What are the Coast and Sea Worth?

November 2005

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Introduction

The somewhat provocative question posed by title of this paper is not easily answered. I will outline why. The Draft Oceans Policy provides a useful entry point into the topic [1]. The Draft Policy calls for a coordinated effort to "manage threats to our ocean and maximise opportunities for its sustainable use." The draft goes on to mention the need to address the threats and opportunities "… across social, cultural, economic and environmental dimensions of sustainable development." Information needed is identified as both "values-based … so that we can understand preferences … and empirical information …" Economics deals directly with preferences and it is an empirical discipline. Unfortunately information available on values – *viz.* relative values – is very limited.

The coast and sea is a complex of natural resources where different values and interests exist. Recent reforms highlight the complex property rights that underpin values and interests in the coast and sea. For example, the Aquaculture Reform Act 2004 amended five existing Acts – Resource Management, Fisheries Amendment, Conservation Amendment, Biosecurity Amendment and Te Ture Whenua Maori Amendment - and created two new Acts. The Foreshore and Seabed Act 2004 vested the public foreshore and seabed in the Crown and spelled out rights of access. Partial analysis of these reforms – that is, without due consideration of the linkages with other legislative frameworks – will fail to capture the economic values at stake.

The notion of total economic value, illustrated in Figure 1, provides a useful framework for identifying the valuation problem. In economics, value is based on the preferences an individual attaches to the services associated with goods and services. The maximum amount an individual is willing to pay for obtaining a benefit or avoiding a loss reflects the individual's preferences for the gain or loss. The minimum willingness to accept measures the compensation necessary for the individual forgoing a loss.

The coast and sea provides a wide array of services, some of which are currently being used in the production of goods. For example, labour and capital (market-priced factors of production) combine with fishing rights to produce seafood. Similarly, labour and capital combine with extraction permits to produce sand. Both of these outputs are market-priced and measuring the values associated with the exercise of rights is relatively straightforward. However, expenditure to derive value from the coast and sea is not limited to the production of market valued outputs. For example, recreational fishers spend money on gear, travel, and so on, in order to fish. The output (utility enjoyed by individuals and families) is not valued in the market. These outputs are referred to as "use values".

Some people value the coast and sea that is independent of their present use. For example, people may gain utility from the knowledge that marine areas are preserved even though they may never visit the site. Natural resource values that are independent of individual's present use of the resource are variously termed "existence" and "non-use" values [2]. These values arise

from a desire to bequeath environmental resources to one's heirs, a sense of stewardship, and a desire to preserve options for the future. If non-use values are large then ignoring them could result in a misallocation of resources.

Figure 1 illustrates provides examples of the values that comprise total economic value. The next section provides a brief overview of techniques available for quantifying – the empirical information sought by the Draft Oceans Policy.

