aquaculture Reform (Repeals and Transitional Provisions) Amendment Act (No. 3) 2011, streamlines the consent process and increases investment certainty for marine farmers.

3.4.1 Water quality and biosecurity issues

As noted earlier, aquaculture is vulnerable to risks posed by other activities in the marine and coastal ecosystem, and policy has been developed to address these threats. By the early 1990s, the value of water quality was recognized as upholding the industry's clean, green image, and an environmental clean-up effort was driven by industry and complemented by RMA legislation. By the late 1990s, a plethora of regulations had been implemented to address water quality issues, such as MAF standards for on-board toilets and hand-washing (1995), biotoxin levies for growers to test stock (1996), and an Environmental Code of Practice written by the Mussel Industry Council in 1999 with support by NZ government. The issue of water quality persists, however, with closures to oyster gathering/aquaculture in Northland in 2001 and in 2004 due to raw sewage.

[164] TECHNICAL ADVISORY GROUP. RESTARTING AQUACULTURE: REPORT OF THE AQUACULTURE TECHNICAL ADVISORY GROUP. MINISTRY OF FISHERIES (2009) at 7.

In addition to the risks posed by the introduction of non-native marine species, aquaculture may contribute to biosecurity risks. The industry appeared in the biosecurity spotlight in the 1990s when marine farms were recognized as creating artificial habitat for invasive seaweed such as *Undaria pinnatifida*. It was also noted then that biosecurity issues posed a threat to aquaculture, such as through fouling of *Ciona intesinalis* sea squirt. Due to *C. intestinalis*, $10 million has been lost in Marlborough Sounds shellfish production.[165] Policy responses to biosecurity concerns associated with marine farming include the following examples:

- Bans on spat harvests in 1992 and 2000
- Increased surveillance by NIWA in 2006
- Establishment of long-term management plans for certain species in 2005
- A government-industry partnership in 2005
- Increases in the biosecurity budget to $150,000 in 2006
- Cooperative management efforts among New Zealand Marine Farming Association, New Zealand Mussel Industry Council, Port Marlborough, and New Zealand King Salmon Co, to reduce risk of effects of a sea squirt invasion.[166]

Biosecurity issues are likely to be an ongoing problem, and it appears that both public and private sectors see the importance in alleviating risk factors to aquaculture through biosecurity policy. The table below includes a description of documented effects of marine farmed species in New Zealand.

Figure 11: Documented Ecological Effects of the Marine Farmed Species

Species	Green lipped mussel	Pacific oyster	King salmon
Ecological effects	Seabed effects Organic and inorganic depositions Plankton extraction Potential to improve water quality/clarity Deposition of faeces or pseudofaeces Changes to local nutrient concentration Water column obstruction Creation of artificial reefs (increase biodiversity) Reduction in seafloor biodiversity Changes to predator-prey interaction Genetic distinctiveness of wild populations	Changes to seabed organic material, Water flows Extraction of plankton Increased microbial activity on seabed Plankton removal Secretion of nutrients that stimulate plankton growth Changes to nutrient cycling, Potential to act as disease vector	Physical, chemical and biological effects of deposition of uneaten feed Organic enrichment to microbial activity and oxygen depletion Algal growth and biotoxins Artificial reef creation Disease Escaped fish Entanglements of marine mammals Zinc and copper additives from feed

Source: Farmed Species Ecological Effects. NZ Govt 2006

[165] B. Forrest, *Fouling pests in aquaculture - issues and management options*. 17 NEW ZEALAND AQUACULTURE MAGAZINE (2007).

[166] M. COLLINS, WHAT IS THE RELATIONSHIP BETWEEN SCIENCE AND POLITICS IN AQUACULTURE? A NEW ZEALAND CASE STUDY IN ENVIRONMENTAL CONTROVERSY (2012).

Recommendation 3.1: That effective integrated coastal and marine planning develop tools to assist in understanding, forecasting, and managing the effects of multiple stressors (cumulative effects) that cut across terrestrial, coastal, and marine ecosystems; to understand the spatial and temporal aspects of river and stream plumes and their role in the transport and fate of land-derived contaminants; to establish standardized monitoring programmes for assessing ecosystem health and integrity over time (you cannot manage what you do not measure); and to avoid compartmentalising what is happening on the land from what is happening in the sea.

Recommendation 3.2: That integrated management instruments and tools that support ecosystem-based management be established. The further development of integrated catchment and coastal planning should reflect the transboundary nature of the pressures from coastal land use activities on marine areas and resources. This requires a strengthening of cross-sectoral and cross-jurisdictional arrangements and support (including harmonized policies, financing, and information gathering/sharing).

Several planning instruments can provide upstream and downstream integration. For instance, spatial planning systems allow for management of large ecosystems with long-, medium-, and short-term perspectives and can incorporate other decision-making elements such as ownership or user fee systems. Today's spatial planning systems need to address shortcomings in the areas of biodiversity, climate-change adaptation, water resources management, and marine ecosystems. Section Four will explore a technical and methodological approach to integrative marine strategic planning in New Zealand further. Integrating watershed and coastal resources management into spatial planning can improve the involvement of stakeholders and increase its focus on water resource management. Spatial planning also must incorporate biodiversity management, particularly when the area in question includes or influences protected zones (both terrestrial and marine).

3.5 The Race for Marine Space

As described in the previous sections of this report there is now a race for marine space – marine areas have been leased for offshore oil exploration and marine mining, there is interest in the use of marine areas for alternative energy production, and continued interest in expanding the size of marine protected areas across the EEZ. The primary human threats and impacts to marine ecosystems are commercial shipping accidents, such as the Rena disaster, commercial fishing and trawling activities on the benthos, and climate change. While aquaculture is an additional sector that is likely to expand into other marine areas, it will take place in marine areas that are increasingly at risk from human pressures. The expansion of marine space for multiple-use will likely take place initially in territorial waters, but there are threats in deeper waters from, for instance, future deep-ocean farming of the country's EEZ.

While the current preference of government is to 'balance' these competing demands for marine space, a more appropriate response, given international best practice in marine governance, is to begin a more integrative approach that can support a more equitable practice in allocating marine space that is grounded in the values of supporting both ecological values and economic interests. This race for space reflects a burgeoning conflict of New Zealand's EEZ that is exemplified by competing interests for marine use, conflicting values for additional marine life protection versus the development of marine economic activity, and increasing tensions across management sectors with diverse constituencies, organizational cultures, and legal mandates. There is no simple resolution to the multiple-

value conflicts that are emerging in the country's EEZ. Advances in technology and marine science in areas such as bioacoustics and the impacts of noise of marine life also will likely highlight the need for an integrative approach to multiple-use. New Zealand currently lacks a comprehensive and holistic marine governance framework to address these conflicts as they arise. A more precautionary and adaptive approach is warranted today.

Spatial conflict has several dimensions. It is influenced by 'spatial and temporal overlap of human activities and their objectives.'[167] Marine spatial conflict in New Zealand has been described as the conflict over values associated with the legislative duty to uphold rights that have been assigned in the legal system (e.g., commercial, customary, recreational rights) and the need for biodiversity conservation.[168] Spatial conflict is based on competing uses and values associated with marine space that can be exacerbated by perceived and real impacts from human activities and natural changes to marine areas. Intergovernmental conflict can also contribute to the challenge of allocating resources in a transparent manner. Conflict can also follow scientific uncertainty and the lack of appropriate planning tools and policy instruments to address conflict at each stage of the policymaking process. *The Natural Resources Sector Briefing to Incoming Ministers* noted:

- Competition for space among different activities is increasing.
- There is a variety of competing interests and values, and no overall framework to drive efficiency across the different laws.
- The connection between management arrangements is poor (e.g., RMA and wild fisheries management).
- Native biodiversity is continuing to decline, despite current efforts and investment levels.
- The current toolbox is narrow: the main tools involve deterrence, with few positive incentives.
- Ecosystem services and values are not well understood and there are no mechanisms to take them into account.[169]

The Briefing acknowledges that conflicts over marine space are inevitable and recommends that appropriate management frameworks are needed to address these conflicts in a comprehensive and integrative way:

> The urgency for action stems from the opportunity we currently have to get the right frameworks in place before the pressures or competition for space become more difficult to resolve. There is also an opportunity to build a greater constituency to work through the range of values and uses. A more collaborative approach to decision-making and management could also address perceptions that might currently be hindering resource development and use in the marine environment. The inefficiencies of fragmented regulatory regimes need to be looked at, and improved integration of legal and management frameworks will be an important step towards reducing compliance costs and improving the prosperity derived from our marine

[167] F. Douvere, *The importance of marine spatial planning in advancing ecosystem-based sea use management*. 32 MARINE POLICY 762 (2008).

[168] R. Bess and R. Radamudi, *Spatial conflicts in New Zealand fisheries: the rights of fishers and protection of the marine environment*, 31 MARINE POLICY 719 (2007).

[169] MINISTRY FOR THE ENVIRONMENT, THE NATURAL RESOURCES SECTOR BRIEFING TO INCOMING MINISTERS (2012).

> resource. We need more sophisticated tools to enable us to have the debate about what resources we use, how we use them and what we conserve.[170]

With respect to the future of aquaculture in New Zealand, there has been a heated debate over growth of the industry into additional marine areas. The range of stakeholders in New Zealand aquaculture include, first, Māori aquaculture interests, their supporting trusts, and joint-venture partners. Others are marine farmers, investors (e.g., from direct foreign investment), those who are impacted by value-chain effects, the Aquaculture Industry Council, and other industry organisations such as cooperatives. And the government is an important stakeholder. Local residents who hold coastal amenity values are stakeholders, as well as other users of marine space, such as fishers, boaters, tourists and recreationalists, and their stakeholder organisations. Public perception of aquaculture in the country has been reported as 'generally poor'.[171] Spatial conflict occurs over the industry's use of space and contention over property rights.[172] For instance, of the aquaculture permits that were declined in the Marlborough District, 95 percent were due at least partially to social reasons.[173] In general, conflict in aquaculture is likely to be higher where coastal areas are densely populated, such near urbanized areas. In the past, conflict over the use of marine areas by the aquaculture industry has developed because of opposition from the commercial fishing industry, and has recently broadened to include other interests and user groups, including recreational fishers.[174] During the 1990s, tensions between the Ministry of Fisheries and the sector increased.[175]

In 2001 the Ministerial Advisory Committee conducted a consultation to determine the value of the oceans to New Zealanders. There were 2000 attendees and 1000 written submissions for this consultation. New Zealanders value the physical setting of the country as an island, and the values carried by a 'healthy sea', including the spiritual and physical connection of Māori to the sea.[176] This was seen in a survey conducted by the Marlborough District Council and Corydon Consultants, Ltd, in 2001 undertaken to understand the national importance of the Marlborough Sounds and perception of aquaculture. Scenic beauty, high water quality, peace, tranquillity, and good fishing were the high scoring values. Forty-nine percent of respondents indicated that they were positive about marine farming.[177] The survey data indicates a range of attitudes towards the marine environment, from spiritual to ecological to economic, with no obvious ranking of these values.

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[170] Id., p. 10.

[171] NEW ZEALAND AQUACULTURE COUNCIL. NEW ZEALAND AQUACULTURE STRATEGY(2006) and C.S. Shafer, G. Inglis, and V. Martin, *Examining residents' proximit, recreational use, and perceptions regarding proposed aquaculture development*. 38 COASTAL MANAGEMENT 559 (2010).

[172] H.G. Rennie, *Aquaculture Management Areas – An example of why we should not rush to ditch the RMA's effects-based approach?* 175 PLANNING QUARTERLY 14 (2009) and H.G. Rennie, *Marine (Aquaculture) Space Allocation: Assessing Transitional Challenges to Local Economies in New Zealand*. 25 LOCAL ECONOMY 190 (2010).

[173] W. Banta and M. Gibbs. *Factors controlling the development of the aquaculture industry in New Zealand: Legislative reform and social carrying capacity*. 37 COASTAL MANAGEMENT 170 (2009).

[174] Rennie, 2002. op cit.

[175] M. Gibbs, *The historical development of fisheries in New Zealand with respect to sustainable development principles*. 1 ELECTRONIC JOURNAL OF SUSTAINABLE DEVELOPMENT 33 (2010).

[176] J. Vince and M. Haward. *New Zealand oceans governance: Calming turbulent waters*? 33 MARINE POLICY 412 (2009).

[177] Dawber, 2004. op cit.

The controversy over the use of the aquaculture industry of marine areas is a driving force behind policymaking. Moratoria on new applications for mussel farms in Marlborough were put in place in 1996 and 1998, partly in response to poor public perceptions of marine farming. Conflict between the commercial fishing industry and aquaculture contributed to discussions on how to amend aquaculture legislation in Parliament in 2000.[178] A national moratorium was put in place in 2001 for all coastal permit applications for all species.[179] The result was the 2002 Resource Management (Aquaculture Moratorium) Amendment Act that included a provision to allow regional councils time to process the permit applications and determine appropriate aquaculture zones.[180] The Aquaculture Reform (No 2) Act in 2005 required councils to establish spatial designations approved by Ministry of Fisheries, known as Aquaculture Management Areas (AMAs). The purpose of the AMAs was to reduce conflict with recreational, commercial and customary fishing, and was based on the use of the Undue Adverse Effects (UAE) criteria.[181] The Aquaculture Amendment Act 2005 repealed the moratorium, and regional councils were required to establish AMAs that were approved by Ministry of Fisheries.

No new marine farms were established during the period following the 2005 Amendment. Policy deliberation began in 2009 to further amend aquaculture legislation. According to a Ministry of Fisheries Technical Advisory Group (TAG) 2009 report entitled *Restarting Aquaculture*, '[The] allocation of water space to aquaculture cannot be separated from other allocation decisions in the coastal marine area.'[182] The TAG report recommends a process of marine spatial allocation that is more consistent with the statutory requirements established under the RMA. The TAG recommendation is based on the value of expediting the planning and decision-making process for allocating permits.

The Aquaculture Amendment (Repeals and Transitions) Act 2011 addresses spatial conflict by giving the regional councils power to set moratoria on applications for highly contentious marine areas, and would set up a planning process where competing applications can be assessed together (as opposed to first-in, first-served). This amendment would also support 'authorisations' by tendering (open to bidding) and other market mechanisms, and it limits the space that can be allocated under a single permit and to certain intensities and scales of activities.[183] Overall, the 2011 Reforms would encourage strategic planning on the part of regional councils and industry. The reforms would abolish the AMA system, and delegate authority to Ministry of Fisheries to put a hold on new applications and to change regional coastal plans to manage aquaculture development where 'change is of national or regional significance'.[184] There would also be changes made to the Tasman and Waikato plans to support the production of new species.[185] Other goals of the reforms are to expedite the

[178] A. Buchanan, Thompson, M., MacRae, J., & Fuller, P. *New Zealand Environment update*. *MONDAQ* (2010) available at http://www.mondaq.com/australia/article.asp?articleid=117644&email_access=on

[179] Id.

[180] Banta and Gibbs, 2009, op cit.

[181] Rennie, 2009, op cit.

[182] TECHNICAL ADVISORY GROUP. RESTARTING AQUACULTURE: REPORT OF THE AQUACULTURE TECHNICAL ADVISORY GROUP. MINISTRY OF FISHERIES (2009).

[183] J. Hassan, *New Zealand: Muscle beyond mussels - new Aquaculture Bill has long reach*. MONDAQ (2010).

[184] MINISTRY OF FISHERIES. INFORMATION SHEET 2. AQUACULTURE LEGISLATION AMENDMENT BILL (NO 3) - PLANNING AND CONSENTING. AQUACULTURE UNIT (2010).

[185] Id.

resource consent process, reduce application costs, promote investment, and enable integrated decision-making.[186] There are other goals of these reforms, including but not limited to:

- removing the spatial planning approach requirement for councils to create aquaculture management areas (AMAs) from RMA Amendment Act (No. 2) 2004
- an attempt to increase certainty of investment for farmers by introducing a default minimum 20-year term for aquaculture resource consents and extending the maximum term length to 35 years
- using economic instruments to help process consent applications, such as by tendering and review of 'first in, first served' process
- addressing use-conflict by linking the resource consent process to the Fisheries Act 1996 requirement for undue adverse effects on fishing test.

These reforms are based, in part, on the TAG recommendations. Additionally, at the time of the writing of this report the Aquaculture Unit under MAF is drafting a National Action Plan and Strategy for aquaculture, which is to be consistent with *Fisheries 2030* and the industry strategy for aquaculture.

Overall, a number of factors or drivers to aquaculture planning and policymaking interact with one another in several ways. The interactions between these interrelated factors and drivers have implications for future governance considerations. First, ecological considerations for aquaculture have been based thus far primarily on socio-economic benefits from the further development of the sector. As the industry increases in scale, cumulative effects to a wider range of marine resource users and ecosystems may result. From an ecosystem managerial point of view, it is important that the assessment of these cumulative effects be addressed during the initial phase of spatial allocation. Ecological factors will also influence the future success of a growing aquaculture industry. For those ecosystem goods and services for which there is economic incentive to maintain, foresight should be taken when promoting growth. The maintenance of the clean, green brand will dependent upon a healthy ecosystem. Because the market is demand-driven and export-oriented, as aquaculture grows foresight is necessary to maintain the goods and services aquaculture provides and those of other resource uses across sectors. The nature of spatial conflict in marine farming not only concerns the space occupied by aquaculture directly over the seabed, but it may contribute to the cumulative effects of resource use throughout the marine environment at diverse ecological scales. As noted earlier, water quality is influenced by activities on land (e.g., agriculture, forestry and other land uses) and can impact marine resource use and the maintenance of ecosystem services. This is an interaction that needs to be better understood and that should be the basis for a more integrative approach to marine governance.

