

The **Allen Consulting** Group

## **Market-Based Approaches to Marine Environmental Regulation**

Stage 2: Instrument assessment framework and case study

Report to New Zealand Ministry for the Environment

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## Chapter 1

# Introduction

This study examines options for using market-based approaches to maximise the value and sustainability of New Zealand's marine resource. These can be powerful tools for achieving policy goals through the use of prices and profit opportunities. Depending on the circumstance, they can sometimes be used in conjunction with or as an alternative to regulation, though some degree of regulation will invariably be required to establish the supporting rules and framework for a market instrument.

Nations around the world are focusing on the opportunities and challenges associated with managing their marine resources — and the role that market-based instruments (MBIs) might play in an optimised policy approach. MBIs are achieving an increasing following among policymakers as tools for promoting an efficient alignment of economic and environmental values. A shortlist of potential benefits highlighted by the United Nations Environment Programme (UNEP) is reproduced in Box 1.1.

### Box 1.1

#### POTENTIAL OF ECONOMIC INSTRUMENTS IN RESOURCE MANAGEMENT

##### *Economic instruments (EIs):*

- 1. Provide flexibility in achieving the overall cost of reducing emissions** — EIs ensure that the overall economy-wide cost of meeting specific emission targets are reduced by allowing the market to determine how much pollution each specific firm can reduce. In this way they encourage firms whose emission reduction is less costly to abate more rather than forcing every firm to meet a specific emissions level.
- 2. Act as incentives for the use of innovative abatement technologies** — Since firms can trade in emissions, and because emission reductions have financial value, firms have a continued incentive to invest in abatement technology innovation since extra reductions can be sold to others.
- 3. Allocate environmental and natural resources to parties who value them most** — Properly structured EIs ensure fair allocation of environmental and natural resources and encourage their sustainable utilization while at the same time raising revenues for the government in the form of resource rents.
- 4. Guarantee self-enforcement by aligning public and private interests** — EIs create a decentralized and self-enforcement system for environmental policies by creating an incentive for agents with vested interests to ensure the proper use of environmental and natural resources. Thus the burden of control is taken away from the state.
- 5. Increase transparency in resource use and allocation** — Application of EIs in environmental and natural resource management is appealing in the sense of their openness as the costs and rights associated with many EIs are more visible through trading levels, prices, ownership patterns and fee receipts. This makes it easy to evaluate investment trade-offs and discourages practices such as lobbying for special privileges or exceptions.
- 6. Help in cost-recovery of publicly provided services** — In the provision of publicly owned or delivered resources such as drinking water or oil, market pricing is applied in many markets. In others, their prices are set at levels that recover the full cost of providing them. The revenues can then not only be used to finance continued provision of these services but also in activities that encourage increased conservation.

Source: UNEP (2005), pp 9-10.

The potential — and challenge — in applying these instruments lies in establishing conditions in which behaviours and outcomes driven by profit seeking (and cost minimisation) are in harmony with broader community objectives.

These objectives will often reflect the enormous wealth embodied in the oceans resource — and its potential to support income-earning activity and economic growth — as well as its significant environmental value and contribution to social and cultural values. There is a need to recognise and achieve a balance across these ‘value’ dimensions so that the stream of community benefits can be maximised over the long term.

However, MBIs can be more suited to some situations than others. Their focus on economic incentives and market structures can reduce their applicability to some environmental management problems, and issues of cost, effectiveness and — in some cases — public acceptability can also diminish their suitability as public policy tools. They also need to be designed and implemented in a way that builds on, and integrates with, existing regulatory frameworks.

The following chapters expand on these issues. They provide an overview of the suite of MBIs available to policymakers in developing an effective management regime for New Zealand’s marine resources, and analysis of the characteristics that can promote or diminish the potential of an MBI to deliver targeted outcomes.

Chapter 2 provides a brief overview of the main categories of market-based instruments and their key characteristics. It also examines the use of these instruments in natural resource management situations.

Chapter 3 examines the preconditions or features that are necessary for the operation of these instruments and the features that can affect their performance in achieving cost-effective outcomes.