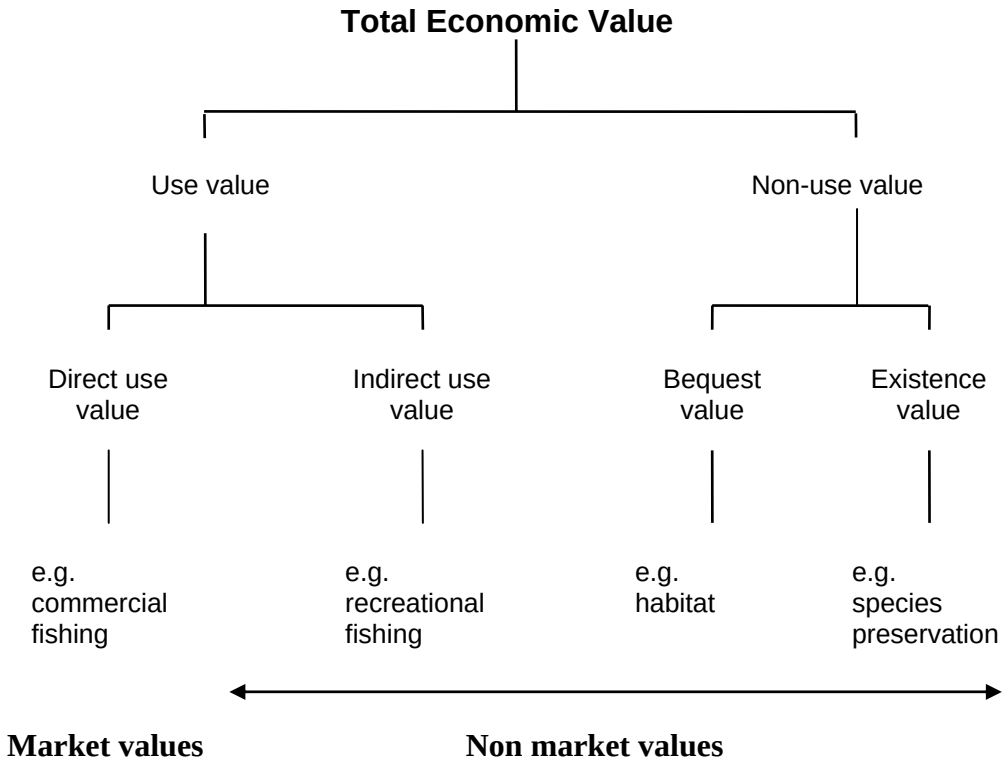

Figure 1: Total economic value

Market Values

Information on the market value of the coast and sea is limited. The seafood sector is New Zealand's 4th largest export merchandise earner after dairy, meat and forestry. Mussel farming covers around 3,920 hectares and for the year ending December 2003 produced exports valued at about NZ$140 m [3]. Over the same period exports from wild capture fin fisheries were approximately NZ$785 m. These data do not tell us what the value of the coast and sea is.

Economists use the term "rent" to describe payment for use of a resource regardless of whether it is land, labour or equipment [4]. In the 19th century

land was considered fixed in supply and its use seen to generate rents. The early economists used rent to describe a payment for the uses of the “original and indestructible powers of the soil”. Land was considered eminently suitable for taxation because the so-called “rent” was seen as a return to a natural resource in fixed supply. The idea caught on and remains with us today as a justification for taxing land.

Subsequently, the adjective “economic” was applied to the word “rent” for any resource supply that is fixed with respect to price. To illustrate, assume that the area of coastal space accords with the notion of fixed supply. Users combine coastal space with inputs, such as labour and other intermediate factors of production purchased at market prices. Profits arise from the difference between revenue and the total cost of market priced inputs. The demand for coastal space will be the contribution of coastal space to profit. Long run rent (value) is the payment to coastal space.

Two preliminary observations can be made about rent (value). First, the market value of, for example coastal space, depends on the institutional foundations laid by governance. For example, the Aquaculture Reform Act 2005 provides the foundations for the use of coastal space for commercial aquaculture. Council-level demarcations of aquaculture management areas will obviously affect opportunities for profitable enterprise. Value will be revealed by tendering, should councils decide to use the tendering process. Site value will be further influenced by the quality of rights that attach to the site. For example, the duration of the permit to occupy space, the transferability of title and the ability to exclude others from free riding on investment combine to determine value. Second, the forces of supply and demand will work alongside the institutional structure to determine economic value. Other things being equal, value will increase if the profitability of aquaculture increases.

The concept of economic rent also applies to the stock and renewable resources that exist within New Zealand’s coastal environment. Stock resources, such as minerals, by definition do not appreciably increase over time. In simple terms, what is used now is not available for use in the future. Maui gas is an obvious example. Setting aside complicating factors – such as stock size, uncertainty, market structure, and so on - resource rent is the difference between the market price of the commodity (e.g. gas) and the marginal cost of extraction. Because time is involved (depletion of the Maui gas field spanned at least 30 years) the total value associated with the use of a stock resource, such as gas, would be the present value of rents over the period of use.

Renewable resources by definition can be utilised indefinitely provided use rates are managed in a sustainable manner. To illustrate, the Fisheries Act 1996 provides for the utilisation of fisheries resources while ensuring sustainability. The annual total allowable catch is a key instrument used to

move stocks towards maximum sustainable yield. It is worth emphasising the point that New Zealand's quota management system provides the basis for transferable harvesting rights, it does not provide a right of "ownership" over fish in the ocean. It is a right to harvest. Maintaining the highest possible quality of transferable rights is an essential component of New Zealand's commercial seafood industry. Moreover, quota trading generates information on the value of rights. In principle, fisheries managers can use this information to guide decisions that enhance value [5].

The market value (resource rent) that attaches to natural resources is therefore the outcome of commercial decisions by resource users working within the parameters of government policies that apply to the coast and sea. Changes in value will fluctuate with economic conditions and changes to the ambient environment. Regardless of whether we are dealing with stock or renewable resources, the system of property rights used to govern access and control will have a significant impact on value. It has long been established – in theory and empirically – that open access to positive resource rent – where total revenue exceeds total cost – leads to rent dissipation. We can conclude that if extraction/use of the ocean's resources is profitable, then resource value should be nonnegative.