3.6 The Role of Science, Scientists, and Values

Evidence-based science is one goal of marine planning and decision-making in New Zealand, but science does not take place in a political vacuum. Sir Peter Gluckman, the Chief Science Advisor to the Prime Minister, notes:

> It is important to separate as far as possible the role of expert knowledge generation and evaluation from the role of those charged with policy formation. Equally, it is important to distinguish clearly between the application of scientific advice for

[186] Id.

> policy formation ('science for policy') and the formation of policy for the operation of the Crown's science and innovation system, including funding allocation ('policy for science') ... A purely technocratic model of policy formation is not appropriate in that knowledge is not, and cannot be, the sole determinant of how policy is developed. We live in a democracy, and governments have the responsibility to integrate ... societal values, public opinion, affordability and diplomatic considerations while accommodating political processes.[187]

Maintaining the objectivity of science so that scientists can inform policy decisions in diverse socio-ecological settings is one goal of evidence-based decision-making and planning. As the Chief Science Advisor recommends, the utilization of science for decision-making should be based on the unbiased advice 'free from conflicts of interest, provided apolitically and independent of any particular end-user perspective'.[188] Gluckman also states that it is necessary to have an 'acceptance of the notion that science is a process that establishes the incontrovertible and absolute fact'.[189]

Scholars describe the use of biophysical and social sciences (and scientists) as a fundamental part of political processes.[190] However, it may be difficult to maintain objectivity from the scientific community in a charged political context that includes contending beliefs, value-based differences and competing worldviews – as is often the case over the allocation of marine resource use and marine life protection in heterogeneous society. Scientific information, including the importance of traditional ecological knowledge, can inform the policymaking process. But there is no guarantee that additional scientific information and a strengthening of knowledge about specific ecosystems and human activities can resolve conflicts. There may be differences between the methods used by diverse members of scientific communities, and how they interpret results from their studies. Scientific information may, in some circumstance, encourage value-based conflicts as exemplified by conflicting claims over the role of human beings in relation to changes in the climate. For example, an earth scientist analyzes global climate change through the lens of geologic time. Atmospheric scientists take many detailed measurements of the present-day climate and believe that such measurements are the key to predicting climatic change. Both approaches are valid. However, the results of the two models may yield different conclusions and advocates of each approach may disagree with each other.

The translation of scientific knowledge into accurate and serviceable form for policy, management or education purposes is often influenced by the values held by members of resource agencies, user groups, and the public. The lag between advances in science and integration of these advances into decision-making occurs for several reasons. Science does not always answer the questions that matter to user groups because the research community may not understand such needs or recognize them as priorities. Understanding and appreciating the significance of ecological functions is generally low among the general

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[187] SIR PETER GLUCKMAN, TOWARDS BETTER USE OF EVIDENCE IN POLICY FORMATION: A DISCUSSION PAPER (Office of the Prime Minister's Science Advisory Committee, 2011) available at http://www.closingthegap.org.nz/wp-content/uploads/2011/07/Gluckman-evidence-based-policy-disc.-paper20112.pdf.

[188] Id., p. 14.

[189] Id., p.7.

[190] K.S. SHRADER-FRECHETTE AND E.D. MCCOY. METHOD IN ECOLOGY: STRATEGIES FOR CONSERVATION (1993).

public and decision makers. Policymakers may not view science as relevant; therefore, scientists do not always have a seat at the table in contexts in which they could make fundamental contributions.

With respect to marine governance, scholars know that planning is a social enterprise that involves an intermingling of diverse perceptions, interests, beliefs, values and science.[191] Ocean management is complicated by the need to make decisions based on limited information. As a result, ocean managers often make decisions based on values and interests.

Scientific studies are not generally seen as persuasive communications, but in practice they are. Scientists and their studies make factual claims and sometimes offer policy recommendations. In the field of ecology scientists also make value-based judgments.[192] Scientific claims and recommendations may be disputed by other scientists or by non-scientists who participate in the marine planning processes. Both the scientists and their critics are attempting to persuade the decision makers to believe their version of the facts and accept their recommendations. Researchers have learned a great deal about persuasion. Of particular relevance here are studies of the influence of values and prior beliefs on acceptance of persuasive communications. Political scientists studying persuasion have found a strong tendency among people to accept persuasive messages that are consistent with their ideologies and values, and to reject messages that are inconsistent.[193] Research investigating the influence of prior knowledge and beliefs finds that prior beliefs (e.g., that recent declines in fish populations are natural fluctuations) have a substantial influence on message acceptance.[194] People will be more likely to accept scientific recommendations and trust scientists when the scientific recommendations are consistent with their values and core beliefs.

So scientists cannot expect that their research findings will be accepted without challenge in the political process. Trust in scientists and acceptance of scientific information and recommendations are often based on vested interests. People's deep core beliefs influence the decisions they make and the coalitions they join. Like other aspects of a conflict, the scientific and technical aspects of disputes over issues such as access to marine resources, the legal right to use a resource, or the protection of a 'public good' are embedded in a political context. Inevitably, value choices are at play. These underlying values are the ultimate arbiters of political decision-making, even when a plethora of scientific information and facts are available. Substituting scientific and technical information does not void the making of value choices or the conflicts that may exist between competing interests. Rather, it more fully informs the value choices that need to be made by creating data-driven points of reference.

Conflicts over the use and protection of marine areas are also rarely caused by scientific or technical information *per se*. More often, they tend to be about perceived or actual competition over interests; different criteria for evaluating ideas or behaviours; differing

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[191] R.W. Knecht and B. Cicin-Sain. *Perceptions of the Performance of State Coastal Zone Management Programmes in the United States*. *II*. *Regional and State Comparisons*. 25 COASTAL MANAGEMENT 325 (1997).

[192] Shrader-Frechette and McCoy. Op cit.

[193] R.M. ALVAREZ AND J. BREHM. HARD CHOICES, EASY ANSWERS (2002).

[194] R.J. MacCoun and S. Paletz. *Citizens' Perceptions of Ideological Bias in Research on Public Policy Controversies*. 30 POLITICAL PSYCHOLOGY 43 (2009).

goals, values, and way of life; misinformation, lack of information, and differing ways of interpreting or assessing data; and/or unequal control, power, and authority to distribute or enjoy resources.[195] Stakeholders and resource managers often use scientific and technological issues as a strategic or tactical weapon. Accordingly, collaborative approaches to marine planning and decision-making require a search for jointly usable information, which, in turn, requires an integrative inquiry.

With this in mind, this section includes a review of materials from interviews of a range of participants and stakeholders, including scientists, in aquaculture policy. Interview questions were open-ended and allowed for prompting to elicit more richness on a particular issue or area of expertise. While the interviews were not limited by region, participants tended to cluster in areas where aquaculture activity takes place (i.e., Marlborough, Tasman, Waikato and Northland) and in Wellington. Interviews took place in Wellington from June-August 2011 in person and by phone, and in Nelson from 25 July – 4 August 2011 in person. Potential interviewees were identified through the policy and academic literature, web searches, and from suggestions from interviewees. Interviewees were all stakeholders in aquaculture development that use science or are involved with spatial conflict deliberation, including as national and regional policymakers, scientists, marine advocates, investors, iwi, local residents and stakeholders involved with aquaculture development.[196]

This section describes the general findings from the interview data. Overall, interviewees perceive science for aquaculture to be oriented towards three inter-related epistemologies: commercial applications, civic concerns, and the diverse Māori worldviews. These epistemologies reflect competing values about the role of science and scientists in aquaculture policymaking. With respect to the incentives for science provision, two chief points made by interviewees are (i) that there are few incentives for a civic-oriented science (despite calls for one) and (ii) that it is difficult to integrate kaupapa Māori into the current framework. These results are significant because they show that spatial conflict cannot be viewed purely in terms of scientific measurements of effects alone – conflict must be contextualised within diverse socio-ecological settings that include value-based differences about the role of science and scientists in planning and decision-making.

Commercialised (or client-based) science. A majority of the scientists, policy makers and planners described commercialised science to be the dominant approach for aquaculture science. The science sector is seen to operate like any other sector, responsible for its own financial viability. Science used to enhance production is termed 'applied' science. Other

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[195] Peter S. Adler, *Science, Politics, and Problem Solving: Principles and Practices for the Resolution of Environmental Disputes in the Midst of Advancing Technology, Uncertain or Changing Science, and Volatile Public Perceptions,* 10 PENN STATE ENV. LAW REVIEW 323 (2012).

[196] Ethics approval was granted by the Victoria University Human Ethics Committee on 18 April 2011. Participants in the study were guaranteed confidentiality. Responses to the interview questions are indicated in the text by numerical value and bracketed. Responses were vetted by interviewed participants. Information gained from these interviews were transcribed in full. The first stage of coding categorised data into end-use categories for science. Patterns were sought from these categories as to how they linked to values. Data were then analysed using content analysis to identify patterns and relationships of meaning. Internal validity of statements was sought through triangulation of primary data with other sources and convergence between interview responses (where applicable). Once the data were coded, the statements were corroborated against each other to a point where sufficient generalisation could be made; otherwise, it was noted that the opinion may have been unique. An effort was made to portray the degree of agreement or disagreement among respondents on a particular issue.

examples of its use are to understand baseline biological and physical conditions for siting a farm and aspects of marine farming. For spatial allocation, marine farmers hire contract research organisations to perform the AEE, expert witnesses are provided by developers to Environment Court, and science agencies are contracted to undertake monitoring and evaluation. Several scientists within the contract research organisations recounted that science is a cornerstone for growth of the aquaculture sector as a whole. Growth is achieved through product research, education, and best practice. These respondents (identified below by numbers in parentheses) explained that applied or practical science[197] is produced by following the commercialised approach, and a great deal of time was spent in interviews to distinguish applied science from 'pure' science. Applied science for NZ marine farming is characterised by well-defined questions (1) aimed at up-scaling research (20) to make it commercially viable (14). Scientific investigation originates directly from an industry question or demand (35). In commercial applications the emphasis is on valuation of science, and some respondents were clear that applied science for aquaculture should have a monetary value (22). This is evident in the following quotes on the benefits that science is perceived to bring. These quotes explain that capacity is enhanced through public good science for industry, which is scientific information that can be shared by firms and is aimed at adding value to the sector:

> The way I see public good research is about building capability, capacity in NZ, whatever the area in NZ. You've got that knowledge and that capacity, and people are able to then do the specific projects that companies want done. (43)

It is necessary to clarify what is meant by 'public good' as part of this dialogue:

> The public good, really in this context means export earnings. That just sort of goes away to 'happy economy, happy people'... It's all a bit unclear with the transition from the Foundation to the MSI and they still don't know what their guiding principles are. But if you look at the people in there, then you know that dollars is paramount. (40)

> I work on fisheries and aquaculture species because I know I stand more chance of attracting money to work on those species to sequence [a] whole genome than I will in any other species. So I am in this area because I want to address some basic science questions, and this is the best way I know to do that. (2)

This type of client-based science is one primary form of scientific investigation taking place in New Zealand. The majority of interviewees were comfortable with the commercialised system. However several were critical and noted things that the commercialised model does not do with respect to baseline knowledge gathering. Because the majority of science funding supports applied science for innovation, an ecologist explained that there is a lack of funding for research projects with non-commercial applications:

> A lot of what I'm doing is commercially oriented, but there is not the ability to study basic ecology of individual critters to great detail. You just don't have the time and the money to spend… That hasn't been put together, partly because it is expensive, and partly because there hasn't been a real commercial need for it. It would be really nice to do. (39)

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[197] These terms were used interchangeably by interviewees, but for consistency 'applied science' is used exclusively.

The source of funding matters for science. It can also influence the perceived 'objectivity' of the science by diverse interests and members of the public. The thinking behind commercialized science goes beyond the sole aim of maximising the *profits* from science; it can also guide the decision-making process for allocating scarce resources, the level of public trust in the science, and the role of scientists in planning and decision-making. Decision-makers attempt to maximise the *outcomes of research* funding by comparing research portfolios and allocating among competing projects. A very important point here is how the commercialised epistemology supports economic development; the privatization of scientific investigation may serve the needs of industry. In serving the needs of private interests, a number of fundamental obstacles to linking scientists to public decision-making and planning may emerge, including the lack of

- information sharing
- publically accessible information
- incentives for scientists to participate in public planning processes
- interdisciplinary partnerships to address complex socio-ecological issues and concerns.

Civic science. Since the early 1990s, the need for a more 'public' and responsible science has been emphasized in a number of coastal and marine planning processes.[198] Civic science is one important facet in the development of a new era of adaptive marine planning and decision-making that includes the use of collaborative and community-based decision-making processes.[199] Civic science, according to Kai Lee is 'irreducibly public in the way responsibilities are exercised, intrinsically technical, and open to learning from errors and profiting from success.'[200] The outcomes of good civic science, Lee argues, should be environmental decisions that are at least as good, if not better, than what would happen otherwise in terms of their conceptual soundness, equity, technical efficiency, and practicability.

A minority group of interviewees in this sample remarked that there is a need for science that is focused on social and ecological improvements that can serve the public good. One scientist described the need to focus on 'real questions and real problems' with respect to catchment planning:

> One of the ways that we've found the best approaches [is] to look at conflict because with the Motueka ICM programme we had a strong social component, and the idea was to provide a framework that all stakeholders could be involved…. And the most important, to me, was getting the marine stakeholders involved, because previously, they pretty much hadn't. They were just accepting what came down the pipe… We

[198] K.N. LEE, COMPASS AND GYROSCOPE (1993). Kai Lee develops the concept of civic science to describe the important role scientists can play in large-scale ecosystem planning. Lee was also one of the academic pioneers in the development of a theory and practice of adaptive planning, and argues that the link between ecology, economics, and community is in part based on the cultivation of civic-minded scientists who are provided with the incentives to participate in public policymaking. With respect to coastal and marine planning, see, for instance, M.V. McGinnis and C.E. McGinnis, *Adapting to Climate Impacts in California: The Importance of Civic Science in Local Coastal Planning*, 39 COASTAL MANAGEMENT 225 (2011).

[199] With respect to the role of civic-minded marine scientists in marine conservation planning, see: M.V. McGinnis, *Learning from California's Experience in Marine Life Protection*, 26 COASTAL AND MARINE PLANNING AND MANAGEMENT (2012) In Press.

[200] Lee, Compass and Gyroscope, page 161.

> extended the area of the catchment to include the marine river plume, the region of the river plume, so we could put that on the table and marine stakeholders, like fisheries and like aquaculture people, could say yes we are in an area that is affected by farming, or domestic sewage inputs, industrial waste, urban growth, residential areas... It was really important, and to do it in a non-threatening way, so it didn't end up being a "them-and-us" situation, which it had been previously when the problem developed. There was no input [from them] prior to that development. (48)

One coastal planner explained that science for spatial allocation should be about understanding the relationships between different parts of the community and the environment through science:

> The scientists can range from people going out to looking at the benthos and coastal processes to dealing with communities and the communities' experiences and views on things. If you are taking a broad view ... it's a pretty constant process. It's about going out the community and getting their views on things ... that the community's views are included in that way of incorporating science [into planning]. (9)

Some statements like the one below included the values of civic science that play a role in addressing non-consumptive issues:

> There's been a real disconnect between the government and the stakeholders and the institutes to actually develop science and skills that are needed to fill the gaps. I don't think the science funding is based around 'what don't we know and what do we need to know.' It's been driven by other motives. (3)

Proponents of civic science advocate for a strong relationship between science and policy development. This necessitates cooperation between scientists and stakeholders. One interviewee would like to see science in service to the social good:

> There's been a lack of marine scientists involved in looking at the environmental issues… I have now over the many years realised that science is recognised as a tool which unfortunately or fortunately we have to use in our society... We have now ended up in a position where the public good science is not being done. This is the trouble with science. Science focuses on the *subject* … So it's not that I'm deadly against aquaculture; I'm deadly against science that focuses on leveraging benefits for the industry rather than science that's looking at the litter base under it. (21)

The term 'public good' in this context is interpreted differently from the above usage linked to economic benefits. This interviewee calls for science that seeks social and environmental improvements, as part of a broader orientation towards democratization, public dialogue, and interpretation. Likewise, one advocate expressed concern that monitoring efforts and impact studies in aquaculture are too small-scale to understand larger ecosystem effects. One interviewee noted the need for a 'deeper' science to increase confidence about the ecological effects of aquaculture. (28)

One key catalyst in the cultivation of a civic-minded science is the creation of the necessary resources and incentive structures that can lead to participation by diverse members of the scientific community in public planning processes. Overall, many scientists fear public involvement in political processes over contentious issues, such as the protection of marine areas, because of their need to maintain objectivity and credibility. The fact is that science may reveal unfavourable information that may threaten economic values and interests, and

without the necessary incentives there is very little reason for scientists to participate in politically contentious policy disputes.