Finally Chapter 4 examines key marine policy objectives and the suitability of MBIs for application in these areas. This analysis develops a framework for assessing the potential for MBIs to promote marine policy outcomes.

This work is supported by a hypothetical case study in which this analysis is applied in the formulation of a marine resource management approach.

## Chapter 2

# Market-based instruments: a taxonomy

Market-based instruments (MBIs) span a range of measures and approaches. Fundamentally, they are policy measures that influence outcomes through their effect on costs and profits. In the hands of policymakers, they can affect the operation of established markets or create new ones. They are commonly also referred to as ‘economic’ instruments because they attribute value to assets and directly affect decisions based on considerations of price and income.

There is a growing literature on MBIs focusing on theoretical aspects and their practical application. The main categories of MBI, and their variants, are described below.

### 2.1 Broad categories and characteristics

MBIs are designed to influence the behaviour of resource users to ensure that resources are used more efficiently — that is, to ensure that the welfare associated with resource use is increased. A plethora of MBIs have been developed (see Box 2.1) — many of which share some core characteristics and can be grouped together.

Two basic categories are universally recognised:

- price-based instruments:
  - establish an explicit and mandated price for resources or outputs that are deemed to have a social or environmental cost associated with them; and
- quantity (or rights)-based instruments:
  - impose quantitative limits on resource use, and supplement these restrictions with rights of access or usage that can be transferred and sold.

A third class of MBI can also be added. This class is often used to capture a range of policy actions and approaches that operate on existing markets to help them work more efficiently, and deliver outcomes that maximise the benefits generated by resource consumption.

This group aims to correct market imperfections or ‘frictions’ that lead to poor resource use, and can be termed:

- market enhancement instruments.

This group of three is a handy categorisation of the wide range of market-based instruments and approaches that can be observed in use, and in development, across a range of public policy areas. Some analysts suggest extra categories (eg, Stavins (2001, p 4) proposes a separate category for ‘subsidy reductions’) while others (eg, Portney (2003, pp 15-18)) prefer a taxonomy based on the initial two.

## Box 2.1

**COMMON EXAMPLES OF MARKET-BASED INSTRUMENTS AND APPROACHES**

There are numerous examples of market-based instruments employed by policymakers as tools for resource and environmental management. Many of these have common characteristics and can be grouped accordingly. Instruments and approaches in common practice include:

- levies;
- royalties;
- emission and effluent charges;
- user / entry charges;
- product charges;
- administrative charges;
- tax differentiation (environment taxes);
- subsidies;
- grants;
- soft loans;
- tax allowances;
- deposit refund systems;
- market creation;
- transferable permit schemes;
- market intervention;
- liability insurance;
- enforcement incentives;
- non-compliance fees; and
- performance bonds.

Source: National Oceans Office (Australia) [www.oceans.gov.au/uses\\_economic/page\\_005.jsp](http://www.oceans.gov.au/uses_economic/page_005.jsp) (accessed 19/01/06)

All economists recognise the ‘value’ focus of MBIs as a core characteristic, and their operation on and within a market framework.

For the purposes of this report, and the key objectives of marine resource management some key options and approaches can be recognised. These are:

- charges and taxes;
- subsidies and tax concessions;
- property rights and market support; and
- tradable permits and quotas.

These will be focused on in more detail in the following discussion.

### ***Taxes and charges***

A pollution charge or tax can be defined as a ‘price’ to be paid on the use of the environment. On a practical level while charges and taxes operate in a similar manner, there is a distinction between the two. Charges are payments for which a good or service is rendered in return, while taxes are payments on the basis of, for example, the level of pollution for which no direct return in terms of goods or services is given (Industry Commission 1997, p 14).

#### ***Pigouvian taxes***

Taxes that are designed to ‘internalise’ social or environmental costs in private consumption and production decisions are known as ‘Pigouvian’ taxes — after Arthur Pigou, a British economist who worked at the turn of the last century and was influential in developing theory in the area of environmental taxes.