To summarise, value arises from the profitable use of market priced factors of production in combination with scarce coast and sea resources. On the surface the concept of resource rent appears reasonably straightforward - it is the marginal value of the resource. However, identifying and measuring resource is not straightforward. At any point in time resource rent is contingent on governance, market conditions, and expectations. A fall in demand for the commodity *ceteris paribus* (e.g. mussels) would result in resource rent trending down. Growth in energy demand would increase rent attributable to natural gas.

Non-market Values

In the 1970s environmental groups were particularly critical of economic analysis as a tool to guide decision-making. Their concern was that important environmental impacts were being omitted. Today, economists are able to offer a range of techniques that attempt to measure the values attached to environmental outcomes.

The term "non-market value" has been coined to describe situations where individuals derive benefit from enjoying a service that is not traded in the market. For example, boat owners derive value from access to fishing and recreational sites; divers benefit from exploring reefs; swimmers benefit from swimming in open and pollution free water; and so on. Often, these values might intersect leading to conflict. For example, jet skiers and swimmers recreating in the same area can be hazardous. Popular navigation passage could be compromised by aquaculture. These conflicts, which are most often

resolved through planning interventions, are relevant to the topic in the sense that value maximisation – if that is what policy is aimed at - requires both a consideration and balancing of the multiple values that exist in the coast and sea environment. Valuation techniques fall under two broad categories: indirect and direct methods.

Indirect valuation methods use information generated in related markets to infer a value to an environmental asset. The travel cost method has a long history. Entry to public recreation sites in New Zealand is typically free; without price variation we cannot estimate demand functions and quantify benefits. The idea behind the travel cost method is to infer how a given group of site visitors would respond to changes in the money travel cost. A study by Choe *et al.* provides a very useful example of how the method can be used to measure the economic benefits of improving the quality of urban water discharging into a swimming beach [6]. Quantitative estimates of the damages provided a basis for comparing the costs of infrastructure investment against the benefits. Travel cost is well-suited to measure use values (see Figure 1) but not non-use values.

In 1993 a collision between two vessels, one of them carrying heavy oil, in Tampa Bay, Florida, resulted in a massive oil spill. Thirteen miles of coastline was closed until the clean up was completed. A travel cost model was used to estimate the dollar impact (damages) of the spill on residents. The result was a settlement of US$2.5 million as compensation for lost recreation services. A similar approach was used to assess the impact of an oil spill off Huntington Beach, California; in this case the jury awarded damages of US$11.2 million.

Hedonic pricing is another indirect valuation method. It uses the fact that goods have a set of characteristics and demand depends on the characteristics. It can be thought of as analysing choice among brand names of a product, since brands are differentiated by attributes e.g. in Auckland, houses are differentiated by location and views of the sea. When buying a house, the buyer is making a choice about particular attributes – location, noise, air quality, and so on. Individual preferences, as revealed in location decisions in the market for housing, can reflect demand for “a view of the sea”.

The contingent valuation method is the most common direct valuation method. It is a survey method that asks individuals to reveal personal valuations on changes in un-priced goods by using contingent markets. Contingent markets define the amenity (e.g. marine reserve), the status quo level of provision (no reserve), the institutional structure under which the good is to be provided (Department of Conservation), the method of payment (e.g. income tax) and the decision rule that determines whether or not to implement the change. Estimates of willingness to pay are based on responses to the questionnaire. The Exxon Valdez oil spill is one of the most widely cited examples of contingent valuation. The possibility of Exxon being forced to pay for use and existence

values (see Figure 1) placed the technique under the microscope. A panel of experts, including a number of Nobel Laureates, concluded that applications of the contingent valuation method can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values [7]. In late 1991 Exxon settled the natural resource damage suit for US$1.5 b payable over 11 years. Lost existence values were estimated to be US $3 b [8]. It is not known whether this study influenced the size of the settlement.

Conclusions

Governance of coastal and sea resources is in its infancy; not unlike that associated with land many years ago. Some property right structures are reasonably well-developed and continue to evolve over time - for example those underpinning commercial fishing - and provide a firm foundation for economic growth and prosperity. Recent reforms – for example the Aquaculture Act – introduce new systems of property rights and governance. In terms of economic value, the dynamic unleashed by this legislation will be revealed in time. In principle, both systems of governance have a capacity to generate information on value.

The challenge facing policy advisors is to grapple with intersecting interests in the coast and sea, particularly those of a non-market nature. In the presence of scarcity the total economic value framework highlights the opportunity costs (that is, the values impacted) associated with policy initiatives. Some claim that insufficient space has been set aside for reserves; others will claim the opposite; and so on. Whoever crafted the Draft Oceans Policy statement is correct, sound policy initiatives require robust information on values. A final word of caution though, policy advisors should not lose sight of the linkage between values – both market and non-market – and the system of property rights and governance.

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