Māori epistemologies. Some members of the sector operate within different cultural worldviews, such as with kaupapa Māori epistemology. There is neither one Māori voice nor one Māori approach to aquaculture. One aspect of the iwi epistemology is Mātaranga Māori (including language, traditional environmental knowledge, traditional knowledge of cultural practice, fishing and cultivation). The following quotes illustrate the under-representation of the Māori worldview(s) in the system for aquaculture science:

> Māori have a whole tradition that is not based in western science, but it is equally valid. That is something scientists easily forget. Science as a philosophy is really new, 4–500 years old! In terms of a system for understanding our environment and our world, it's very, very new. It's very important, but it's not unique or the only means by which we can comprehend the natural environment. The Māori system is called Mātaranga Māori. And it describes things in terms of relationships to each other. It doesn't differentiate relationships from human relationships and relationships between non-humans. (5)

This worldview reflects relationships with the environment where resources are both utilised and responsibly upheld for their maintenance. Some iwi are engaging in aquaculture as a livelihood, employing knowledge of the environment garnered through kaitiakitanga:

> Kaitiakitanga is the local version of more internationally recognised traditional environmental knowledge. It operates locally within communities, within specific environments. It has to do with two things. One is maintenance and sustainability of the resource, but also it is utilisation… It is the underpinning of Māori environmental management. (27)

A Māori worldview also relates to the inherent values of the sea:

> The primary objectives for [Māori who invest in] aquaculture are social and economic. That is within ... the exercise of the framework of kaitiakitanga, which is an appreciation for the interlinked nature of life and non-life. It accords closely to ecology. Ecological principles can be found within the Māori framework, which is known as Mātaranga Māori. (5)

> I suppose it's difficult to get into these sorts of esoteric discussions with you, but in Māori, if you go into an area of the sea, that is the domain of the Atua Tangaroa (god of the sea). Tangaroa is assigned the duty to make decisions on what, where and how things happen in the sea. Tangaroa knew where to place scallops, mussels or shell fish. Human kind comes, makes all these mistakes, tries to do science about it. Science is so singularly focused on the content of what they are doing that they are not taking a holistic approach. (21)

One respondent described the challenges of uniting Māori and western epistemologies for science in policy:

> If there is a different epistemological knowledge system for kaitiakitanga from mainstream environmental science, which there could very well be, and there are certainly operationally very big differences… You end up thinking you are making sense, and you end up talking to yourself. It's that colonisation of the information again. You say things from a kaitiaki perspective but they are heard in terms of a

> mainstream perspective. So you've got to spend a lot of time and a big effort to retain the essence of kaitaikatanga and articulate it in that other world. (27)

Overall, the challenge of utilising diverse epistemologies, values and forms of knowledge in marine planning and decision-making represents a challenge of integration. While integration across management sectors and marine activities is desirable, the greater challenge may be the need to integrate across diverse value orientations to sustain the use and protect the marine life that diverse peoples depend on. As one participant in the study noted:

> The heart of what is the issue around aquaculture development is that spatial conflict. Also, there are a whole range of players in there and science information is really relevant in terms of assessing conservation values of the areas and impact on ecosystems and so on. Also relevant is social science information in terms of impact on communities in terms of visual impacts and all those sorts of things, and the spatial conflict, arises on all those sorts of spectrums. Some of those we find easier to take account of than others.
>
> The reality of policy anywhere is that a lot of the time it is driven by politics rather than facts. I guess if you're making decisions which are in relation to managing natural resources, if you can hook that into an understanding of the facts, then you can strengthen the understanding of the science and outcomes.
>
> Conflicts will be used in any way possible, depending on what the competing interests are... So it is sometimes alarming how pretty much the same information can be used for different arguments... Science information, like any information, is dependent on whose side of the bench you are talking to... It's really about the competing uses of the same area or the lack of use of that area… that is what the conflict is about. The science is just a tool to whack other arguments with, quite frankly. The science itself doesn't do a lot. It just sits there. People *use* it for or against doing something to an area.
>
> So science can be manipulated, and that's an unfortunate circumstance. Science gives itself to the adversarial nature of our consent process. Two sciences provide competing views, and the judge tries to sort out which one is more believable. So in that sense, the reductionist approach supports that kind of adversarial nature.
>
> The reality is that it's things like landscape, navigation, amenity, that tend to derail things... And the ecology is a means to an end. It's another rock to throw, another lever or obstacle.

The conflicts over the use of the marine environment for aquaculture and the tensions between diverse epistemologies of science (and the role of scientists in planning and decision-making) in aquaculture have parallels with other issues and concerns over the use and protection of New Zealand's EEZ. This case study calls into question the 'tradeoffs' framework for marine governance, which frames resource allocation debate in terms of the exchanges between economic and ecological values or between diverse epistemologies and worldviews. This way of framing marine governance creates a political contest between would be 'losers' and 'winners' in marine planning and decision-making. The result may not be an equitable allocation of marine space across sectors or the values carried by marine ecosystems. A trade-off between ecological values, for instance, and an economic interest for resource development may threaten an ecosystem service. In this sense, an approach to balancing competing interests may be a planning decision that contributed both to the loss of

essential service and an economic use. A more holistic approach to resource use, access, and marine life protection is warranted – one that can support a more integrative approach to the values of ecology, economy and equity.

Recommendation 3.3: That with respect to the use of scientific information and scientists in a more comprehensive, ecosystem-based approach to marine governance, the United Nations Environmental Program (UNEP) recommendations be adopted:

> Be careful that appraisals of available scientific information do not present excuses for not taking management measures.
> Utilize both natural and social sciences to generate the information needed to support management.
> Embrace uncertainty by making it apparent, but do not let it distract attention from the things that are known. Marine management should not be held to a higher standard of certainty.
> Ensure that the science used to support planning and management is defensible – i.e., relevant, credible, and legitimate.
> Be aware that the scientific input should not stop when management is implemented.
>
> Use science effectively and judiciously. Do not let science become an objective in itself, or allow technical expertise to displace participatory decision-making.[201]

3.7 Economics, Ecology, and Equity

The formidable task of comprehensive ocean governance with respect to New Zealand's EEZ and continental shelf is based on integrating at least three principles – ecology, economics and equity. The assumption here is that ocean governance is not only a question of 'balancing' competing or often conflicting interests, but rather a question of 'integrating' the values of ecological, economic, and equitable development.

First, working in the biological template of an ecosystem almost always requires acting across political and administrative boundaries. A bioregion reflects the physical scale of, for example, a catchment or a marine ecosystem such as an oceanographic province. Few political and administrative boundaries reflect the scale of bioregions. Second, because of the multiple values that are associated with the coastal and marine environment, there are many stakeholders, interests, and user groups. Consider those who are always present: governments and consumptive users of the sea. In addition, there are activists and would-be investors from outside. These groups have conflicting goals. The art of the ocean governance under these conditions is to reconcile conflicting objectives, at least temporarily, so as to make agreements on use and other protective actions that may be needed. Third, there are the challenges of adaptive management and institutional learning. Ultimately, governing large marine areas requires the institutional capacity to address issues across sectors, and to adapt to new information in a political context that is often contentious.

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[201] UNEP, ECOSYSTEM-BASED MANAGEMENT: MARKERS FOR ASSESSING PROGRESS (2006).

Recommendation 3.4: That the protection of ecosystem services be recognised as the foundation to a 'green' economy. An ecosystem-based approach should be adopted insofar as it has been shown to be an important part of promoting a more sustainable approach to marine resource use.

UNEP Recommendations: Linking Green Economic Development and Ecosystem-based Management

A UNEP report entitled *Restoring the Natural Foundation to Sustain a Green Economy* offers a number of recommendations that support an ecosystem-based approach to 'green' economic development, including the following major points:

1. *Natural ecosystems provide the life-support systems for humans, and the natural foundation for a sustainable green economy, yet their health is under increasing threat.*

- Cutting-edge science has proven that ecosystems provide the essential 'life support systems' we all depend on.
- Recent economic analysis of ecosystems revealed that ecosystems provide the natural capital and lay the foundation for the development of a Green Economy.
- There is mounting evidence that many ecosystems are in various states of degradation and face unprecedented pressures from unsustainable exploitation, unplanned or poorly planned development, invasive species, climate change and population growth. This will not only jeopardize economic development, but also impose increasing threats to the survival of human beings, with the poor being most vulnerable.

2. *The Ecosystem Management Approach plays a critical role in addressing substantial challenges of Green Economy development, including promoting the sustainable use of natural capital and providing cost-effective environmentally-friendly approaches.*

- As an integral part of Green Economy development, Ecosystem Management is essential to ensure a sustainable flow of ecosystem goods and services, while also maintaining healthy and fully functional ecosystems.
- It is critical to ensure that Ecosystem Management meets the needs of the poor, especially those in developing countries who are highly dependent on ecosystem goods and services and are most vulnerable to ecosystem degradation.
- Ecosystem Management can help retain the balance between economic growth, societal development and ecosystem health to ensure long-term sustainability.

3. *There are already scientific, economic and political means and emerging champions in promoting the role of Ecosystem Management Approach in the Green Economy development, yet they need to be institutionalized and supported.*

- Methods and tools for assessment, valuation of, and payment for ecosystem services have been developed to help improve the current economic model.
- In the transition to a Green Economy, policymakers should ensure that the full range of goods and services provided by ecosystems, including those which are currently non-monetised, are fully integrated in decision making and public policy.
- New systems of global public goods governance and new institutional structures will be required to link ecosystem services with a Green Economy, because the generation of, and benefits derived from, ecosystem services frequently crosses political and geographic borders.

• Many market mechanisms have been piloted which would engage the private sector and harness market forces.

4. *Green Economy development will help improve ecosystem health and sustain its functionality.*

• Placing a value on ecosystem services through mechanisms that facilitate investment in ecosystems will at the same time benefit local people and the private sector who are rewarded for good environmental stewardship.

• Developing a Green Economy within ecosystem capacity can be planned by better understanding of the science of ecosystems.

5. *Challenges and opportunities in applying Ecosystem Management Approach in the Green Economy development remain.*

• Ecosystem services are not valued within the current economic model.

• Current governance and institutional structures have been inadequate in preventing the decline in ecosystem health.

• There is a need for urgency: the rate of developing solutions is far too slow to keep up with the rate of degradation.

• Equity recognises need for a balanced sharing of benefits among different groups of stakeholders and, especially, among generations.

6. *Ecosystem Management is both a local task and one determined by higher level decisions and policies and legal frameworks. There must be concerted coordination of top-down and bottom-up approaches.*

7. *The interactions between Ecosystem Management and Green Economy development are multi-faceted and mutually supportive, which provides the basis for enhanced synergies in pursuing global sustainability.*[202]

The perceived benefits and costs of a more integrative, ecosystem-based approach to address the synergistic impacts of human use of marine resources is the subject of the next section. The scientific literature describes an existing range of marine planning tools and ecosystem-based approaches while the use of tools in the international community range from the adoption of marine zoning strategies, marine spatial planning, integrated coastal management, and to marine protected area designation.[203]

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[202] UNEP, RESTORING THE NATURAL FOUNDATION TO SUSTAIN A GREEN ECONOMY: A CENTURY LONG JOURNEY FOR ECOSYSTEM MANAGEMENT (International ecosystem management partnership [IEMP], 2011).

[203] During the last five years, there has been a burgeoning academic and scientific literature on the benefits of an integrative, ecosystem-based approach to marine management and planning. A sample of articles and books on this subject are: K. MCLEOD AND H. LESLIE. ECOSYSTEM-BASED MANAGEMENT FOR THE OCEANS (2009); M.M. Foley et al., *Guiding ecological principles for marine spatial planning*, 34 MAR. POL. 955 (2010); C. EHLER AND F. DOUVERE, VISIONS FOR A SEA CHANGE, REPORT OF THE FIRST INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION AND MAN AND THE BIOSPHERE PROGRAMME, IOC MANUAL AND GUIDES, THE BIOSPHERE no. 48, IOCAM Dossier no. 4, 12 (UNESCO 2007); K. St. Martin and M. Hall-Arber, *The missing layer: geotechnologies, communities, and implications for marine spatial planning*, 32 MARINE POLICY 779 (2008); Larry Crowder and Elliott Norse, *Essential ecological insights for marine ecosystem-based management and marine spatial planning*, 32 MARINE POLICY 772 (2008); B.S. Halpern et al., *Placing marine protected areas onto the ecosystem-based*

International best practice has shown that the following institutional characteristics can contribute to successful integrative, marine ecosystem-based planning and decision making:

- clear regulatory authority and enabling legislation in support of integrated ecosystem-based planning
- the accountability of regulatory agencies and departments that are charged with coastal and marine governance
- the use of formal planning activities that integrate different forms of knowledge (scientific information, local knowledge and traditional ecological knowledge) into decision making
- the cultivation of decision-making processes that are legitimate and that do not favour one interest or value over another
- the use of adaptive planning strategies to learn from new information and data;
- the establishment of dependable and sufficient sources of funding for each stage of the planning and policy-making process including collaborative activities, monitoring, enforcement and evaluation
- the use of well-structured stakeholder-based public processes.[204]

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management seascape, 107 PNAS 18312 (2010); and, J. Lubchenco and L.E. Petes, *The Interconnected Biosphere: Science at the Ocean"s Tipping Points* 23 OCEANOGRAPHY 115 (2010).

For a comprehensive overview of the strengths and weaknesses of MSP in the US waters, see M. GOPNIK, INTEGRATED MARINE SPATIAL PLANNING IN U.S. WATERS: THE PATH FORWARD, A Paper prepared for the Marine Conservation Initiative of the Gordon and Betty Moore Foundation (2008) *available at* http://www.msp.noaa.gov/_pdf/Gopnik_MSP_in_US_Waters.pdf. Based on interviews with coastal and marine managers in the US, Gopnik shows that there are a number of concerns over the use of MSP. One particular concern Gopnik describes is that ―the environment will lose if it has to compete with users *at* 22. See also F. Douvere and C.N. Ehler, *New perspectives on sea use management: Initial findings from European experience with marine spatial planning*, 90 J. OF ENV. MGMT. 77 (2009) and UNESCO INITIATIVE ON MARINE SPATIAL PLANNING *available at* http://www.unesco-ioc-marinesp.be/msp_guide

[204] M. CALDWELL ET AL., KEY CONSIDERATIONS FOR ESTABLISHING A FRAMEWORK FOR EFFECTIVE MARINE SPATIAL PLANNING IN THE UNITED STATES. Submitted to the Interagency Ocean Policy Task Force (February 2010) *at* 3-4.

4. A STRATEGIC APPROACH TO ECOSYSTEM-BASED MARINE PLANNING

As New Zealand continues to encourage marine resource development – from offshore oil development to aquaculture – a concerted effort to strengthen and improve the marine governance framework in New Zealand to better reflect international best practice is needed. This report has noted that the socio-ecological context in New Zealand's EEZ and continental shelf is changing, as new areas have been leased for offshore oil and mineral exploration, and as marine areas for aquaculture or marine farming are expanded. Sections Two and Three have included a review of recent legislative developments and other marine activities that are likely to influence the future of marine policy in the country. Conflicts over marine resource use and biodiversity protection are likely to develop. As also noted, New Zealand lacks the institutional capacity and capability to address these types of conflicts and other challenges.

An opportunity exists today to forge a new era of marine policy in the country. Accordingly, the report has focused on the need for central government to support several principles of integrative, ecosystem-based marine management and planning. Section Two, for instance, emphasized the need for the formal adoption of such management principles as the public trust doctrine, the maintenance of ecosystem services, and the compatible use criterion in national marine policy. Section Three described the importance of integrating the values of ecology, economy and equity.

A number of recommendations are offered in this report. They include description of a range of policy tools and policy instruments that can strengthen and improve the country's marine governance framework. This final section offers a number of strategic elements that can contribute to future marine spatial planning (MSP), and briefly describes adaptive planning goals to address the multiple threats posed by climate disturbance on coastal and marine ecosystems. This section's focus is on a characterization of the strategic planning elements that support a more comprehensive, integrative, and adaptive approach to ecosystem-based planning and decision-making.

4.1 The Changing Socio-Ecological Context

Conflict between contending interests and multiple values associated with marine areas is shaped by two interdependent factors: the level of marine resource use, and the proximity and/or access of users to coastal marine areas. It is important to recognize that scale and the scope of conflict often shape the politics of marine planning and decision-making. The political outcome of conflict is often predicated on the conceptual level of the conflict between diverse participants in decision-making and planning situations. For example, the scope of conflict is shaped by different political contexts associated with marine life protection that includes user-user conflicts (e.g., commercial versus recreational fishing interests) and user-marine ecosystem conflicts (e.g., fishery interests versus interests for marine mammal protection). The larger the scale needed to sustain resource use and protect marine life, the more politically contentious the decision-making and planning process becomes. As the biophysical scale of the management concern expands, the political scope of conflict between values also expands.

Government's response to an expanding scope of conflict between diverse interests and values often includes an attempt to control the conflict by limiting the range of diverse voices, values, and interests in planning process. Governmental control of conflict can also

lead to support of a sector-based approach to marine planning and decision-making rather than the more difficult and potentially contentious multiple-sector approach to management and governance that includes more interests and values. There are three examples of institutional conflict management: government shifts the focus of decision-making from multiple species to single species (e.g., a shift from biodiversity considerations to fishery issues); government shifts the focus of multi-sector or multi-scale governance to single-sector or single-scale governance (e.g., a shift away from integrated, ecosystem-based planning to a resource-based mentality); government shifts the focus from multi-stakeholder decision making to client-based decision-making.

To date the existing marine governance framework in New Zealand emphasizes a traditional approach to resource management and planning. This marine governance framework contributes to a number of institutional challenges, such as:

- a spatial and temporal overlap of human activities and their objectives, causing conflicts (user–user and user–ecosystem conflicts)
- a lack of connection between the various authorities responsible for individual activities or the protection and management of the environment as a whole
- a lack of connection between offshore activities and resource use and onshore communities that are dependent on them
- a lack of protection of biologically and ecologically sensitive marine areas.