A Pigouvian tax is levied on a polluting activity in an effort to ‘privatise’ the cost to third parties of that activity. If it is possible to introduce an appropriately designed tax on those causing the externality, then a socially optimal distribution of resource use could be attained at the least cost to society (ABARE 2001, p 27).

The objective of the tax (and the rate that is decided upon) is to drive pollution output down to a level that equates the social and environmental cost of the pollution with the economic cost of further reductions. In effect, imposing pollution costs on the polluter gives an incentive to cut back pollution output to the level where social and environmental effects can be compensated (through tax payments), and the economic benefits of further production exceed the environmental costs associated with it.

User charges are a related method of ‘internalising’ costs associated with negative externalities or driving behavioural change. Rather than taxing activity levels or particular behaviours, they often involve a fixed charge for the use of environmental services, and can be reflected as an access or license fee.

Product charges or taxes could be introduced on products that could have a harmful effect on the environment — either in the manufacturing or consumption phase. They can be based on a product, such as the use of petroleum, or on a product characteristic, such as the carbon content in petroleum.

#### ***Subsidies and tax concessions***

A subsidy is a payment by government (directly or through another body) to those who undertake certain activities the government wishes to promote. A tax concession, on the other hand, reduces the amount of tax owed to the government by those undertaking such activities. Ideally, the size of a subsidy or tax concession should not exceed the overall benefits derived from the action or activity for which the subsidy or concession is given (Industry Commission 1997, p 14). Such measures tend to reduce costs and have an expansionary effect on the activities targeted —working in a broadly similar way (but opposite direction) to the Pigouvian tax described above.

Such measures, in theory, can provide incentives to address environmental problems. In practice, however, many subsidies promote economically inefficient and environmentally unsound practices because they have a tendency to promote over-consumption and additional production (Stavins 2001, pp 4-5). Pollution reduction aims tend to be served more efficiently by tax, rather than subsidy, approaches.

A variant on this is the deposit–refund system. Buyers of products that are potentially damaging to the environment pay a surcharge that is refunded to them when they return the product or container to an approved centre for recycling or disposal.

### ***Property rights and market support***

The underlying cause of environmental services being under-supplied (or pollution being ‘over-supplied’) is the failure of markets to generate appropriate values for these services (or negative externalities) by providing a framework in which resource owners, users, consumers and other stakeholders can share ‘value’ information and make satisfactory agreements for exchange at low costs.

Well-defined property rights are fundamental prerequisites for a market to function. Experience suggests that property rights are ‘well defined’ if they are adequately configured in three dimensions. According to Van Bueren (2001, p 5), the rights must be:

- defined clearly so as to reside with a specific person or entity;
- defended easily against non-owners who might wish to use or ‘steal’ the entitlement; and
- fully transferable by the owner to others on whatever terms are mutually satisfactory to buyer and seller.

Properly defined property rights provide the owner with an incentive to improve or preserve the resource beyond the time they expect to make use of it. Under these circumstances potential buyers of the resource would be willing to pay up to an amount equivalent to the benefits they receive for the right to use the resource. If property rights are well defined, then any further government intervention could be relegated to simply facilitating the exercise of these rights.

### ***Information***

Lack of information is a common source of failure in a range of markets. Public provision of information is a powerful means by which governments can facilitate the operation of markets and improve decision making by their participants (ABARE 2001, p 27). It can also entail governments undertaking (or funding) scientific and economic research aimed at understanding the dynamics and interrelationships in ecological and economic systems. Such information can be very important to determining values and risks for natural resource management purposes, and reflecting these in public policy processes.

Substantial gains can be made in environmental protection simply by reducing existing market imperfections. An example is the introduction of liability rules that encourage firms to consider the potential environmental damages of their decisions.

***Tradable permits***

Tradable permits are a particular example of creating a market for resource by allocating property rights over a resource that was previously 'common property' and hence vulnerable to over-use and exploitation. These instruments work by establishing some overall limit on environmental degradation, such as a limit on total pollution / emissions of substances or a quota on natural resources that can be extracted / removed. This limit or quota is allocated amongst market participants, who are then free to trade permits (which represent a defined quantity of their individual quota allocation). This system promotes economic efficiency by allowing scarce assets to flow to those who can extract the greatest value from them, and promoting constraint among those who reduce their usage most cheaply. This relatively straightforward arrangement is often referred to as a 'cap and trade' system.

