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ENCOURAGING NEW OPPORTUNITIES IN THE OCEANS

Contents

Introduction

1 The oceans offer great potential for innovation and investment in a range of different wealth-creating activities. The purpose of the Government's recently released *Growing an Innovative New Zealand* strategy is to lift New Zealand's GDP[1] per capita to the top half of OECD[2] countries. Future opportunities in the oceans have the potential to help New Zealand meet this goal. While a large amount of New Zealand's land-based resources are already being utilised, the exclusive economic zone and continental shelf offer largely untapped space and resources[3] for future developments.

2 Future technologies and management techniques will enhance our ability to realise these opportunities. Technology will enable new uses of the oceans, many of which fall outside the scope of the current marine management framework. Technology also provides opportunities to improve our understanding and effective management of the marine environment, and to promote environmentally effective practices, such as the increased use of renewable energy.

3 This paper examines some different potential activities in the oceans, to demonstrate policy issues that may arise in the future. The current management framework is then examined with regard to how it would facilitate these and any other possible future economic opportunities.

4 The Oceans Policy Secretariat has commissioned a private sector report to explore the current and future economic opportunities in the oceans, and explore any policy issues preventing the maximisation of these opportunities. The report will help develop the ideas in this issues paper, and get a sense of what issues are important for investors and wealth creators.

Potential technologies

Energy generation technologies

5 The oceans offer a wide range of energy sources. Many are renewable (i.e. they do not involve the depletion of a finite resource), and represent an opportunity to develop sustainable energy solutions for future needs. Future energy sources also present a number of policy and planning issues, as demonstrated in the following examples.

Offshore windfarms

6 Europe has pioneered the construction of offshore wind farms, with a small number already operational. The appeal of offshore wind generation is offshore locations avoid the 'not in my backyard' issues experienced on land, such as

[1] Gross Domestic Product
[2] Organisation for Economic Cooperation and Development
[3] Aside from commercial fishing

complaints about visual pollution. The strong and constant winds over the sea also provide a more reliable energy source than on land.

7 The establishment of wind turbines offshore is more difficult and costly than on land, with difficulty and cost increasing with the depth at which is being built, and the distance from shore. For this reason, it is likely most offshore wind developments in the near future would be in the territorial sea, and subject to the provisions of the Resource Management Act. Wind farms further offshore may be a possibility in the future however.

Wave power

8 The World Energy Council estimates two terawatts of energy could be harvested from the world's oceans, the equivalent of twice the world's current electricity production. New Zealand has a high wave energy potential, due to the long 'fetch' of our coastline.

9 There are a number of new wave power technologies emerging to capture this resource. All require the establishment of offshore generators of differing descriptions.

Ocean currents and tidal power

10 Ocean currents are a huge source of untapped energy. Sea water is much denser than air, providing a 5-knot ocean current with more kinetic energy than a 350 km/h wind.

11 Tidal power operates by building a barrier across a river estuary. The tidal flow drives turbines to produce electricity.

New harvesting technologies

Deepsea aquaculture

12 All of New Zealand's marine farms are located close to the shore, where construction and access are easier and farms are more sheltered from extreme weather conditions.

13 Near-shore aquaculture is not, however, without its problems. Marine farms can close off sections of shallow bays, where fish wastes concentrate and the oxygen in the water is depleted by quick-growing algae. Further, because the density of fish is high, diseases can spread rapidly. Land use on the shore and pollution from shore-based activities can affect marine farms, as recently demonstrated at Waikare Inlet in the Bay of Islands.

14 Recent experience with the aquaculture 'goldrush' has also demonstrated the extent to which aquaculture can conflict with other uses of near-shore space, and negatively affect surrounding ecosystems through disruption of habitats and nutrient flows.

15 Some of these problems can be solved or mitigated by moving operations offshore where water circulation is better, and fewer activities compete for the space in question. Deep-sea aquaculture developments are more expensive, however, as sites are harder to construct and gain access to, and there are more extreme weather conditions to deal with. They are also less productive, due to lower nutrient levels further offshore.

Fishing techniques

16 A major reason for worldwide depletion of fish stocks in the 20th century is the advent of sophisticated, industrial-scale fishing techniques. New Zealand does, however, have a quota management system (QMS) in place to govern the sustainability utilisation of fish stocks, and this paper does not discuss the effectiveness of the QMS in meeting this goal. Future technology, however, will probably allow a wider range of species to be caught in a wider range of environments. Again, the sustainable management of the stock in question is an issue for the QMS, but policy makers need to be aware of the wider environmental effects of new techniques.