As government continues to encourage development of marine areas, the socio-ecological context will inevitably expand to include diverse interests and values. Value-based conflict between competing interests and government jurisdictions will expand and the scale and level of resource use exist. It will be difficult to resolve conflict over marine resource use and biodiversity protection without a more comprehensive and integrative approach to marine planning and decision-making.

Future marine policy in New Zealand will likely be based on how well the country resolves three general institutional issues and concerns. First, as Section One described, the existing marine governance framework in the country is highly fragmented and is based on a sector-by-sector approach to marine resource use. Second, New Zealand is not living up to its international obligations when it comes to marine resource management and biodiversity protection. New Zealand has not created marine reserves within the EEZ that can protect ecosystems from human impacts. The existing benthic protected areas do not protect marine areas from resource extraction, such as deep seabed mining. As the Parliamentary Commissioner for the Environment noted in 2011, 'It is over nine years since the First Reading of the Marine Reserves Bill. Given the growing pressure to exploit marine resources, this legislation [the Environmental Effects Bill] should be urgently advanced.'[205]

In managing the EEZ, the protection of marine life is required in international conventions and treaties**,** such as the UNCLOS. Every coastal state is granted jurisdiction for the protection and preservation of the marine environment of its EEZ. Coastal states have the obligation to control, prevent and reduce marine pollution from dumping, land-based sources or seabed activities subject to national jurisdiction, or from or through the atmosphere, among

[205] PARLIAMENTARY COMMISSIONER FOR THE ENVIRONMENT, EXCLUSIVE ECONOMIC ZONE AND CONTINENTAL SHELF (ENVIRONMENTAL EFFECTS) BILL (Submission to the Local Government and Environment Select Committee, December 2011), at 5.

other requirements. While New Zealand has access and right to use marine resources of the EEZ, this use is predicated on the protection of marine life in accordance to international obligations, as noted in Section One. The management of resource use and human impacts, including the need to develop adaptive strategies to address climate disturbance on coastal marine ecosystems associated with New Zealand, are fundamental issues facing the country. Under existing international treaties such as the UNCLOS each country must develop protective measures for marine life in the resource use of its EEZ. National policy that supports the value of marine biodiversity protection has not been fully developed for the EEZ, and the current marine reserve designations in New Zealand fall short of international agreements (as described in Section Two).

Third, the country remains far behind the curve in international best practice in marine policy and ecosystem-based programmatic development and planning. Marine policies should be based on internationally-recognized principles of management and planning. Adopting an ecosystem-based approach to marine governance can contribute to a more comprehensive and integrated approach to marine ecosystem protection and to integrated resource use across diverse management sectors. Policy innovation in the area of land-use and catchment planning are examples of New Zealand's capacity to lead the world in environmental management (as noted in Section Three). Yet, in marine governance of the EEZ, it has yet to embrace the principles of integrative management and associated planning tools that are being used across the world to better protect marine ecosystems and to resolve resource-based conflicts across sectors. With these primary concerns in mind, this final section describes a number of strategic elements and goals that can support the development of an ecosystem-based approach to marine governance.

4.2 The Need for a Proactive Approach

This report maintains that clear management principles in statutory language are needed to support the use of integrative planning tools. Statutory language needs to be developed that can clearly be seen to protect marine ecosystems and to integrate marine resource uses across sectors. Several Commonwealth countries and the USA have adopted bioregional, ecosystem-based marine zoning strategies that have included the use of MPAs and MSPs. New planning tools, such as SeaSketch, are available and should be used. These new planning technologies can assist in the assessment of the synergistic and cumulative effects of human impacts on coastal and marine areas, such as an Ocean Health Index, and ensure that marine uses and activities do not jeopardize the maintenance of ecosystem services and ecosystem integrity.

DOC's *BluePlan* is a positive step in the direction of marine ecosystem-based planning and should be supported insofar as the plan reflects the promise of international best practice.

The future planning effort for the Hauraki Gulf represents an ideal pilot project to develop an ecosystem-based approach to integrative planning and decision-making. It is important that as this planning effort develops further, steps should be taken to learn from the collaborative process. It is also important that adequate resources be made available for the Hauraki Gulf planning process so that state-of-the-art planning tools and evidence-based decision-making can be incorporated at each stage of the planning process.

Marine governance depends ultimately not only on the capacity and capability of institutions to address the synergistic impacts and pressures of multiple impacts and uses, but also on the

cultivation of a broad ocean constituency in the public realm that supports a more sustainable ecological approach to planning, decision-making and policymaking. This is where a hope for change resides. All inhabitants of Aotearoa arrived by boat or waka. The Māori have inhabited the Aotearoa for over 800 years. New Zealand's rich indigenous history in combination with maritime cultures of the country represents a foundation for the establishment of restored ocean constituency. Accordingly, translating the intrinsic principles and multiple values that are associated with marine ecosystems into a comprehensive and holistic governance framework should be an important part of future marine planning and decision-making in New Zealand.

Historically, the geography of hope that led to the migration across the wild ocean to New Zealand is a shared value that is part of the country's rich and diverse maritime heritage. Policy innovation is part of the history of New Zealand environmental governance. Risk-taking, experimentation and adaptation are required traits of island cultures. Today the wild ocean is reflected in the brand of *New Zealand 100% Pure* – a brand that kiwis embrace, and that is celebrated abroad. But as the spill of the Rena showed, it is a very vulnerable brand. Living up to the brand requires a renewed responsibility to live up to and adapt to the changing, life-giving blue planet.

4.3 International Best Practice

From the early 1930's to the late 1990's, the first wave of ecosystem-based planning included proposals, programmes, and plans that were developed at regional and national government levels in a number of countries.[206] This wave focused on terrestrial and aquatic ecosystems, such as the development of plans for major river systems and catchment basins or watersheds. In New Zealand catchment plans were developed during this first phase of ecosystem-based planning. New Zealand is considered to lead the development of land-use plans that support catchments across various regional areas of the country.

In the late 1980's, driven by a growing free-market ideology, inspired leadership, the widespread desire to shrink central government, and an overly complex and prescriptive regulatory system, New Zealand undertook a massive effort to rationalize its environment legal framework and local government structure.[207] An extensive stakeholder consultation effort led to an unprecedented alignment among business, government, and the public interest community in support of the reforms.

Under the government sector reforms, more than 800 governmental and quasi-governmental agencies were dismantled or reorganized. In their place, three primary central government agencies and 86 local government authorities (comprised of 12 regional councils based on watershed boundaries, and 74 territorial authorities called district or city councils) were established, which were collectively responsible for all aspects of environmental, natural resource, and land use planning and management. In addition, over 55 statutes and 19 sets of regulations were eliminated and replaced by the Resource Management Act 1991 (RMA or

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[206] For instance, with respect to the development of ecosystem-based planning in the USA, see R. Haeuber, *Setting the Environmental Policy Agenda: The Case of Ecosystem Management*, 36 N.R. J. 1 (1996).

[207] N.J. Ericksen, *New Zealand Water Planning and Management: Evolution or Revolution*. In INTEGRATED WATER MANAGEMENT: INTERNATIONAL EXPERIENCES AND PERSPECTIVES (Bruce Mitchell, ed., London: Belhaven Press, 1990).

Act), encompassing environment, natural resources, and land use beneath one umbrella for the purpose of promoting the 'sustainable management of natural and physical resources'. Sustainable management was defined in a way that addressed social, economic, and cultural considerations, meeting the needs of future generations, safeguarding the life-supporting capacity of natural resources and ecosystems, and avoiding, remedying, or mitigating the adverse environmental effects of human activities.

The RMA, in conjunction with local government reforms, was designed to create an 'effects-based' system in which environmental 'bottom lines' were established that could not be compromised. The system allowed government and the regulated community greater flexibility in achieving environmental outcomes as long as they operated above those bottom lines. The RMA also established a uniform system of planning and administrative processes, and set forth a strategic planning hierarchy requiring statutory policy and planning documents developed at the central, regional, and district/city government levels.

Major changes in land-use planning and watershed-based planning were key developments in the history of New Zealand's environmental policy. The literature and technical documentation on ecosystem-based planning during this first wave provided a set of generic principles to guide policy and program development. [208] For example, the use of participatory and collaborative decision-making strategies that include the use of the science and scientists are key factors that contributed to planning processes.[209] Similar policy innovation is needed for marine areas, and should be based on lessons learned from these earlier reforms.

During the 1990's, a second wave of enthusiasm and support for ecosystem-based planning emerged, and the scientific and intellectual basis of an ecosystem-based approach garnered support within resource agencies, the scientific community, and non-governmental organizations in many countries. [210]

With respect to the second wave, scholars have emphasized the need for a shift in administrative priorities that can support marine ecosystem-based planning and management (Figure 12).

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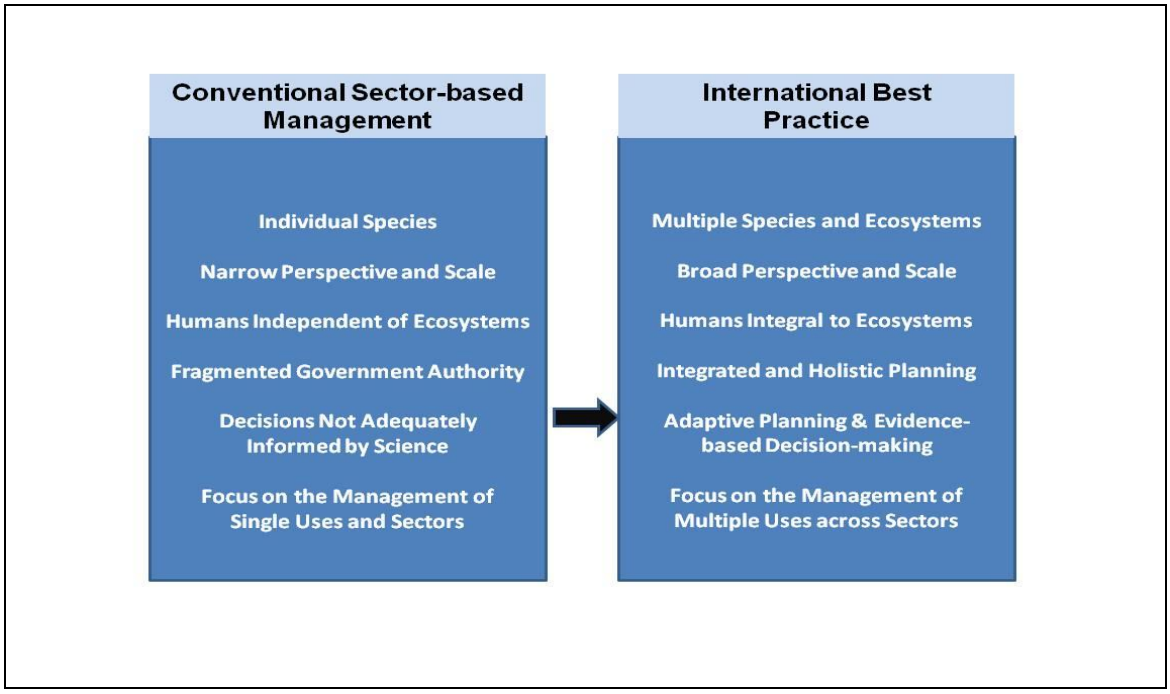
[208] R. Keiter, *NEPA and the Emerging Concept of Ecosystem Management on Public Lands*, 25 LAND AND WAT. L. REV. 23 (1990); R. Keiter, *Beyond the Boundary Line: Ecosystems and Law on the Public Domain*, 65 UNIVERSITY OF COLORADO LAW REVIEW 293 (1993); and K.S. SHRADER-FRECHETTE AND E.D. MCCOY, op cit.

[209] D.S. Slocombe, *Environmental Planning, Ecosystem science, and Ecosystem Approaches for Integrating Environment and Development,* 17 ENV. MGMT. 289 (1993); D.S. Slocombe, *Implementation of Ecosystem-based Management: Development of a Theory, Practice, and Research for Planning and Management a Region*, 43 BIOSCIENCE 612 (1990); R.E. Grumbine, *Protecting Biological Diversity Through a Greater Ecosystem Concept,* 10 NAT. AREAS 114 (1990.

[210] H. Cortner, *Intergovernmental Coordination in Ecosystem Management*. *In* ECOSYSTEM MANAGEMENT: STATUS AND POTENTIAL. SUMMARY OF WORKSHOP CONVENED BY THE CONGRESSIONAL RESEARCH SERVICE (1994).

Figure 12: Shift in Administrative Practice to Support Marine Ecosystem-based Planning



A third wave in the use of an ecosystem-based approach includes an emphasis in creating planning tools and policy instruments that support marine governance. To sustain marine ecosystems, for example, national and international organizations and governments are realigning marine governance frameworks to reflect the values of ecosystem 'health and integrity', collaborative stakeholder-based planning, evidence-based decision-making, adaptation, sustainability, and precaution. These values are the new pillars of marine ecosystem-based planning, and the examples of the types of principles that are shaping a new era of international best practice in the area of marine governance.

4.4 The Strengths and Weaknesses of Collaborative, Ecosystem-based Planning

Across the three waves of ecosystem-based planning, one common institutional characteristic is the use and adoption of collaborative approaches to decision-making and planning (CP).[211] CP is a prominent feature of New Zealand's *Blue Green Agenda*, and is therefore worth describing in further detail as it pertains to future marine policymaking, planning, and management. CP is not a panacea and may not fit all circumstances in marine policymaking. The CP process is often not easier or less-costly than more traditional administrative or judicial decision-making approaches. However, in many circumstances collaboration can enhance people's understanding, narrow the range of disagreements, build concurrence about necessary direction, and produce on-the- ground marine environmental improvements. There are four major uses of CP in marine resource planning and decision-making:

[211] J.M. WONDOLLECK AND S.L. YAFFEE, MAKING COLLABORATION WORK: LESSONS FROM INNOVATION IN NATURAL RESOURCE MANAGEMENT (2000).

- *Building understanding*: by fostering exchange of information and ideas among agencies, organizations, and the public and providing a mechanism for resolving uncertainty
- *Effective decision making*: by providing a mechanism for effective decision making through processes that focus on common problems and build support for decisions
- *Coordinating across boundaries*: by generating a means of getting necessary work done by coordinating cross-boundary activities, fostering joint management activities, and mobilizing an expanded set of resources
- *Capacity building***:** by developing the capacity of agencies, organizations, and communities to deal with the challenges of the future.

With CP, responsibility for preparing marine plans may be delegated directly to affected stakeholders who work together in face-to-face, interest-based negotiations to reach a consensus agreement. Advocates argue that collaborative planning is more likely to result in high quality agreements that are more stable, enduring, and more easily implemented then those created under traditional processes. They also argue that CP creates additional benefits such as improved skills, knowledge, and increased trust and cooperation among participants resulting in new ideas, new networks, and long-term partnerships. However, CP is not without its critics. The following are often included among their stronger criticisms, including the following.

- Critics suggest that consensus rules may encourage stakeholders to seek second best solutions, or the lowest common denominator, in order to achieve consensus. Difficult issues may be ignored, or subsumed in vague language, thus leading to recommendations that are neither precedent setting nor definitive enough to effectively guide implementation.
- CP is also criticized as being incapable of dealing with power imbalances among stakeholders. It is founded on the principle of stakeholders being motivated to negotiate with each other. In some cases more powerful stakeholders will avoid, or simply undermine, CP by using delaying tactics or by pursuing alternative means to achieve their objectives, if they do not like the outcome of collaboration. Critics also suggest that, even if more powerful stakeholders are motivated to negotiate, the asymmetrical distribution of resources such as time, money, information, and negotiation training can result in inequitable outcomes.
- Participation in collaborative processes also has an opportunity cost as it reduces civil society stakeholders' resources for participating in other activities to further their interests, such as political lobbying, legal challenges, and public education. Critics point out those mandating collaborative processes can disempower some participants by cutting off their use of other political options.
- Critics note that government agencies may abdicate their legal obligations and authority to nonelected stakeholders who may represent only a narrow spectrum of special interests in society. Unorganized interest groups and the general public may not have the capacity or the desire to participate in collaborative processes. As a result, planning responsibility is delegated to a select group of parties who may negotiate resolutions that meet their own narrow interests to the exclusion of the general public's wide array of concerns.
- Critics claim that CP has not been effective in reaching mutually satisfactory agreements in some environmental planning situations that involve fundamental

ideological and value differences. Conflicts based on value differences, such as disagreement over the use or protection of marine areas, may not be effectively resolved by CP.

- Another problem relates to the serious logistical challenges involved in collaborative processes. Organizing a large group of stakeholders to come together for a number of meetings can consume substantial financial and administrative resources. If the negotiations involve complex legal or scientific issues, further costs may arise as parties hire scientists, economists, and other experts to assist them. The challenges of organizing the process are compounded by planning agency cultures that are inimical to CP methods and reluctant to abdicate their decision-making power.

The use and adoption of CP in marine planning, decision-making and management faces a number of obstacles, including the following[212]: the lack of resources for collaborative planning processes which include time required by stakeholders to participate in the process, financial support, and personnel; participants' lack of understanding and ability for operating in collaborative planning approaches; mistrust among group members and negative group attitudes about one another; and, organizational cultural barriers to the use of CP.