As noted by OECD / IEA (2004):

Most tradable permit experiences link government regulations with markets. Permits delivered by governments to economic agents, most often firms, are recognised as a means of complying with a certain regulation. The permits are then simply recognised as tradable. In the case of polluting emissions, for example, firms are given allowances or permits to emit fixed (absolute) amounts of emissions over a given period of time. Firms that can cheaply reduce their emissions more than stipulated by the government regulation can offer to sell surplus emission rights to others that have only costlier options for reducing emissions. As a result, the total cost incurred by companies in achieving the environmental goal set by the government is lower than in case of pure 'command-and-control' environmental regulation .... and this benefits the society as a whole.

Philibert & Reinaud (2004), p.9

Basic trading approaches have spawned a wide range of variants that can differ in terms of the way tradable units are generated (and the obligations on those who participate in the system) and the allowable units of exchange.

Variations on the ‘permit trading’ theme can include:

- baseline-credit arrangements — depending on their design and the stringency of ‘baselines’, these can represent lower compliance obligations on participants — and be popular with industry for that reason. ‘Credits’ are created at the discretion of participants, and quota allocation arrangements can be either implicit or undefined within the scheme.
- offset schemes — allow a business to conduct an activity that may have negative environmental impacts in exchange for positive offsetting actions. This is basically a trading arrangement where ‘like for like’ is exchanged rather than negotiating a monetary ‘price’. For example, a business may be allowed to alter a wetland substantially if it agrees to undertake activities to protect, restore and / or enhance another wetland. A potential benefit of this approach is that businesses must directly account for environmental costs within investment and production decisions. However, to be effective, offset rates must accurately reflect the relationship between environmental damage and mitigating action. In some instances, it may not be feasible to resolve the scientific uncertainty associated with calculation of such a measure, or be satisfied that there is reasonable homogeneity in the assets and offsets being exchanged. Nevertheless, there are also examples of offset arrangements embracing — in principle — the potential for ‘monetised’ exchanges (eg, WA EPA 2006) — environmental damage might be offset through the purchase of tradable environmental credits or a contribution to a “...statutory trust fund with the ... purpose of ... environmental improvement activity” (Environmental Improvement Authority (Western Australia) 2006, p 9).
- bubble programs — an emission bubble allows an individual firm to increase its emissions in some production centres, provided these increases are offset with emission reductions in other centres. Firms are judged to be in compliance if the sum of individual emissions does not exceed the limit set for the bubble. This is an example of an airshed or ecosystem ‘equivalence’ (and non-equivalence) arrangement.

## **2.2 Common applications in natural resource management**

### ***Taxes and charges***

A wide range of ‘green’ tax or charging initiatives can be observed internationally — although few appear to have been designed and implemented with the explicit Pigouvian objective of restoring consumption or output levels to a social optimum. Nevertheless, to the extent that these arrangements have been implemented with a view to curtailing activity levels and easing environmental pressures, they can be thought of as Pigouvian in nature.

The EU Environment Agency reports a gradual increase in the importance of what it terms ‘environment’ taxes since 1980, though pollution taxes make up a relatively small share of this total. Dominant contributions in the ‘environmental’ category come from energy and transport taxes — and while both these are associated with social and environmental problems such as air pollution, greenhouse gas emissions and urban congestion, the extent to which they have been targeted as a pollution source, or as a convenient tax base (which tends to be relatively insensitive to price) is unclear.