17 New technologies may have positive implications for environmental management. More advanced and targeted fishing technologies could help avoid or mitigate adverse effects, such as by-catch or damage to sea floor habitats. Also, more advanced detection and ecosystem modelling systems could allow targeted catches that maximise sustainable yield while mitigating the effects on the wider ecosystem.

Extractive activities: mining and bioprospecting

18 Seabed mining and bioprospecting are two very different types of extractive activity that can occur in the marine environment that nonetheless raise a number of common policy implications.

Seabed mining

19 There are currently no offshore mining[4] operations in New Zealand. Offshore mining is a developing area that is not yet commercially viable, particularly due to the costs and technical challenges involved with accessing underwater environments. There is, however, a growing body of knowledge around the potential nature and location of seabed resources. Many are associated with hydrothermal (underwater hotspring) mineralisations.

20 Mineral resources in New Zealand identified to date include[5]:

- gas hydrates – methane in an ice matrix
- coastal sand and gravel
- titanomagnetite and ilmenite sands

[4] 'Mining' does not include petroleum extraction for the purposes of this paper. New Zealand already has operational petroleum extraction from the ocean, and advances in petroleum mining technology should allow exploration and extraction in deeper waters in the future.
[5] Centre for Advanced Engineering (2001), *Our Oceans, A Journey of Understanding*, p8.

- placer gold
- phosphate nodules on the Chatham Rise
- metal-rich volcanic deposits on the Kermadec–Tonga ridge.

Bioprospecting

21 Bioprospecting is the examination of biological resources (e.g. plants, animals, micro-organisms) for features that may be of value for commercial development[6]. These features may include chemical compounds, genes and their products or, in some cases, the physical properties of the material in question. The oceans are a rich source of biodiversity and potential bioprospecting discoveries.

The potential of natural capital: tourism and the economic value of healthy environments

22 Natural capital is those characteristics of natural systems that provide tangible and intangible goods and services of economic value to people. When considering potential economic opportunities in the oceans, it is important to consider that environmental protection and economic development can be viewed as mutually supporting processes. A healthy environment underpins much of the wealth generation capacity of the oceans. The fishing industry would collapse if marine ecosystems were heavily stressed through overfishing, or the effects of other activities. The ecotourism market requires healthy, natural environments to attract tourists.

23 There is a common assumption that economic benefit is derived from use and use is generally understood to be extractive, in an economic sense. Examples such as the Leigh marine reserve – which prohibits extraction – demonstrate the 'ecotourism', non-extractive benefits of healthy environments. This reserve receives 200,000 visitors annually and supports several small businesses in the area, as well as indirectly contributing to many others.

24 On the other hand, economic development opportunities can also contribute to better environmental management. For example, the information gathered to assess the environmental effects of a proposed activity can add to environmental knowledge of the area.

Information technology: monitoring and modelling

25 Developments in monitoring technology mean we now have the ability to place highly sensitive instruments deep in the ocean, or far into space, with long-term monitoring and observation potential. High-speed data transmission now allows information to be sent to and from remote sites with relative ease.

26 Information collection and transmission technologies will continue to improve in the future, allowing data on factors such as sea temperature, salinity, sea surface

[6] The Ministry of Economic Development is current leading a bioprospecting policy project, examining how to maximise benefits to New Zealand

height, currents, winds and ocean colour (i.e. phytoplankton) to be monitored in near real time.

27 The computing power and complex software needed to model this information is becoming available today. In the near future we may be capable of establishing models that integrate all relevant data to create a quantitative and complete picture of active processes in the sea, and which are also capable of forecasting events and trends in the marine environment – for example climate change, the occurrence of harmful blooms and the onset and dispersal of pollution. One key challenge for the future is to determine how these models and their outputs should be incorporated in decision-making systems.

28 Another possible application of future technology is the delimitation and monitoring of property rights. Such technologies could help to reconcile the different uses of space in the marine environment through precise monitoring of activities across different locations (e.g. sonar, satellites, tagging).

Encouraging wealth creation: policy problems

29 It can be argued that current management frameworks do not encourage new opportunities to create wealth from our oceans. These are the major 'problem areas' for an Oceans Policy to address:

- allocation of space and conflict between activities
- gaps in the legislative regime
- uncertainty and inconsistency around the assessment of environmental effects.

Allocation of space and conflict between activities

30 Within the territorial sea, the Resource Management Act permits activities in relation to their environmental effects[7]. The focus on environmental effects does not address a wider spectrum of considerations relevant to reconciling different uses, and there is often unclear specification about the nature and security of rights and responsibilities. The 'first come, first served' nature of the consent process does not provide a comprehensive framework to allocate space for different activities and reconcile their clashes with other uses and users. The recent problems with the aquaculture 'goldrush' demonstrate that problems around competing uses are already occurring.