Several international best practices can help CP overcome many of the obstacles listed above. Below is an integration of the various recommendations derived from the studies of best practices.[213] An effective CP process should: ensure inclusive representation; provide clear ground rules; reduce inequities among stakeholders; ensure process accountability; remain flexible and adaptive; provide sound process management; provide realistic timelines; provide implementation and monitoring processes; and, use multiple-objective evaluation. A number of strategic elements are recommended below to support the future use of CP as an approach to marine ecosystem-based planning and management:

1. *Purpose and Incentives: A process is driven by a shared purpose and provides incentives to participate in and to work towards consensus*. The process is driven by a purpose and goals that are practical and shared by the group. Parties believe that a consensus process, in contrast to traditional ones, offers the best opportunity for addressing the issues. To value a consensus process above all others requires an informed understanding of consensus processes and a realistic view of available alternatives. Participants share a sense of urgency with respect to settling the dispute and this urgency provides incentive to participate and reach agreement.

2. *Inclusive Representation: All parties with a significant interest in the issues and outcomes are involved throughout a process*. Representation includes: parties affected by, or who have an interest in, any agreement reached; those parties needed to successfully implement an agreement or who could undermine one if they are not involved in the process (particularly non-activist, nonaligned members of the public); and appropriate government authorities. Those members representing similar interests form a caucus or coalition in order to maintain a manageable number of participants in the process. There are clear provisions to add parties to the process as appropriate.

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[212] Ibid.

[213] R.D. Margerum, *Getting past yes: From capital creation to action*. 56 AMERICAN PLANNING ASSOCIATION JOURNAL 181 (1999); R.D. Margerum, *Collaborative planning: Building consensus and building a distinct model for practice*. 21 JOURNAL OF PLANNING EDUCATION AND RESEARCH 237 (2002).

3. Voluntary Participation: Affected or interested parties participate voluntarily and are committed to the process. All parties are supportive of the process and committed to invest the time and resources necessary to make it work. Participants remain free to pursue other avenues if the consensus process does not address their interests; the possible departure of any key participant presses all parties to ensure that the process fairly incorporates all interests.

4. Self-design: The parties involved work together to design a process to suit the individual needs of that process and its participants. A process is self-organizing, and allows participants to customize ground rules, objectives, tasks, working groups, and discussion topics to meet the circumstances and needs of the specific situation. All parties have an equal opportunity to participate in designing a process. An impartial person may suggest options for process design, but ultimate control over the mandate, agenda, and issues comes from participants themselves.

5. Clear Ground Rules: As a process is initiated, a comprehensive procedural framework is established including clear terms of reference and ground rules. Clear terms of reference and ground rules are to be established, including: scope and mandate; participant roles, responsibilities, and authority, including process management roles and responsibilities; code of conduct; definition of 'consensus'; a dispute settlement process; use of subgroups; clear media and public outreach policy; and a 'fallback mechanism'. It is important to allow for adaptation and flexibility.

6. Equal Opportunity and Resources: A process provides for equal and balanced opportunity for effective participation of all parties. All parties are able to participate effectively in a consensus process. This promotes an open, fair, and equitable process where power is balanced among participants and consideration is given to the provision of: training on consensus processes and negotiating skills; adequate and fair access to all relevant information and expertise; and resources for all participants to participate meaningfully.

7. Principled Negotiation and Respect: A process operates according to the conditions of principled negotiation, including mutual respect, trust, and understanding. Participants demonstrate acceptance of, understanding of, and respect for the legitimacy, diverse values, interests, and knowledge of the parties involved in the consensus process. Active, respectful dialogue provides the opportunity for all participants to better understand one another's diverse interests and knowledge, fosters trust and openness, and allows participants to move beyond bargaining over positions to explore their underlying interests and needs.

8. Accountability: The process and its participants are accountable to the broader public, to their constituents, and to the process itself. Participants are accountable to the process that they have agreed to establish. Participants representing groups or organizations maintain communication with, are empowered by, and speak effectively for the interests they represent. The public is kept informed on the development and outcome of the process, and mechanisms are in place to ensure that interests of the broader public are represented in a process and its final agreement.

9. Flexible, Adaptive, Creative: Flexibility is designed into the process to allow for adaptation and creativity in problem solving. The process is designed to be flexible. Feedback is continually incorporated into the process such that it can evolve as the parties become more familiar with the issues, the process, and each other, and to accommodate changing circumstances. The process addresses problems in new and different ways by

fostering an open, flexible, comprehensive, and integrated problem-solving environment that allows for creative thinking and adaptive management.

10. High-Quality Information: A process incorporates high-quality information into decision-making. The process provides participants with sufficient, appropriate, accurate, and timely information, along with the expertise and tools to incorporate it into decision making.

11. Time Limits: Realistic milestones and deadlines are established and managed throughout a process. Clear and reasonable time limits for work completion and results reporting are established. It is apparent to all that unless parties reach an agreement, someone else will impose a decision. Milestones are established throughout a process to focus and energize the parties, marshal key resources, and mark progress towards consensus. Milestones provide participants with positive feedback that the process is working. Sufficient flexibility, however, is necessary to embrace shifts or changes in timing.

12. Implementation and Monitoring: A process and final agreement include clear commitments to implementation and monitoring. A process fosters a sense of responsibility, ownership, and commitment to implement the outcome. A final agreement includes a commitment and plan for implementing the outcome of the process, including mechanisms to monitor implementation and deal with problems that may arise.

13. Effective Process Management: A process is coordinated and managed effectively and in a neutral manner. While participants themselves may perform process management duties, a neutral process staff is helpful in ensuring effective process management while minimizing participant burnout. A process is managed effectively by providing: a project/process plan and managing its execution; skilled coordination and communication; information management; appropriate meeting facilities; records of meetings, decisions, and action items; and support to ensure participants receive the resources required to participate effectively.

14. Independent Facilitation: A process uses an independent, trained facilitator throughout the process. A trained, independent facilitator acceptable to all parties is used throughout the process to assist the parties in reaching an agreement. The facilitator helps parties feel comfortable and respected, understand and communicate underlying interests, and balance power by ensuring equal opportunity for participants to voice their needs and concerns. The facilitator demonstrates neutrality on issues and with parties, communicative competence, general knowledge, and a basic understanding of the issues. In some instances there may be overlap between this criterion and the effective process management criterion depending on the specific approach taken in different processes and the roles of process managers, staff, and facilitators.

4.5 Marine Spatial Planning (MSP)

CP is recognized as an essential component to marine ecosystem-based planning. Marine ecosystem-based planning includes a range of programmatic developments, including: integrative marine policymaking, ocean zoning, large marine ecosystem (LME) programmes, integrative coastal zone management, and marine spatial planning (MSP). National ocean frameworks are being developed in France, USA, England, Canada, Vietnam, Japan, Australia, Brazil, China, Germany, Jamaica, the Russian Federation, the Netherlands, Norway, Portugal, India, Mexico, and the Philippines. CP is an important part of many of these national efforts.

The idea of marine ecosystem-based planning is generating a considerable amount of interest across the disciplines, and includes the use of new planning tools such as MSP, marine zoning strategies, and the designation of marine reserves.[214] As with terrestrial ecosystem-based planning, marine ecosystem-based planning is made more complicated by the fact that decisions are based on limited information. Marine ecosystem-based planning is also made more difficult in an era of climate change and the global use of marine resources. As a result, planning activities often reflect conflict between diverse beliefs, interests, and values.

The next section first introduces the planning tool of marine spatial planning or MSP as a method and technical tool that can support marine ecosystem-based management. The section's focus is to describe the strategic elements that can support the future development of MSP in New Zealand. MSP is a planning tool, not an approach to policy and management. Its use should be based on principles of marine policy. As with all tools, the use of MSP is based on the values, administrative priorities, interests, and political culture of the planners who use the tool. A second focus of this section is to describe planning and strategic elements that can improve and strengthen adaptive decision-making and management to address the threats to marine life posed by climate disturbance.

There is a burgeoning literature in support of MSP as a planning tool that can address intergovernmental fragmentation, and facilitate integrated strategic and holistic management across diverse sectors and uses of coastal marine areas.[215] MSP is characterized as a tool that can support integrative ecosystem-based planning.[216] But it is unclear whether MSP can move industrial society toward a more sustainable, ecological relationship with the more-than-human oceanic commons.[217]

The literature in support of MSP emphasizes the need for the use of collaborative processes involving scientists and stakeholders in all stages of decision-making.[218] MSP can also be used well in conjunction with MPAs and other planning tools. Given the historical

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[214] M.M. Foley et al., *Guiding ecological principles for marine spatial planning*, 34 MAR. POL. 955 (2010). The wave of interest in a coastal marine ecosystem-based planning includes the use of collaborative and participatory decision-making and the use of special advisory roles of scientific experts and stakeholder groups. Many of these efforts support a *place-based* approach to ecosystem planning insofar as the emphasize co-management efforts, community-based planning, and the role of local knowledge is decision-making.

[215] C. EHLER AND F. DOUVERE, VISIONS FOR A SEA CHANGE, REPORT OF THE FIRST INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION AND MAN AND THE BIOSPHERE PROGRAMME, IOC MANUAL AND GUIDES, THE BIOSPHERE no. 48, IOCAM Dossier no. 4, 12 (UNESCO 2007) and K. St. Martin and M. Hall-Arber, *The missing layer: geotechnologies, communities, and implications for marine spatial planning*, 32 MARINE POLICY 779 (2008)

[216] For a comprehensive overview of the strengths and weaknesses of MSP see M. GOPNIK, INTEGRATED MARINE SPATIAL PLANNING IN U.S. WATERS: THE PATH FORWARD (A Paper prepared for the Marine Conservation Initiative of the Gordon and Betty Moore Foundation, 2008) *available at* http://www.msp.noaa.gov/_pdf/Gopnik_MSP_in_US_Waters.pdf. Based on interviews with coastal and marine managers in the USA, Gopnik shows that there are a number of concerns over the use of MSP. One particular concern Gopnik describes is that 'the environment will lose if it has to compete with users' *at* 22. A similar sentiment is expressed in this report.

[217] MSP may represent a means by government to sell off the commons to private interests and other competing user interests (e.g., oil, mining, aquaculture, wind farm interests), and as potentially anti-conservation.

[218] B.D. Gold, *Marine Spatial Planning as a Framework for Sustainably Managing Large Marine Ecosystems*, in Sherman and Adams, *supra* note 4, *at* 224. Gold is the Program Director for Marine Conservation with The Gordon and Betty Moore Foundation, which is currently supporting the west coast marine spatial planning activities. Gold recommends that MSP for LMEs should be based on the following: effective monitoring and data sharing; comprehensive stakeholder involvement; coordination across political, economic and administrative boundaries; clear enabling legislation; and adaptive and integrative planning mechanisms in the face of scientific uncertainty, *at* 228.

development of the concept of ecosystem-based planning, the test for MSP is whether it can break from the resource-based mentality that does not live of up the promise of multi-sector and ecologically integrated governance:[219] it may become a planning tool that fosters unsustainable growth and further economic development of marine resources. It remains unclear whether MSP will require new regulatory controls at regional and national government levels that reduce the economic use of marine resources and curb the over-development of coastal ecosystems. For example, as a geospatial planning tool, MSP can identify resources in marine areas for economic development, such as deep sea bed minerals, ports, marine fishes, aquaculture, and offshore oil deposits among other industries. There is no guarantee that MSP will lead planners, user groups, government officials, and conservationists down the path of the scale of biodiversity preservation that is needed to protect and maintain ecosystem services.

International best practice in MSP and in the use of other integrative approaches to marine planning and decision reflects a major shift in administrative priorities. This shift can be understood as a general emphasis in multiple species, multi-sector, evidence-based approaches to marine planning and decision-making.

Key features of such integrative approaches to marine governance include the need for clear statutory language in support of an ecosystem-based approach to marine planning and decision-making; the use of collaborative approaches; an increasing reliance on science and scientists in planning and decision-making; and the role of private endowments and other funding sources to support ecosystem-based marine planning.

Several countries are currently developing a number of MSPs for marine areas in their EEZ. Commonly, the main strategies in these MSP efforts and activities include the following goals: to provide protection for important habitats and ecological processes; to separate conflicting human activities; to ensure use is compatible with the goal of marine life protection; to allow reasonable human use of marine areas; to allocate resource use across time and space; and to support public trust values, including traditional cultural values and customs.

The promise of an integrative, ecosystem-based approach to MSP is that human beings can cooperate to plan for the large-scale spatial complexity and variability of ecosystems, and resource managers can resolve the inevitable conflicts between social, economic and political interests that are often associated with marine spaces.[220] MSP can also support participatory and collaborative processes that can broaden the planning effort so that it is not limited to those who receive economic benefit from marine resource use.[221]

Despite advances in the development of new ocean planning tools, such as marine zoning, MSP, and MPAs, governments continue to prioritize resource development in coastal marine

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[219] J. Eagle, *Regional Ocean Governance: The Perils of Multiple-Use Management and the Promise of Agency Diversity*, 16 DUKE ENV. L. & POL. F. 143.

[220] C. EHLER AND F. DOUVERE, MARINE SPATIAL PLANNING: A STEP-BY-STEP APPROACH TOWARD ECOSYSTEM-BASED MANAGEMENT. INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION AND MAN AND THE BIOSPHERE PROGRAMME. UNESCO (2009). *See also* UNESCO INITIATIVE ON MARINE SPATIAL PLANNING *available at* http://www.unesco-ioc-marinesp.be/msp_guide

[221] F. Douvere and C.N. Ehler, *New perspectives on sea use management: Initial findings from European experience with marine spatial planning*, 90 J. OF ENV. MGMT. 77 (2009).

areas rather than the more difficult policy choice that limit or curbs the over-use of industrial-scale resource extraction from the sea. Ecological factors that are part of a well designed ocean health index (OHI) should also be used as a basis of developing and implementing a MSP. Ecological indices can provide sufficient weight to the values of coastal marine ecosystem services in MSP. In addition, MSP should include careful consideration of the cumulative impacts and synergistic pressures on ecosystems from human behaviour and use, so that important coastal marine areas are protected over time. Policy responses to address the cumulative impacts from human activities and climate change need to be developed and implemented at diverse scales of planning, including LMEs. MSP should be used in conjunction with other planning tools to facilitate ecological resilience and adaptive governance. Climate refuge areas in coastal marine areas should be identified and protected in MSP.

A few cautionary notes should be mentioned. Advocates of MSP often refer to the appropriateness of land use planning (LUP) and zoning in terrestrial settings as a reason for the need and practice of the tool. Relying on terrestrial models of land management, zoning and LUP has problems. LUP may be an inappropriate model with respect to the dynamic scale and complexity of coastal marine systems.[222] We continue to assume that planning tools, such as MPAs and MSP, should be derived from terrestrial or landscape approaches to manage or allocate use and resources between competing interests. But oceans have very different characteristic scales (function, time, space) than terrestrial systems.[223] For instance, the abundance and distribution of marine life is influenced by subtle changes in sea surface temperature and oceanographic processes, such as currents and eddies. Our perceptions and values are based on the fact that humans inhabit landscapes. Our understanding of the spatio-temporal features and processes of marine systems is poor, and often 'shifts' over time with new insights into history, evolution and scientific (e.g., paleoecological, archaeological, and ecological) data.[224] It is difficult for us to deepen our social, conceptual, perceptual and psychological identification of what it means to live in a multi-dimensional and fluid medium of the dynamic and complex marine environment. In a discussion about what is 'natural' about coastal marine ecosystems, Jeremy Jackson notes, 'Natural conditions in the oceans fluctuate greatly and sometimes suddenly on time scales that extend for decades to millennia. Thus, the filter of individual experience has two components. Changes caused by humans are the signal and natural variability constitutes the noise that obscures the human footprint.'[225] This use of terrestrial models for coastal marine governance warrants further investigation given the complexity and limited amount of scientific information on the natural history of these ecosystems.

While a set of generic principles to guide MSP is described in many recent scientific articles and government documents, many of these planning principles are difficult to practice[226] or

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[222] J.H. Steele, *Regime Shifts in Marine Ecosystems*, 8 ECO. APPL. S33 (1998). Steele argues that the ecological processes, such as oceanographic regimes, are very different from landscapes, and therefore, land-based models to manage or zone use may be inappropriate for coastal marine governance and planning. This is an issue that has yet to be addressed by those who support MSP.

[223] J.H. Steele, *A comparison of terrestrial and marine ecological systems*, 313 NATURE 355 (1985).

[224] There are dramatic and subtle shifts in scientific understandings and human perceptions of what is a healthy and *natural* ecosystem *in* D. Pauly, *Anecdotes and the shifting baseline syndrome of fisheries*, 10 TRENDS IN ECO. AND EVO. 430 (1995).

[225] J.B.C. Jackson, *What was natural in the coastal oceans?* 98 PNAS 5411 (2001).

[226] Gopnik, *at* 20-21.

apply in light of the unsustainable use of marine resources in global markets. Because MSP is more than a technical or scientific mapping exercise it will require more than the formulation of zonal plans for particular uses of marine space. Because MSP is more than a bureaucratic or technocratic exercise, it requires that human beings address the types of their over-use and behaviour that is a primary cause of the declining state of the world's oceans. As a tool for decision making and planning, MSP requires a strategic and forward-looking ecological approach to manage human behaviour and the multiple-uses of coastal marine ecosystems. As with all tools or technologies, the use and application of MSP may not represent an ecological panacea.