The difficulty in assessing the ‘purity’ of Pigouvian taxes and the predominance of indirect tax approaches has been noted by Morgenstern (1995) in his overview of IMF survey work:

... the IMF has recently completed a survey of tax laws in 42 nations — industrial and developing countries, and economies in transition. They found that Pigouvian taxes were used in one or more instances in ten of the 19 OECD countries surveyed (mostly on hazardous wastes and aircraft noise). None was used in the U.S. and none was used outside the OECD except in the economies in transition where all four countries surveyed were found to use them. However, as the authors note, “it is easy to exaggerate the role of Pigouvian taxes because the rates rarely reflect environmental damages and, particularly in economies in transition, there is reason to believe that actual practices diverge sharply from legislated provisions” (McMorran & Nellor, 1994, p 8).

In contrast, indirect environmental taxes, including levies on fuels, energy, fertilizers, and beverage containers are widely used. The IMF found them in 20 of the 23 non OECD nations and in all 19 of the OECD countries surveyed. Unfortunately, definitional issues abound once you depart from pure Pigouvian taxes, and it is difficult to know exactly when a tax is properly labeled an environmental tax.

Morgenstern (1995), p.9

New Zealand’s own experience with the proposed carbon tax highlights the significant design and stakeholder issues that need to be dealt with in applying an environmental taxation approach.

In addition to pollution and effluent taxes, a Pigouvian approach can also be discerned in resource management arrangements such as the sale of recreational fishing licenses (which acts as an entry deterrent and can also provide a revenue source for re-stocking and monitoring) and plastic bag levies (aimed at reducing the incidence of litter).

### ***Subsidies and tax concessions***

Tax concessions and subsidies can be used to promote the use of a product considered more environmentally friendly than alternatives. Examples include concessional sales tax treatment of products such as recycled paper, or special fuel excise arrangements for bio-diesel, ethanol or gas. A wide range of subsidy programs operate in the EU, North America and other developed nations (including New Zealand) to encourage environmentally friendly activities such as renewable energy, energy conservation and more sustainable farming practices.

### ***Tradable permits***

Tradable permit systems are an increasingly popular method of environmental resource management.

One of the best-known examples of a tradable permit system is the United States’ system for regulating SO<sub>2</sub> emissions, the primary precursor of acid rain. A robust market of bilateral SO<sub>2</sub> permit trading has emerged among liable electricity producers, resulting in cost savings in the order of \$1 billion annually, compared with the anticipated costs under some command-and-control regulatory alternatives. This program has apparently had exceptionally positive welfare effects, with benefits being as much as six times greater than costs (Stavins 2001, p 28). Fisheries managers – including those in New Zealand – are also highly familiar with the use of tradable quota systems.

As noted by OECD / IEA (2004), trading systems are becoming increasingly widespread — in terms of their policy application and their geographic usage:

A quarter century after its first formulation, the concept of tradable permits has received numerous applications to preserve the environment and natural resources by rationing access to the commons. A survey a few years ago found nine applications in air-pollution control, seventy-five in fisheries, eight in the water and five in land-use control (OECD, 1999a). More recent developments include tradable renewable energy certificates ('green certificates'), tradable energy efficiency improvement certificates ('white certificates'), waste management, experiences or at least thoughts in transport and, last but not least, many developments in the field of greenhouse gases (OECD, 2002). Moreover, originally experienced in a relatively small number of countries (mostly the USA), tradable permit experiences are rapidly expanding throughout the world. For example, the EU is finalising its EU-wide CO<sub>2</sub> emissions trading scheme, while China has been experimenting with air pollutant emissions trading in six cities since 1994 — though with limited success (Greenspan Bell, 2003) — and its government is investigating a possible nationwide SO<sub>2</sub> emissions trading scheme (Yang & Schreifels, 2003).

Philibert & Reinaud (2004), p 10

### ***Property rights and market support***

Efforts to remove 'friction' from markets by reducing red tape and on-costs are widespread. Since well-functioning markets depend, in part, on the existence of well-informed producers and consumers, information programs can — in theory — help foster market-oriented solutions to environmental problems. The European Union established an 'Eco-label' in 1993, which was initially intended to replace existing national labels in Europe. By 1999, the Eco-label had been applied to 200 products, including detergents, light bulbs, linens and t-shirts, appliances, paper, mattresses, and paints. National labelling systems also continue to be used across the EU.