31 Aside from issues around the conflict of activities, the Resource Management Act is not geared toward maximising economic opportunities in the oceans. The Act focuses on environmental effects, and councils do not have the mandate, or the tools, to determine 'best value' uses of the oceans[8].

[7] A major exception is the applicability of the Fisheries Act to management of fish stocks
[8] Although the currently under-utilised provisions for coastal tendering could perhaps help establish a more market-based, 'best value' approach

32 There are also problems with the integration of different marine statutes, both with each other and with the Resource Management Act. The framework established by sector-specific legislation, such as the Fisheries and Crown Minerals Acts, does not necessarily interface with the considerations of other statutes. For example, a marine farm may impinge on some of the space a fishing boat has traditionally used to catch its quota, or a marine reserve may be established in an area desired for a telecommunications cable or petroleum pipeline.

Gaps in the legislative regime

33 Outside the territorial sea, policy frameworks are either vague or non-existent. The Continental Shelf Act and Fisheries Act do allow for some types of extractive activity (mining and bioprospecting, for example), but the decision-making processes in these Acts, with regard to permitting activities and assessing environmental effects, are unclear and not geared toward facilitating investment.

34 For example, two years ago an Australian company applied for a minerals prospecting license over a seamount. The Continental Shelf Act gives the Minister of Energy the authority to grant permits, but does not specify any considerations or timeframes for the decision making process. The seamount was subsequently closed off to fishing activity through protective mechanisms under the Fisheries Act, causing uncertainty as to what activities could proceed. The permit has only recently been granted following an ad hoc process of discussion among relevant officials. Such an uncertain process does not promote investment confidence.

35 The establishment of many new technologies described earlier in this paper will fall into a policy vacuum, with no relevant laws to govern their establishment. A recent aquaculture application in Canterbury is close to extending beyond the territorial sea, with no certain policies in place to approve its construction or assess environmental effects.

36 New activities in the exclusive economic zone also have to be assessed in relation to their effects on existing uses. The establishment of a wind or wave ‘farm’ beyond the jurisdiction of the Resource Management Act would require assessment of the effects on other activities such as shipping and fishing. Again, there are no formal processes in place to balance these competing interests. This creates an undesirable situation for existing and potential users, who are unsure of effects on their interests, and have no certainty about the timeframes, costs and considerations of the decision-making process.

Uncertainty and inconsistency around the assessment of environmental effects

37 This paper has already noted uncertainty around the assessment of environmental effects, especially outside the territorial sea. New technologies and intensified use of the oceans will raise new areas for effective environmental management. For example:

- As the quota management system deals with a wider range of species, the cumulative effect of harvesting of individual species will increasingly need to be understood in terms of the wider ecosystem.

- New fishing techniques will provide both challenges and opportunities in relation to impacts on the wider ecosystem. For example, new techniques to avoid by-catch could have positive environmental outcomes.
- Some new technologies will have poorly understood environmental impacts, making environmental impact assessment difficult. For example, tidal and wave power could alter tidal currents, affecting the habitat of seabirds and fish in the area. The exact nature and scope of these changes will be hard to predict until the technologies are implemented and monitored.

38 Uncertainty about the environmental implications of new activities will test the robustness of decision-making frameworks. Inconsistency in environmental management frameworks, particularly in the exclusive economic zone, could provide considerable uncertainty and cost for investors.

Role of technology in meeting these challenges

39 New technologies will present a new range of management challenges, but they may also provide some tools to help better manage competing activities and environmental integrity. In the future we may have:

- increasing abilities to monitor the natural fluctuations of the ocean environment
- increasing abilities to model the effects of environmental effects at the ecosystem level
- increasing abilities to accurately define and monitor the extent of different activities and interests in the oceans
- tools to make more accurate and robust decisions based on accurate information and modelling techniques, assuming that policy making frameworks are able to incorporate new techniques of information management and modelling
- technologies and management techniques that reduce environmental impacts.

Conclusions

40 The promotion of innovation and wealth creation in New Zealand's oceans may be held back by some features of the current management framework that present uncertainty and high transaction costs to business. Key issues are the lack of clear processes to establish and reconcile different uses, unclear decision making frameworks, particularly outside the territorial sea, and uncertain/inconsistent environmental impact provisions, particularly in relation to new, untested activities.

41 Problems with the status quo could worsen in the future, with an increased demand for marine resources, and new technologies changing and intensifying use patterns in the oceans. New technologies will, however, also provide opportunities to overcome some problems facing marine managers now and in the future.