There are pitfalls in the reliance on a view of MSP that deploys techniques to rationalize nature and to render the ocean predictable, to replace its self-sustaining, ecological function and structure with well-managed industrial, commercial, and recreational spaces or boundaries. While MSP may resolve potential conflicts between the uses of coastal marine areas, ecological thinking is integral to the planning enterprise. Maintaining the life-giving values of coastal marine ecosystems will require that we overcome the limits of the 'multiple-use' mentality that is pervasive throughout government, which makes impossible a collective use of and experience with the oceans. The future of maritime cultures requires that we redesign ocean governance to encompass the natural values that are not merely instrumental, but also intrinsic to ocean ecosystems. Can we pass from institutions supporting multiple uses to a form of governance that sensitizes to, protects, and conserves the multiple values that are carried by marine ecosystems, integrating human culture with these values? The strength of any truly adaptive coastal marine governance framework is based on the value orientation(s) of decision-makers, the scale of resource use, the level of biodiversity protection that is supported and maintained over time, the ability of decision-makers to learn and respond to new information and values, and the communicative and integrative skills of the practitioner, the resource user, the scientist, and the citizen.

4.6 A Strategic Approach to MSP

A number of guiding strategic objectives should be incorporated into future ecosystem-based MSP in New Zealand, including the following.

- The primary objective of the MSP is to maintain the coastal and marine ecosystems of New Zealand in accordance with the requirements of various regional, national and multilateral agreements to which New Zealand is party, and which are pertinent to MSP.
- New Zealand recognizes that the full commitment of affected stakeholders to MSP represents the best, and most viable, means of achieving the sustainable management of marine and coastal resources.
- An effective MSP program will require the development of new, or revision of existing, public policy and the formulation of an appropriate regulatory framework (and corresponding coastal zoning plan).
- An effective MSP plan will also require a detailed understanding of the unique elements, or combinations of factors, influencing intensive use areas, areas of concentrated or specialized uses, and areas of multiple uses or high conflict areas. These 'pressure zones,' or areas of intense local concern or conflict, must be understood and addressed with great care and balance, and are often the most intractable of problems for national policy. The six area and action plans will guide

future development and intervention to promote sustainable development in these areas of the coastal zone and adjacent areas that may be affected by the activities within the pressure zones.

The key to success in MSP is based on the promise of integration across sectors. The key functions of integration must occur in: (1) establishing the objectives of the MSP process; (2) selecting processes, procedures, products, and data requirements needed to meet these objectives; (3) identifying the appropriate policy areas, regulatory arenas, and administrative levels for their application; (4) understanding the terrestrial and marine components of the coastal zone including activities in one component that affect or are affected by the MSP policy and regulatory; (5) understanding the views and issues of importance to the major stakeholders and other interested groups; (6) in analysing and interpreting these different views and their *implications* for policy and regulatory options; and, (7) analyzing and interpreting data assembled from disparate information sources (including user group values and use patterns) into a coherent and easily understood format, including state-of-the-art GIS databases and cartographic representations.

With respect to MSP the following programmatic goals are useful to consider in future marine planning and decision-making:

- support sustainable multiple-use of the coastal marine environment, and resolve potential conflicts among the multiple users of coastal and ocean resources
- protect coastal and marine ecological processes, life support systems, and biological diversity
- minimise the loss of human life and property from human and climate-related impacts and threats
- provide public access to and enjoyment of the coastal marine environment
- be supported by stakeholders, policymakers and the general public.

MSP should focus on programmes and policies that support a healthy and sustainable relationship between natural and human- induced (anthropogenic) influences on the coastal and marine environment. MSP should include management of the marine and terrestrial components of the coastal zone and should recognize those pressures from the wider zone of influence (e.g., watersheds, normal and episodic weather events) as well as detailed plans to guide spatial development and project activities in the coastal zone including beach development plans. Although MSPs can be developed for territorial waters, it is important to recognize the future marine activities associated with the EEZ and continental shelf, and terrestrial land-use activities, such as agriculture and ranching, will influence the future success of these plans.

4.7 Elements of a Collaborative Approach to MSP

At its heart, MSP is a collaborative planning and decision-making process, and support at the national level for regional planning should be made available. In addition, MSP should be designed to organize and facilitate the process by which interest groups and stakeholders are able to gain access to and provide input into MSP decision-making process. To address conflicts effectively that arise during negotiation and collaboration, a collaborative model can be used to facilitate resolution of potential conflicts and foster negotiation and agreement between user groups (stakeholders) and the various sectors of coastal and marine management in New Zealand. A two-pronged approach to collaborative planning involves (1)

capacity building programmes and public workshops that foster public education and professional training, and (2) consensus building strategies to foster agreement among government agencies, user groups, and local communities.

The collaborative decision-making process should include four primary elements: (1) efforts to understand the roots, causes, and consequences of coastal marine conflict through 'conflict mapping' studies; (2) identification of key issues and concerns held by stakeholders; (3) an established and transparent process for making decisions about conflicts including collaborative identification of key MSP objectives; and (4) an agreement to adopt and implement measures that can ensure the sustainable use of coastal marine resources while protecting coastal marine ecosystems. MSP is, by definition, a conscious management process that acknowledges the interrelationships among most coastal and ocean uses and the environments they may affect. MSP should be designed to overcome the fragmentation inherent to single sector management, and is intended to result in a program that yields a sustainable long-term relationship between human development activities and resulting human and naturally-induced environmental changes over time.

An example of the type of collaborative process that can be developed in support of MSP is shown in Figure 13.

Figure 13: Activities in Support of MSP

Phases of Collaborative Decision Making	Activities in support of MSP
Pre-negotiation	• Identification of stakeholders • Meeting and interviews with potential stakeholders • Conduct 'issue audit' based on stakeholder input • Creation of 'conflict map' • Presentation of MSP strategy • Drafting protocols • Engage in joint fact finding and synthesis
Negotiation	• Drafting of consensus statement on ground rules between stakeholders • Agreement on goals and objectives • Sharing of information and analysis • Review of scientific assessments • Presentation of draft alternatives for MSP Area Plans • Inputs and comments from stakeholder groups • Presentation of draft MSP Area Plans and Draft MOU • Inputs and comments on Area Plans and Draft MOU • Ratification of MOU for MSP Area Plans

The following strategic elements should be included in future collaborative processes that support MSP:

Issue Identification: The collaborative process is an important part of issue identification and information exchange. A MSP process will likely reflect the existing institutional cultures of policymaking and decision-making that exist at local, regional and national levels of governance. As with the landward side, the MSP should be based on a planning and

regulatory boundary that extends as far offshore as needed to adequately plan and manage for the current and future marine resource use and biodiversity issues (such as coastal fishery stocks or recreational use). Moreover, the boundaries of the coastal zone in an MSP plan should extend as far inland as necessary to identify and resolve watershed-based threats effectively and efficiently. Issue identification, accordingly, must consider a scale of analysis that includes coastal watersheds and nearshore marine environments, such as marine habitat areas, wetlands, and marinas/harbours.

Assessment: A MSP strategy should provide mechanisms for prioritizing projects to allow for efficient and focused coastal and marine resource management. The Area Plans can be developed to prevent, reduce, or mitigate pressures and/or coastal marine ecosystem disturbance. With respect to the assessment of pressures and threats, a MSP strategy can include the use of a 'pressure-state-response' (PSR) model that was briefly introduced in Section One. The PSR model can aid in bridging all gaps and pressing issues by creating a structure that links human activities in a logical way to environmental and socioeconomic issues associated with coastal and marine areas. The PSR model focuses on an assessment of human activities and associated pressures (such as pollution emissions or land use changes) on the coastal marine environment, which can induce ecosystem changes (such as changes in ambient pollutant levels, sea surface temperature, habitat diversity, water flows, etc). Based on the use of existing information, a PSR model supports an analysis of basic relationships among: the anthropogenic and climate-related pressures on the coastal marine environment; the resulting state or condition of the coastal marine environment; and the response of policymakers to these conditions to ease or prevent negative impacts resulting from the pressures.

4.8 The Importance of Linking Pressures to Responses

The PSR model should include analysis of the indicators for direct threats (e.g., coastal and marine resource use, marine industries, and other uses) and indirect threats (such as air and water quality, inland commercial activities and coastal land uses) from human activities on the coastal marine environment. Selection of reliable indicators will assist in directing future research and field surveys, developing functional databases, and enhancing decision making that will correct for past environmental mistakes. Indicators are powerful tools to help identify and support MSP, both at the reporting stage and subsequently during policy analysis. Indicators can assist with overall analysis in the following areas:

Figure 14: The Process of Adaptive Learning

Performance evaluation	Indicators help evaluate performance if a basis for comparison is clearly identified, for example when a target is specified in policy processes
Thresholds	Thresholds are unique and perhaps the most important basis of assessment. In general, establishing a clearly defined sustainability threshold is an essential part of the analysis
Causal Loops	Indicators are important to support claims for causality, such as the links between pressures and environmental conditions
Model construction and Scenario analysis	Indicators provide real data and support field testing of models and possible future scenarios.

As part of a comprehensive approach to MSP, the use of the PSR model should include an analysis of 'pressures', which are classified into underlying factors or forces such as coastal population growth, urban and industrial activities, coastal marine resource use, and climate-related impacts, such as sea level rise and associated coastal erosion or the warming of sea surface temperature. These pressures on the coastal marine environment are often considered from a policy perspective as the starting point for MSP. The PSR analysis should include the use of available socio-economic, biophysical and other monitoring databases.

Indicators of state should be designed to be responsive to the pressures, and at the same time facilitate corrective actions and tasks. The 'response' component of the PSR model relates to the actions taken by governments and non-government organizations that are designed to ease or prevent negative coastal marine impacts, to correct existing damage, or to conserve or enhance coastal marine ecosystem health. Responses are derived from consideration of the pressures, state and commensurate objectives that one has developed in applying this information. These responses may include regulatory action, environmental or research expenditure, public opinion and consumer preference, changes in coastal marine resource management, and the provision of environmental information. Responses are designed to act on the pressures but may at the same time also have an impact modifying the indicators of state.

There are a number of responses to diverse pressures and threats that are useful to consider in MSP. Examples of these responses are shown in the table below.

Figure 15: Integrated Responses for MSP

Area Planning	*Stewardship of Resources*
Studies of coastal environments and their uses	Conducting environmental assessments
Zoning of uses	Conducting relative risk assessments
Anticipation of and planning for new uses	Establishment and enforcement of environmental standards
Regulation of coastal development projects and their proximity to the shoreline	Protection and improvement of coastal water quality (point and non-point sources)
Public Education on the value of coastal and marine areas	Establishment of management of coastal and marine areas
Regulation of public access to coastal and marine areas	Protection of marine biodiversity
	Conservation and restoration of coastal and marine environments (mangrove forests, coral reefs, lagoons, etc)
Promotion of Economic Development	
Industrial and Artisanal Fisheries	
EcoTourism	*Conflict Resolution*
Marine aquaculture	Studies of multiple uses and their interactions
Marine/harbour development	Applications of conflict resolution and collaborative methods
Marine recreation	
Offshore minerals	Mitigation of unavoidable adverse effects on some uses
Ocean and coastal research	

As noted above, the success of MSP is often based on the development of clear regulatory authority at the national level that emphasizes the values of integrative planning and an ecosystem-based approach to marine policymaking and decision-making. To be effective, an MSP program may need new legal authority to regulate or manage coastal activities that heretofore had not been regulated.

Recommendation 4.1: To foster the development of a national policy for MSP, a number of recommendations are:

Establishment of a national centre for the analysis and synthesis of ecological and socio-economic information to support information sharing and public access to data

A national plan for collaborative planning and decision-making that supports MSP

A review and characterization of ocean management problems (causes, effects, solutions), management objectives and development opportunities

A characterization of threats and opportunities, taking into consideration technical and financial feasibility and availability of personnel that can support future MSP

A clear description of the policies and principles to guide MSP

A description of new management measures, such as zonation schemes, which may be needed to strengthen regulatory programmes and to establish market-based incentives

The creation of suitable government arrangements, including intersectoral and intergovernmental coordination mechanisms

A description of the initial management objectives and goals, including important milestones that should be part of future MSP

A characterization of funding and staffing requirements (e.g., adequate financial resources to carry out the planning and implementation of MSP efforts)

The establishment of appropriate monitoring and evaluation systems (e.g., information gathering and monitoring of coastal and marine ecosystems and processes, the maintenance of coastal and marine database and information systems).

One focus of a national policy in support of MSP is to foster geographic integration across regional and national marine jurisdictional areas while providing the necessary national guidance and resources to regional councils to support integrative planning activities. International best practice includes national policies and resources to support regional MSP activities. The Development of Area and Regional Action Plans for the MSP should include a description of goals, objectives and management actions, physical improvements, management techniques, proposed financing, and necessary tasks. The Area and Action Plans should also include a summary list of planned programmes and actions (or projects), with the following attributes:

1. Priority (i.e., high, medium, low)
2. Program and project activities to be performed (i.e., a short statement of work)
3. Responsible Agencies (National, local, non-governmental organization)
4. Program and project estimated costs (or cost range)
5. Potential Funding source(s)
6. Estimated Schedule for completion
7. Estimated timeframe for review of effect of the plan and necessary revision.

The individual Area and Action Plans should focus on an adaptive approach to planning and decision-making. The development of the Area and Action Plans may also include the proposed Pilot Projects for particular areas of concern or data deficiency. The Area and Action Plans should provide a detailed timeframe specifying specific actions to be taken and use phased approach to ensure the plan is implemented successfully and sustainably.

Figure 16: Strategic Components to Be Addressed for Each Management Element

Hierarchy	Definition
Goal	Broad statement of intent, direction, and purpose. An enduring, visionary description of a desirable future.
Objective	Specific statement that describes a desired condition. Can be quantitative.
Strategy	Explicit description of ways and means chosen to achieve objectives.
Policy	Formally-adopted strategy or decision.
Task/Activity Tactic	Specific step, practice, or method to deliver output and, ultimately, outcome, usually organized sequentially with timelines and duty assignments, and cost estimates.

Each management element should include a general goal (or policy goal), specific objectives, and actions or tasks to accomplish the objectives. The management rationale for the objectives and actions should be provided at the beginning of each management element. Because the various management elements are interrelated, some management actions will likely be repeated under several different elements in order to accomplish desired goals and objectives. In general, where actions are interrelated or overlap, references to similar actions in other elements should be provided.

4.9 Adaptive Marine Planning in an Age of Climate Disturbance

An important aspect of MSP is the need to develop adaptive plans that can support long-term intergovernmental response to the threats and pressures associated with climate disturbance on marine ecosystems. These responses should include strategic elements and provisions to protect marine habitat areas important for biodiversity and that can ensure the general maintenance of ecosystem services across generations. With the growing recognition that climate change is already underway and that additional impacts are inevitable despite mitigation efforts, adaptive marine planning is rapidly becoming an important policy focus internationally. In many countries, efforts are beginning in nearly every sector of society, ranging from coastal planning for higher sea levels and reviews of water and drought management strategies, to climate-cognizant species preservation and habitat conservation planning, to adjustments in the financial sector.

A range of threats and pressures associated with climate disturbance should be addressed in future MSPs. The pressures and threats posed to coastal and marine areas from climate disturbance include the following:

(a) Impacts from Sea Level Rise:

- Inundation of permanent coastal habitat
- Alteration of dune habitat and coastal wetlands
- Coastal habitat loss of migratory birds, shellfish and endangered plants
- Reduction of fresh water resources due to salt water intrusion
- Sedimentation increases may increase pollution and run off
- Degradation of aquatic ecosystem
- Increase in invasive species
- Competition for coastal land areas
- Shifts in urban growth and development
- Agricultural relocation
- Alterations of ecological reserves, wildlife areas, undesignated lands, mitigations, sites and easements
- Groundwater recharge and overdrafting
- Water management and water transfer conflicts
- Reduction in wetland habitat on commercial and sport fisheries

(b) Ocean and coastal resources impacts due to warming:

- population changes in coastal areas anticipated
- Public health education and planning needed for extreme heat
- Relocation of marine species
- Changes in marine food systems (upwelling and nutrient availability)
- Changes in commercial and recreational ocean fishery
- Economic Impacts

(c) Ocean and coastal resources impacts due to precipitation changes:

- Higher runoff and flooding
- Flood risks from inland and coastal flooding
- Contamination from sewage distribution and treatment systems
- Health risks from contaminated runoff
- Increased marine pollution

(d) Ocean and coastal resources impacts due to sea level rise:

- Increased risks of coastal flooding in low-lying areas
- More people and assets at risk
- Public infrastructure at increased risk of inundation
- Levees and structures require retrofit
- Potential loss of coastal wetlands
- Increased erosion of beaches, cliffs and dunes
- Private property and structures at risk
- Beach recreation and tourism may decrease in select areas
- Greater Expenditures for beach maintenance
- Increased saltwater intrusion into coastal groundwater resources
- Agricultural land degraded by saltwater.

To ensure a coordinated effort in adapting to the unavoidable impacts of climate change, future MSPs should not only address use-related conflicts and biodiversity protection measures but should also carefully consider the threats and needed adaptive responses for climate disturbance. This section concludes with a set of guiding principles to support adaptive marine planning. These strategic principles include:

- Use the best available science in identifying climate change risks and adaptation strategies. Resource managers should understand that data continues to be collected and that knowledge about climate change is still evolving.
- Involve all relevant stakeholders in identifying, reviewing, and refining the state's adaptation strategy.
- Establish and retain strong partnerships with national and local governments, tribes, private business, landowners, and non-governmental organizations to develop and implement adaptation strategy recommendations over time.
- Give priority to adaptation strategies that initiate, foster, and enhance existing efforts to improve economic and social well-being, public safety and security, public health, environmental justice, species and habitat protection, and ecological function.
- When possible, give priority to adaptation strategies that modify and enhance existing policies rather than solutions that require new funding and new staffing.