The German 'Eco-Angel' label program, the world's first, began in 1977. More than 4,200 products in dozens of sectors have received the label, including almost 600 foreign products. The Nordic Swan has been applied in Norway, Sweden, Finland, and Iceland since 1989, and now covers 1,000 products. The French 'NF Environment' label has been granted for paint products and garbage bags, and Spain's environmental label has been applied to ten classes of consumer products. The Czech Republic uses eco-labels on the basis of product life cycle analysis tests (paid for by applicants), and has issued 262 labels in 21 chiefly industrial product categories (Stavins 2001, pp 36-37). Eco-labels have also been employed in New Zealand. The Environmental Choice label has been licensed for use on over 200 products, spanning floor coverings to dishwashing liquid.

Experience has highlighted strengths and weaknesses in all these approaches, and their greater suitability to certain applications than others. These issues are addressed in the following chapter.

### *Chapter 3*

## Factors affecting MBI relevance and performance

The following sections discuss pre-conditions for the application of market-based instruments (MBIs) and factors affecting their suitability to certain policy objectives.

### **3.1 Framework conditions for MBIs**

There are several basic factors that will assist in successfully applying policy instruments to address environmental problems. The following conditions have been identified by Australia's Industry Commission (now the Productivity Commission) as being necessary for an environmental policy or measure to be successful:

- evidence that a significant environmental problem exists, or is likely to arise, which otherwise would not be adequately addressed;
- strong public and / or industry support for action to address the problem;
- availability of appropriate expertise to help design, implement and monitor the use of the instrument;
- capacity to establish an effective and efficient administrative and legal framework to implement the instrument;
- measures in place for reviewing, adapting and refining approaches to changing circumstances; and
- clear goals against which effectiveness can be evaluated (Industry Commission 1997, p 22).

A critical factor in MBI success is a supportive broader policy and institutional environment. Other government policies or institutional arrangements can reduce the effectiveness of MBIs if they provide an incentive for individuals or firms to undertake activities that result in outcomes that are counter to objectives of MBIs. For example, in the recent past, in a number of countries, subsidies have been used to promote resource exploitation and industry development, with no reference to environmental outcomes. Such policies can be inconsistent with existing environmental policies.

Governments must also have the legal rights required to create MBIs, and the conditions required for their effective use. For example, governments must possess the right to impose certain taxes and charges, to declare and assign property rights, to impose penalties for non-compliance, to determine allowable emission levels or to collect information in order to monitor the performance. In considering the appropriateness of certain MBIs, it is possible that choices may be limited by the legal capacity that a government has to implement different options. This can be reflected in issues associated with international jurisdictions and agreements (such as the Law of the Sea) and the obligations national governments can impose in these areas.

The structure and variation in the firms that impact (positively or negatively) on the desired environmental outcome is also important. Certain industries may be structured in such a way that means MBIs are not an appropriate policy tool or in a way that makes certain MBIs preferable to others. For example, Whitten et al (2004, pp 11-12) highlight the following lessons:

- the greater the degree of firm heterogeneity, uncertainty or variability generally the greater the gains relative to traditional command and control regulations;
- the less site-specific the impacts of pollution (that is, the less likely it is that hot-spots will develop) the more likely an MBI will be cost-effective;
- if outcomes are critical (for example due to threshold or irreversibility issues) then rights-based methods are preferred;
- rights-based instruments work best when the firms using them have experience with similar tools (such as trading in water markets) and there are low-cost mechanisms for exchange.

The availability of information is also critical. Relevant questions for policymakers in assessing and applying MBIs include:

- How (and over what time frame) will firms respond to the incentives that the MBI approach offers?
- How well can polluters and resource users be identified, and relevant activity levels monitored?
- How do proposed mitigation actions relate to environmental outcomes?
- How will the institutional environment evolve?

The Pigouvian tax is a good example of an instrument that, while offering considerable elegance from a theoretical perspective, faces a few challenges in a practical context.