In order to ensure coping capacity and long-term resiliency, researchers have previously developed two distinct approaches: (1) projecting the amount of climate change that may occur and (2) assessing the natural or human system's ability to cope with and adapt to change. In recent years, these approaches have been seen as complementary and as such, both are needed to understand climate risks, vulnerabilities, and interventions that can help society and ecosystems adapt successfully.

As an important part of MSPs, climate-related adaptation strategies should include the following specific objectives:

1. Analyze climate change risks. Synthesize to the greatest extent possible how temperature rise, extreme weather events, precipitation changes, seasonal shifts, and sea level rise will exacerbate existing fire, flood, water supply and quality, air quality, habitat loss, and human health risks. Assess how these changes will impact the state's economy, infrastructure, human populations, and environment.

2. Identify sector-specific, and to the extent possible, cross-sectoral adaptation strategies that help reduce vulnerabilities and build climate resilience. Attention should be given to strategies that help (a) avoid, prevent, or minimize climate change impacts to public health, biodiversity, working landscapes, and infrastructure, (b) improve preparedness for climate change impacts and extreme events, (c) enhance the state's response capacity in case of extremes, and (d) facilitate recovery from impacts and extremes in order to enhance ecological resilience.

3. Explore cross-cutting supportive strategies. Identify governance efforts (such as leadership, policy or rule changes, procedural adjustments, etc) and resources needed to enable the development and implementation of identified adaptation strategies.

4. Formalize criteria for prioritizing identified adaptation strategies. The applicability of these criteria may vary across sectors, and should ideally include but not be limited

to social, environmental, equity, technical, staffing, institutional, policy, and financial/economic considerations.

5. *Specify future direction.* Indicate areas where further work will be required to increase the existing understanding of climate risks (including the possibility of catastrophic climate change), environmental and societal vulnerabilities, and adaptation options and barriers. Identify additional cross-cutting, supportive strategies such as public engagement, networking, decision support, monitoring, periodic review of adaptation effectiveness, and fundamental policy changes. Establish feedback mechanisms that provide for the modification of strategies when needed.

6. *Provide recommendations for immediate and near-term priorities for implementing identified adaptation strategies*. This may include management actions and policy changes based on the information developed in other stated objectives.

7. *Inform and engage the New Zealand public about climate risks and adaptation strategies*. Citizens of New Zealand must be informed of existing and future climate change risks and of the need for a comprehensive approach to managing climate change risks through mitigation and adaptation. They must be provided with guidance about what actions they can initiate to adapt to climate change, or reduce their consumption of energy and resources. This information is critical, and will serve as the foundation for residents to actively engage in discussion, refinement, and implementation of those actions needed to build a climate-resilient New Zealand.

In light of the pressures and threats posed by climate disturbance on marine life, a number of strategic goals are recommended below:

- Create a large scale well connected, sustainable system of protected areas across the New Zealand
- Manage for restoring and enhancing ecosystem function to conserve both species and habitats in a changing climate
- Adjust management actions as appropriate for threatened and endangered species
- Prioritize research needs and pursue collaborative partnerships with the research community to ensure that the best available science is informing management actions
- Re-evaluate existing policies and programmes to incorporate climate change and seek regulatory changes as appropriate
- Pursue endeavors that will support implementation of the strategies including funding, capacity building, collaborative partnerships, and education and outreach.

5. CONCLUSION

A range of values are carried by healthy marine ecosystems. These values are not limited to economic or consumptive use of marine space. A range of instrumental and non-consumptive values exist including the values of biodiversity and the services that they provide to humans. Few people dispute the intrinsic values of marine systems, which are often reflected in maritime stories, ritual, and other ceremonies of maritime peoples.

While we often focus on the economic values of the ocean, we also recognise the natural values associated with the marine environment, such as aesthetic, scientific, recreational, spiritual, and sacred values. For instance, a sea in a wild storm is valuable beyond the human capacity to understand it, while a sanctuary on a coastal estuary for feeding shorebirds embodies spiritual and sacred significance. Such diverse maritime values need to be sustained. Marine management is not merely a question of balancing uses or addressing environmental effects or mitigating the impacts of a proposed resource use. Successful marine governance is ultimately a question of how well society can integrate the multiple values supported by life-giving character of marine areas.

The level of resource use and the scale of marine life protection influence the general health and integrity of the ocean. New Zealand needs to respond to the increasing pressures, threats, and associated impacts that human beings have on marine ecosystems. A particular threat or pressure should be understood within a much broader range of impacts for there are synergistic effects associated with the cumulative impacts of the multiple-use of marine areas. A particular resource use does not occur in isolation from other marine activities. Therefore, marine management and planning for marine activities requires a multi-sector approach to address environmental effects and impacts.

5.1 Integrating Economic Use with Ecological Values

When in a boat we may see the details of the interaction of marine life and coastal-dependent species, such as the sooty shearwater, sea lions, and commercially valuable species such as squid. From a satellite image our perceptions and observations change. We may see the larger-scale interactions between a river's plume brought on by a rain event, or the changes in sea surface temperature that is supported by data generated by technologies such as remote sensing. When we combine observations of larger and smaller ecological scale interactions we may be able to identify the relationship between changes in sea surface temperature, the abundance and distribution of plankton, and the presence of a fished species.

Recognizing the interdependence of economic values and the maintenance of marine ecosystem services is the foundation to marine ecosystem-based approach to integrative planning and decision-making.[227] Ecosystem-based planning is a process that aims to conserve major ecosystem services while meeting the socioeconomic, political and cultural needs of current and future generations. The principal objective of ecosystem-based planning is the efficient maintenance and ethical use of natural resources. Ecosystem-based planning is a multifaceted and holistic approach to planning that requires a significant institutional change in how the human uses of ecosystems are managed.

[227] UNEP, RESTORING THE NATURAL FOUNDATION TO SUSTAIN A GREEN ECONOMY: A CENTURY LONG JOURNEY FOR ECOSYSTEM MANAGEMENT (International ecosystem management partnership [IEMP], 2011).

Economic use of marine resources is irrevocably connected to the maintenance of the ecological health and integrity of the marine environment.[228] The protection of ecosystem services is the foundation to a 'green' economy, as a number of governmental, scientific, and technical documents and plans emphasize the need for an ecosystem-based approach to marine resource use and biodiversity protection.[229]

In this time of growing interest in the use of marine resources the development of an integrative, ecosystem-based framework to guide the future of New Zealand's marine resource use and marine life protection activities is needed.

5.2 Recognizing Limits of Resource Use

New Zealand will likely face increasing conflicts over marine areas and sectors as the country continues on a trend for a 'race for marine space' in the territorial sea and in the deeper waters of the EEZ. While marine governance in New Zealand has not embraced the principles of management and the planning tools used elsewhere, it should be stated that to date the need has been relatively low, given that there have been few conflicts arising from multiple uses. But as certain extractive uses (hydrocarbons and minerals, in particular) ramp up and others are explored and brought on line, the need will increase for a more integrative, ecosystem-based approach to marine governance.

The level of use and proposed future marine activities include proposed offshore oil and minerals development, an increase in marine areas used for aquaculture or marine farming within the territorial sea, the impacts of commercial vessels on marine life, and other activities such as the impacts of terrestrial inputs and pollution on marine areas. There is also increasing evidence of the impact of a range of factors associated with climate disturbance on marine areas, such as changes in the pH level of the oceans (i.e., ocean acidification).[230]

Scientific studies identify four primary threats to marine ecosystems across the Pacific Ocean: pollution, overfishing, habitat destruction, and climate change.[231] MacDiarmid and colleagues note that the primary pressures on marine ecosystems of New Zealand are from climate change, terrestrial inputs including water pollution, and overfishing.[232] MacDiarmid and colleagues based their study on a survey of perceptions of diverse scientists who work in New Zealand. In addition to pressures associated with climate disturbance, scientists perceive the top threats and pressures as follows.

- Human activities in catchments that discharge into the coastal and marine environment were among the highest scoring threats to New Zealand's marine

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[228] UNEP, FAO, IMO, UNDP, IUCN, GREEN ECONOMY IN A BLUE WORLD (2012) available at www.unep.org/greeneconomy and www.unep.org/regionalseas

[229] S. NAEEM, D. BUNKER, A. HECTOR, M. LOREAU, C. PERRINGS, EDS., BIODIVERSITY, ECOSYSTEM FUNCTIONING, AND HUMAN WELLBEING: AN ECOLOGICAL AND ECONOMIC PERSPECTIVE (Oxford: 2009).

[230] MACDIARMID ET AL., ASSESSMENT OF ANTHROPOGENIC THREATS TO NEW ZEALAND MARINE HABITATS: FINAL PROJECT REPORT (Wellington: Ministry of Fisheries 2010).

[231] CENTER FOR OCEAN SOLUTIONS, PACIFIC OCEAN SYNTHESIS available at http://centerforoceansolutions.org/PacificSynthesis.pdf.

[232] MacDiarmid *et al*., *op cit*. A comprehensive survey of important ecological indicators for New Zealand's oceans can be found at M.H. PINKERTON, HEADLINE INDICATORS FOR THE NEW ZEALAND OCEAN, (Paper prepared for NIWA. Wellington, 2010).

habitats. Foremost was increased sedimentation resulting from changes in land-use, which was third equal among these threats over all habitats and was the highest-ranked threat for five coastal habitats including harbour intertidal mud and sand, sub-tidal mud, seagrass meadows, and kelp habitat. Other threats deriving from human activities in catchments include sewage discharge, increased nitrogen and phosphorus loading, and heavy metal pollution. Three other highly ranked threats (algal blooms, increased turbidity, and oil pollution) stem in part from human activities in catchments.

- Seven threats to New Zealand marine habitats were directly related to human activities in the marine environment, including commercial fishing (e.g., trawling operations), the introduction of non-native marine species, coastal engineering, and aquaculture. The most important of these was bottom trawling, which was the third equal highest ranking pressure on marine ecosystems. The second highest ranking marine activity was dredging for shellfish which, although destructive, usually operates over a smaller spatial scale than bottom trawling.

Human impacts exacerbate an ecosystem's ability to withstand stress and disturbance associated with short-term and long-term climate events.[233] For example, the multiple impacts of humans on marine ecosystems exacerbate the ability of indicator species, such as birds and mammals, to adapt to climate-related disturbance caused by sea level rise, an increase in sea surface temperature, ocean acidification, and changes in ecological productivity (e.g., changes in the availability of prey species).[234] Moreover, climate change interacts with and accelerates the cumulative pressures on marine biodiversity. To avoid tipping points, international best practice emphasizes the need to develop integrative, ecosystem-based approaches.

One challenge for New Zealand is to move beyond the reliance on a marine governance framework that emphasises a traditional sector-by-sector approach to management and planning. This governance framework contributes to a number of institutional challenges, such as:

- a spatial and temporal overlap of human activities and their objectives, causing conflicts (user–user and user–ecosystem conflicts)
- a lack of connection between the various authorities responsible for individual activities or the protection and management of the environment as a whole
- a lack of connection between offshore activities and resource use and onshore communities that are dependent on them

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[233] B.S. Halpern *et al*., *Understanding Cumulative and Interactive Impacts As a Basis for Ecosystem-Based Management and Ocean Zoning*, 51 OCEAN AND COASTAL MANAGEMENT 203 (2008); B.S. Halpern *et al*., *A Global Map of Human Impact on Marine Ecosystems*, 319 SCIENCE 948 (2008); and E.L. Miles, *On the Increasing Vulnerability of the World Ocean to Multiple Stresses*, 34 ANNUAL REVIEW OF ENVIRONMENT AND RESEARCH 17 (2009).

[234] NIWA, CLIMATE CHANGE PROJECTIONS FOR NEW ZEALAND (August 2008). With respect to climate change and the world's ocean, see R. SCHUBERT *ET AL*., THE FUTURE OCEANS – WARMING UP, RISING HIGH, TURNING SOUR (German Advisory Council on Global Change. Berlin, 2006). For a characterization of the impacts of climate disturbance on New Zealand's biodiversity, see W. GREN, CLIMATE CHANGE IMPACTS ON NEW ZEALAND'S BIODIVERSITY. A BACKGROUND PAPER PREPARED FOR THE PARLIAMENTARY COMMISSIONER FOR THE ENVIRONMENT (Wellington, 2006); and more generally M. MCGLONE, T. CLARKSON, AND B. FITZHARRIS, UNSETTLED-OUTLOOK: NEW ZEALAND IN A GREENHOUSE WORLD (Wellington, 1990).

- a lack of protection of biologically and ecologically sensitive marine areas.

As governments encourage economic development of marine areas in the future, the socio-ecological context will inevitably expand to include more diverse interests and values. Value-based conflict between competing interests, international jurisdictions and within-state government jurisdictions will expand, as do the scale and level of resource use. It will be difficult to resolve conflict over marine resource use and biodiversity protection without a more comprehensive and integrative approach to marine ecosystem-based planning and decision-making.

Marine policy innovation requires a strengthening of the role of regional councils to address the land-sea interface and the range of problems associated with water pollution and increased use of marine areas in the territorial sea. In addition, marine policy innovation requires leadership and the political will to strengthen the role of central government in planning, management, and programmatic development.

It is also important to note the progress made in the natural resource sector (NRS) of central government to establish a more integrated marine management framework with more inclusive decision-making. These recent activities largely focus on resource allocation. There is much to commend regarding the country's marine management and planning efforts. With respect to the EEZ, a number of planning efforts are underway, including the Department of Conservation's *PlanBlue*, and the extensive research undertaken by the Ministry of Forestry and Agriculture (formerly the Ministry of Fisheries) to facilitate planning for biodiversity protection in the EEZ.[235] These developing planning activities include the mapping of biodiversity values and the trawl footprint in the EEZ, and new conservation strategies that include assessment of marine ecological integrity and ecosystem services.

5.3 Summary of Short-term Recommendations

Table 1 includes a list of the major short-term recommendations that are described in this report. It is based on a pressure-state-response (PSR) model of marine planning and management. Pressures include threats and impacts, and other institutional issues and concerns. Responses include strategic elements, policy innovations, and management actions that can be developed at regional and central levels of marine governance.[236]

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[235] A useful overview of this research commitment is given in the Ministry of Fisheries, *Fish Biodiversity Medium Term Research Plan* 2007/08 to 2011/12.

[236] The intent of this Summary Report is not to provide a detailed description of recommendations. A complete description of recommendations is found in the full report.

Table 1: Summary of Short-Term Recommendations

PRESSURE	RESPONSE (Management Principle)	PLANNING TOOL/POLICY INSTRUMENT/MANAGEMENT ACTIONS
Synergistic impacts associated with multiple-use	Maintenance of marine ecological integrity	Creation of Ocean Health Index Planning tools, such an InVEST and SeaScape (to assess ecosystem services) Comprehensive cumulative impact assessment effects and synergistic impacts
Loss of marine biodiversity	Clear statutes in support of the creation of networks of marine reserves that can protect marine life	The Marine Protected Areas Policy and Implementation Plan (MPA Policy) should be amended Use of marine zoning tools Marine Protected Area Designation Adoption of a compatible use criterion Creation of an Ocean Protection Council under the new EPA DOC's *PlanBlue* (to be further developed and implemented)
Expanding scope of conflict across management sectors and user groups	Clear statutory requirements and resources that foster integrative, ecosystem-based planning	New marine policy (to support place-based marine spatial planning) Place-based, ecosystem-based collaborative planning (to be supported)
Climate disturbance	Adaptive planning	Climate Adaptation Plans to be developed at regional scales of governance that can address threats from climate change on the marine and coastal environment
Fragmented governance	Clear statutory requirement for well coordinated ecosystem-based planning and decision-making Strengthened institutional capacity and capability at regional and central government levels	Marine spatial planning (by regional councils and with assistance from central government) Place-based collaborative planning Development of a public trust doctrine for the EEZ Administrative reorganization to foster intergovernmental coordination and consistency across sectors and management authorities
Role of science and scientists	Evidence-based decision-making	Establishment of interdisciplinary scientific partnerships that include social and physical scientists Establishment of Māori advisory body under EPA Creation of an ocean science trust under EPA Creation of a publicly accessible web-based information clearinghouse Creation of a national centre for ecological analysis and synthesis

Offshore energy development, fossil fuels, and minerals	Passage of the Environmental Effects Bill and other EEZ policies and statutes	New Regulations that support: Compatible use Integrated risk assessment Creation of MPAs for sensitive marine areas used by birds, mammals and fishes Development of a public trust doctrine for the EEZ Establishment of a Living Permit Process The creation of mitigation funds to support independent scientific monitoring and enforcement Independent review of permitting applications and environmental assessments under the EPA
Water pollution	Integrative coastal planning and management	Strengthened and Improved capability and capacity of regional councils to respond to the drivers of impacts from terrestrial inputs on marine areas Clear Development of best practices for land-use activities that influence marine areas Water quality monitoring and enforcement Development of catchment-oriented indices Marine spatial planning
Protection of cultural values	Clear support of Māori Treaty obligations	Integration of Māori values and traditional ecological knowledge in marine policies, programmes, and plans

This report emphasizes the need for clear management principles, policy tools and policy instruments that can strengthen and improve integrative, ecosystem-based marine governance in New Zealand. A range of relevant principles have been described, including the need to support a public trust doctrine, a compatible-use criterion, and the maintenance of ecosystem services. In many cases these management principles should be embodied in law. These governing principles are part of a range of marine policies and programmes that are developing and being implemented in a number of countries, and reflect international best practice in various Commonwealth countries, including Australia and Canada. New Zealand can learn from the experiences and practices of other Commonwealth countries.

Given the resource constraints endemic to islands countries such as New Zealand, future integrative, ecosystem-based marine governance in New Zealand should also be supported by international funding organizations, such as the Moore Foundation, and private industry. A more concerted effort to attract additional funding opportunities is warranted today. But there is a clear need for clear public policy that supports the types of planning tools and policy instruments in central government before international funds can be pursued.

New Zealand also has the rare opportunity to build on policy innovation developed in the 1990s that supported integrative coastal planning, such as the reorganizational efforts that emphasize a catchment-based approach to land-use policy. One challenge today is that regional councils lack the institutional resources and expertise to address marine issues.

Ultimately, marine governance depends not only on the capacity and capability of institutions to address the synergistic impacts and pressures of multiple impacts and uses, but on the cultivation of a broad ocean constituency in the public realm that supports a more sustainable

ecological approach to planning, decision-making and policy making. This is where a hope for change resides.

All the peoples of New Zealand arrived by boat or waka. Māori have inhabited Aotearoa for over 800 years. New Zealand's rich indigenous history, in combination with the maritime cultures of the country, represents a foundation for establishing a restored ocean constituency. Accordingly, translating the principles and multiple values that are associated with marine ecosystems into a comprehensive and holistic governance framework should be an important part of future marine planning and decision-making in New Zealand.

Historically, the hope that led to the migration across the wild ocean to New Zealand is a shared value that is part of the country's rich and diverse maritime heritage. Policy innovation is part of the history of New Zealand environmental governance. Risk-taking, experimentation and adaptation are required traits of island cultures. Today the wild ocean is reflected in the brand of *100% Pure New Zealand*– a brand that New Zealanders embrace and that is celebrated abroad. But as the grounding of the Rena showed, it is a very vulnerable brand. Living up to the brand requires a renewed responsibility to adapt to and sustain the life-giving blue planet.

5.4 List of Recommendations

Recommendation 1.1: That no single marine resource use or activity, such as commercial and recreational fishing, be considered and managed in isolation from other marine activities and that the synergistic and cumulative impacts from human use of marine ecosystems, including the impacts of land-use activity, such as farming, on marine systems, be addressed in new programmatic and environmental policies using available technical tools and methodologies.

Recommendation 1.2: That New Zealand conduct a more systematic approach to assess and value the marine ecosystem goods and services associated with the EEZ. An alternative approach is needed today in New Zealand – one that can sustain and maintain the general ecosystems 'goods and services' that are provided by healthy ecosystems. The foundation of a new integrated, ecosystem-based approach to manage multiple use and impacts across sectors is based on the principle that use should be made more compatible with the value of preserving the biological integrity of ecosystems so that goods and services can be maintained across generations. Sections 2–4 describe the types of planning tools and policy instruments that support an integrated, ecosystem-based approach to marine governance. The challenge is to integrate uses across a common marine area while prioritizing biodiversity protection so that the use of the area can be sustained across generations. Maintaining biological integrity requires that elements of ecosystem processes, structures and functions (such as biological diversity) are preserved. This will be more difficult in a context of climate change and increasing marine resource use in the ocean jurisdiction of New Zealand.

Recommendation 1.3: As part of the creation of new performance-based standards: That the Pressure-State-Response model should be used in New Zealand to better understand the link and relationship between pressures or threats and the response of political systems to these threats and the changing status of marine ecosystems associated with the EEZ.

Recommendation 2.1: That policy instruments and planning tools that include a combination of community-oriented governance structures (such as collaborative decision-making), market incentives, and new regulatory tools, such as the creation of new permitting authority, be implemented to address future challenges in marine governance. A more comprehensive, multi-sector approach to ecosystem-based planning and management is recommended in addition to new permitting authorities under the Environmental Protection Authority that is currently being developed. There is a clear and present need for a more integrative approach. New Zealand has yet to establish clear enabling legislation that reflects international best practice in many aspects of the environmental decision-making, planning and management for the EEZ.

Recommendation 2.2: That the role of science and scientists in marine planning and decision-making be strengthened to include statutory language that requires:

The creation of an Ocean Protection Council, an Ocean Science Trust; and an Interdisciplinary Coastal and Marine Science Advisory Council to support the EPA and Regional Councils in important marine conservation and marine resource use issues.

Separate funding of such bodies from that of decision-making.

Recommendation 2.3: That the procedural processes for planning and decision-making should be strengthened to include the following the use of new planning tools, such as:

Creation of Living Permit to Ensure Adaptation and Learning. A living permit would allow for new information to be gathered and synthesized during the monitoring phase that can be used by policymakers to ensure that the impacts of marine activities do not significantly impact public health, safety and environment. Similar permitting tools have been used in the USA for offshore oil and gas activities. With respect to the consent, the intent of the living permit is not closure via the planning and regulatory processes but recognition of the need for further information during the operation and activity of particular aspects of marine resource use, such as the health related impacts of the use of a pipeline or the environmental effects on habitats from the operation of a structure.

Integrated Risk Assessment that will strengthen assessment across different activities. A major failure of risk assessment is the compartmentalization of risk analysis into particular aspects of a marine resource use, such as offshore oil exploration and development. Given the fact that large-scale offshore oil activities are often supported by a number of sub-contractual arrangements, one planning tool to assess risks is to integrate across different activities. This planning tool is being used in the United Kingdom and Norway to strengthen the analysis and assessment of risks for offshore oil and gas activities.

Independent Production and Review of Environmental Assessment to be performed by the lead government agency or department. A major concern in environmental assessment is the independence, reliability and credibility of the information used in the analysis. In the USA, proposed developers and industry are responsible for conducting an environmental impact assessment for marine resource use. These environmental assessments are contracted out by the lead agency or department and not by the industry. In addition, special advisory bodies can be used to support the independent review of environmental assessments.

Recommendation 2.4: That the Marine Protected Areas Policy and Implementation Plan (MPA Policy) be amended to consider the cumulative and synergistic impacts of increasing marine resource use in the EEZ. The Plan should carefully incorporate new scientific

information and planning tools on the benefits of marine reserves as an instrument to protect marine life and habitat. In addition, the maintenance of ecological security requires that cultural forms of ecological knowledge (that include indigenous value systems) and biodiversity are protected. A conceptualization of sustainability is needed in the Environmental Effects Bill – one that embraces an ecocentric value orientation that includes the importance of preserving 'biocultural heritage'. Increasingly, the importance of maintaining both biological and cultural diversity, place or, more generally, the importance of recognizing the irrevocable connection between people and place is being recognised. This is particularly important with respect to New Zealand, with its diverse cultural characteristics that include the traditional knowledge and language of Māori.

Recommendation 2.5: That the creation of enabling legislation as set forth in the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill require a new EPA to evaluate and assess the environmental effects of proposed marine activities, such as offshore oil development, and should be supported by additional strengthening and improving of existing marine life protection policies and programmes. The range of threats to marine mammals should be carefully evaluated in future environmental assessments. In some cases, the marine and coastal areas used by marine mammals will warrant further protection and buffer areas should be created to ensure these species, including nesting birds, are provided additional support. Similar protective measures have been adopted in the USA and other places.

Marine noise from vessel activities and the use of sonar technology for exploring offshore oil are examples of under-evaluated impacts to marine life and should be explored further by marine scientists in New Zealand, given the importance of the marine areas associated with the country for marine mammals. An additional threat is vessel strikes that should be carefully considered in future environmental assessments. Collision with ships is a key mortality factor for large whales, many of which are endangered. An increase in the rate of detected collisions between whales and ships in the past few decades corresponds to an increase in the number, size and speed of ships over the same time period. Without intervention the problem is expected to be exacerbated as already high levels of oceanic shipping continue to rise.

Recommendation 2.6: That ocean waters, coastal waters, and ocean resources be managed to meet the needs of the present generation without compromising the ability of future generations to meet their needs. The most robust public trust doctrine for ocean resources should be established through recognition of a national public trust doctrine via statutory establishment of a strong suite of public trust principles. The establishment of statutory laws would enable citizens, ocean management agencies, and courts to best apply the public trust doctrine to the long-term stewardship of ocean resources. National ocean resources could benefit greatly from protection afforded by a public trust concept.

Recommendation 2.7: That a comprehensive multi-sector approach be created to gather baseline information to be used in the assessment of environmental effects and to assess the cumulative effects of proposed offshore marine activities that include the use of tools to value ecosystem services and non-consumptive values.

Recommendation 2.8: That New Zealand establish an Ocean Health Index (OHI) in conjunction with the development of new EEZ policy. It may be one useful tool to better understand the cumulative and synergistic impacts of marine resource use over time. An OHI can also be based on recognition of thresholds of significance and tipping points that are key

considerations in ecosystem-based planning and decision-making. The OHI is a new quantitative way to measure whether the ocean's health improves or declines over time. It is a composite index based on indicators drawn from international agreements, intergovernmental panels and other high-level recommendations regarding marine conservation and resource use. Its indicators measure the most critical ocean stressors (climate change, fisheries, habitat destruction, pollution and invasive species) as well as their effects on the ocean's ability to provide ecosystem services and to support human well-being. Trends in the value of OHI and its indicators stimulate deliberate, performance-based ocean improvement by helping managers and the public to (1) identify unfavourable ocean trends, (2) select the most strategic goals and actions to reverse them, and (3) evaluate the success of remedial actions through data-driven outcomes assessment. The OHI can thus play a focal role in efforts to re-build the ocean's ability to support abundant populations, rich biodiversity, robust ecosystem services and improved human well-being. The OHI should be developed in conjunction with current international efforts to establish such an index. The OHI will likely be a new world standard for gauging ocean health – a measuring stick to show whether our efforts to improve ocean governance and health are successful. It will guide decision makers in the actions they take and raise global public awareness and support for ocean conservation. Accordingly, the creation of an OHI will be a valuable tool in performance-based evaluations in marine governance in the near future.

Recommendation 2.9: That New Zealand pass a National Marine Sanctuaries Act to allow the creation of national marine sanctuaries. The oil spill offshore Santa Barbara, California, led to the creation of major state and federal policies that support increasing the protection of marine areas, including the passage of the National Marine Sanctuaries Act of 1972. The Act requires the establishment of marine sanctuaries in the EEZ of the USA, and the Sanctuaries Program now includes 13 designated sanctuaries. The Act also prioritizes the protection of marine life in accordance with an ecosystem-based approach. In many ways, the sanctuary policy in the USA can be considered the most progressive statute to protect ecosystems in the country. The Act also requires that marine resource use in sanctuary waters be 'compatible' with the goal of resource protection. Compatible use is a very different approach to resource use; it requires that any use can take place if it does not threaten the marine life of a sanctuary.

Recommendation 2.10: That a compatible use criterion be integrated into new legislation for the EEZ to facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities. This statement is unambiguous insofar as it prioritizes a '*primary purpose*' of resource protection, and could be put in place for special habitat and cultural areas.

Recommendation 2.11: A number of recommendations are made below:

That regional collaborative approaches to achieve compliance be strengthened. Shared databases and web-based dissemination of information can help to overcome the challenge of information dissemination by providing easy access to information. The Monitoring, Control and Surveillance Network (MCS Network) is one web-based approach that allows enforcement officers to share information about suspicious fishing vessel activity. Dissemination of positive or negative lists of vessels through regional management organizations is another web-based data-sharing approach.

That the use of market-based approaches to achieve compliance be increased. Certification programmes take advantage of consumer choice to drive sustainable practices. Catch certification can also be a useful tool to ensure that catches are legal: for example, the Northeast Atlantic Fisheries Commission requires a catch certification for fisheries products to be imported. For example, the creation of environmental certification or labelling systems, which provide information to consumers regarding the environmental impact of a product, can provide incentives for increased compliance. Eco-labelling programmes should include compliance measures to ensure labelled programmes or industries are in compliance with the certification.

That political will be increased to expand compliance and enforcement programmes through non-governmental approaches. NGOs and business associations can have an important role in promoting compliance and in enforcing, complementing government agencies and international institutions. For example, many NGOs lead campaigns to raise public awareness about high profile illegal fishing activities such as those occurring in the Patagonian toothfish fishery and encourage consumers to avoid purchasing fish from potentially illegal operators. Also, in the case of the toothfish fishery, legal fishing industry operators have launched a website that publicizes information about alleged illegal fishing operations. Collaborative efforts by the shipping industry, through organizations such as the Maritime International Secretariat Services Limited (MARISEC) and InterTanko, have been established to help facilitate compliance through education-based approaches.

That compliance through increased public participation and education be encouraged. Programmes to increase public participation can also increase compliance rates by raising public awareness, creating, pressure groups, and heightening transparency, accountability, and monitoring. Tools that can effectively demonstrate to stakeholders the costs of coastal and marine degradation can increase the willingness to take steps to conserve ocean resources. Accounting systems that demonstrate the value of coastal preservation are useful for monitoring the impact of human activities on water resources and identifying the economic valuations, costs, and social impacts of management systems. By defining the value of ecosystems, stakeholders can more concretely see the costs and benefits of preserving the environment, thereby increasing willingness to comply with regulations. Scenario development and integrated assessment modelling tools, like those used to predict climate change and the impact of greenhouse gases, can be used to examine alternative perspectives regarding consequences for stakeholders.

That integrated control measures be promoted. Most countries have extremely limited resources to devote to promoting compliance or effectively and vigorously enforcing their ocean and coastal laws. Moreover, these resources are often allocated sectorally to fishing, commercial shipping, energy development, and so forth. Integrated control measures can enhance compliance and enforcement by helping to validate data through cross-referencing information. In addition, integrated control measures can help to use scarce financial, personnel, and technical resources more efficiently and effectively. An ongoing EU pilot project in the Mediterranean illustrates the potential, through integrating marine surveillance systems. The project aims to validate and show that in practice bringing together information collected from various maritime surveillance systems and fusing them into a common operational picture creates cross-border and cross-sectoral advantages and can lead to more effective government actions against illegal activities. Ongoing projects are already testing integrated solutions based on emerging capabilities such as e-navigation, satellite observation, etc.

That penalties be increased to reflect damage to the resource and deter continued violations. 'Command-and-control' methods, in which governments prescribe desired management through regulations and standards, can work effectively when implemented along with sufficient penalties and threat of enforcement. The certainty and severity of the penalties imposed must be sufficient to deter would-be violators. In many instances, however, penalties are nominal and readily incorporated into the cost of doing business. Moreover, penalties are rarely applied. A large body of experience in setting effective penalties – as well as options for creative alternative penalties – from the sectors outside the specific ocean context can inform the reform of penalty regimes.

Recommendation 2.12: That in-service training and ocean awareness workshops be developed to foster the continued development of current ocean leaders, and the skills they need to develop and implement appropriate policy measures to manage oceans sustainably.

Recommendation 2.13: That New Zealand create a state-of-the-art professional graduate program in Marine Affairs that emphasizes an interdisciplinary approach to marine science, planning and policy.

Recommendation 3.1: That effective integrated coastal and marine planning develop tools to assist in understanding, forecasting, and managing the effects of multiple stressors (cumulative effects) that cut across terrestrial, coastal, and marine ecosystems; to understand the spatial and temporal aspects of river and stream plumes and their role in the transport and fate of land-derived contaminants; to establish standardized monitoring programmes for assessing ecosystem health and integrity over time (you cannot manage what you do not measure); and to avoid compartmentalising what is happening on the land from what is happening in the sea.

Recommendation 3.2: That integrated management instruments and tools that support ecosystem-based management be established. The further development of integrated catchment and coastal planning should reflect the transboundary nature of the pressures from coastal land use activities on marine areas and resources. This requires a strengthening of cross-sectoral and cross-jurisdictional arrangements and support (including harmonized policies, financing, and information gathering/sharing).

Recommendation 3.3: That with respect to the use of scientific information and scientists in a more comprehensive, ecosystem-based approach to marine governance, the United Nations Environmental Program (UNEP) recommendations be adopted:

Be careful that appraisals of available scientific information do not present excuses for not taking management measures.

Utilize both natural and social sciences to generate the information needed to support management.

Embrace uncertainty by making it apparent, but do not let it distract attention from the things that are known. Marine management should not be held to a higher standard of certainty.

Ensure that the science used to support planning and management is defensible – i.e., relevant, credible, and legitimate.

Be aware that the scientific input should not stop when management is implemented.

Use science effectively and judiciously. Do not let science become an objective in itself, or allow technical expertise to displace participatory decision-making.

Recommendation 3.4: That the protection of ecosystem services be recognised as the foundation to a 'green' economy. An ecosystem-based approach should be adopted insofar as it has been shown to be an important part of promoting a more sustainable approach to marine resource use.

Recommendation 4.1: To foster the development of a national policy for MSP, a number of recommendations are:

Establishment of a national centre for the analysis and synthesis of ecological and socio-economic information to support information sharing and public access to data

A national plan for collaborative planning and decision-making that supports MSP

A review and characterization of ocean management problems (causes, effects, solutions), management objectives and development opportunities

A characterization of threats and opportunities, taking into consideration technical and financial feasibility and availability of personnel that can support future MSP

A clear description of the policies and principles to guide MSP

A description of new management measures, such as zonation schemes, which may be needed to strengthen regulatory programmes and to establish market-based incentives

The creation of suitable government arrangements, including intersectoral and intergovernmental coordination mechanisms

A description of the initial management objectives and goals, including important milestones that should be part of future MSP

A characterization of funding and staffing requirements (e.g., adequate financial resources to carry out the planning and implementation of MSP efforts)

The establishment of appropriate monitoring and evaluation systems (e.g., information gathering and monitoring of coastal and marine ecosystems and processes, the maintenance of coastal and marine database and information systems).