Identifying the tax rate that will deliver the desired trade-off between economic and environmental benefits (and allow production to proceed at the ‘socially optimal level of pollution’) is a key challenge. This is often difficult because governments seldom have good information on production cost conditions in an industry, or how it will respond to a given level of tax or per unit charge. In such cases, governments must embark on a process of ‘price discovery’ — varying the rate in order to drive (or maintain) production levels at or near that identified as the social optimum.

### **3.2 Choosing the appropriate MBI**

The choice of MBI depends on the characteristics of the problem and the needs of the instrument itself. For all MBIs (and indeed other policy approaches) it is important to construct a clearly defined and measurable goal.

The inherent transparency and empirical nature of MBIs (which focus on catch units, litres or kilograms of discharge, dollars and / or units of production) imposes a discipline on MBIs that is seldom matched by other policy approaches.

In fact, a significant determinant of the performance of MBIs is associated with the capacity of these measures to be applied to activities (and constituencies) that are readily monitored, and are tightly aligned with the environmental or resource outcomes sought.

Legal and political considerations can also affect MBI choice. This and other aspects have been highlighted by Robinson & Ryan (2002) in a recent review of economic instruments for environmental management. An overview of these considerations — important to both instrument selection and design — is reproduced in Table 3.1. It relates to a wide range of issues — spanning tenure and access considerations for leasehold properties, and to the need to consider the impact of administrative costs in selection and design.

Table 3.1

**CONSIDERATIONS IN THE CHOICE AND DESIGN OF AN ECONOMIC INSTRUMENT**

|                                |  |
|--------------------------------|--|
| Tenure                         | Land ownership significantly affects instrument design. If the issue being addressed is largely on freehold land then it is likely to attract compensation. For state-controlled land, access and maintenance issues must be given more attention.   |
| Diffuse / Point Source Problem | Most tradeable permit or load-based licensing systems require accurate monitoring and are more amenable to point source discharges.  |
| Single issue Multiple Benefits | Instruments, such as carbon trading, address single issues with discrete benefits, such as limiting climate change. Where a problem (such as water quality) has multiple solutions or the solution (such as riparian vegetation) has multiple benefits. It is best dealt with through a combination of instruments or through flexible instruments, such as Environmental Management Systems, which can incorporate a broad range of management actions. |
| Available Information          | Design of market-based instruments generally requires reliable data on sustainable yields / limits and the operation of market instruments requires information on issues such as compliance costs. Regulation and financial incentive may be preferable in information-poor environments.   |
| Proportional Cost of Tool      | Charges, bonds and permit prices can have limited effect on management practices if they represent a relatively small proportion of the total costs for a firm or individual.  |
| Intended Environmental Outcome | Ideally, clear, science-based, quality or quantity standards should be stipulated from the outset and the instrument should respond proportionally to the achievement of those standards.  |
| Efficiency Gains               | Refer to any improvement in resource use over time as a consequence of the implementation of economic instruments to regulate emissions or product use. Water trading is regarded as leading to efficiency gains as entitlements tend to move to producers with the highest marginal returns. The criterion is difficult to assess if base-line environmental conditions or returns on investment in abatement technology are not readily available.     |

|                                      |  |
|--------------------------------------|--|
| Ongoing Incentives                   | Economic instruments, such as permit systems, that provide the incentive for perpetual self-management of emissions by industry are generally superior to those that are dependent on limited funding arrangements or require intensive administration and enforcement.  |
| Timing                               | When environmental degradation is imminent, instruments that are readily available are preferable to those that may take some time to implement. However, implementation of an instrument without due consideration of its impacts may also create problems.   |
| Flexibility                          | Some instruments may need to be responsive to ongoing scientific research and monitoring information to confirm their effectiveness and to facilitate any necessary adjustments.   |
| Equity Aspects                       | Economic instruments can have equity considerations that should be addressed or acknowledged in their implementation. Examples include:<br>(a) Charges for 'public rights' eg, access to National Parks;<br>(b) Differential treatment of similar entities eg, targeting properties for economic incentives while neighbours are denied funds;<br>(c) Flat charges or levies which act regressively, impacting most on those less able to pay; and<br>(d) Charges / subsidies leading to industry restructuring eg, cost recovery for water or prohibitively large discharge licence fees. |
| Transaction Costs                    | For market-based incentives, impediments to locating and forming agreements with buyers and sellers and government intervention in trading can create high transaction costs, reducing their efficiency.   |
| Community Acceptance                 | A perception of legitimacy on the part of the community is an important requirement for economic instruments to be effective. For example community support for environmental levies can evaporate if they are seen as merely a method for increasing general revenue. Emissions caps and trading rules also require legitimacy and certainty to gain market acceptance and induce trade.  |
| Administrative Feasibility and Costs | Financial instruments should not cost more to administer than equivalent command and control regulation and established market instruments should theoretically have low enforcement and administration costs. Nonetheless, costs and management of the instruments should be kept within the capacity of the administering authority. As such, complex emissions trading schemes may be inappropriate for small local governments.  |

Source: Robinson & Ryan (2002), pp.6-8.

In considering instrument selection and design issues it is critical to establish and build on a solid foundation of information. This process of scientific investigation and knowledge accumulation should generally precede policy action, and is critical to orienting and monitoring an approach based on economic incentives and the use of transparent metrics.

**Price versus quantity-based**

There is a range of perception and social acceptability issues that come into play for political decisions makers in choosing between a price-based approach (eg, taxes and charges) or quantity (eg, licenses and quota) to a resource management problem. Issues in this regard can include the optics of 'handing over' or selling exclusive rights to common pool resources, or governments imposing a new set of tax or charging arrangements. However, there is a set of economic efficiency (and environmental efficacy) considerations that can also be important in choosing between these policy approaches.

A dimension already mentioned relates to urgency or certainty of outcome. As noted, if policymakers have identified a particular resource outcome that needs to be achieved, and attach a high level of importance to that outcome, then a quantity approach — involving access restrictions and quotas — is likely to provide the most reliable and immediate result.

However, trading activity (and the economic flexibility it offers) can take some time to establish. Costs associated with complying with the revised level of resource availability can be higher in the meantime. On the other hand, a price-based approach automatically allows for the possibility of additional resource consumption (and avoidance of unwelcome shortages and price spikes) — provided the price is met.

The efficiency rule for choosing between environmental management instruments under conditions of uncertainty is known as the Weitzman Theorem. Weitzman (1974) demonstrated that where the value of marginal benefits and costs associated with abatement are uncertain, but where economic costs are likely to increase faster (ie, have a steeper slope) than environmental benefits, a smaller welfare loss is likely to result from a pricing mechanism than a strict quantity constraint (Weitzman 1974).

This simply recognises that, if there is a risk that policymakers might under or overshoot the socially optimal pollution level, it is best to lock in a quantity target (and risk an increase in abatement costs) if adverse environmental impacts are rising strongly — but if the risk of a blow out in compliance costs is of greater concern then a price approach is the better choice. In practice, this implies that quotas are likely to be appropriate for managing a hazardous pollutant discharges or threatened species or habitat, while a tax approach would be an appropriate instrument for dealing with a relatively benign pollutant or slowly accumulating environmental threat.

On-costs must also be considered. These are relevant to choices between MBIs and also to consideration of MBI options relative to adoption of a regulatory approach.

For a quantity approach underpinned by trading, there is a need to develop contracts of exchange and absorb costs such as negotiation or search fees, brokerage and insurances in order for trading to take place. Allocation of permits or licences can also involve significant time and effort on the part of government — with due consideration of the potential efficiency and equity implications involved. This has been a complex and protracted exercise for policymakers looking to establish a domestic permit trading system for greenhouse gas emissions.

For a tax (or subsidy) approach, trading costs are avoided — but business compliance costs still apply, as do costs associated with revenue collection by government. Efficiency implications can also be associated with incentives for evasion under a price approach relative to a trading system in which the tax 'liability' is commoditised and converted into a tradable 'asset' that is exchanged between commercial entities.

MBIs have generally been more effective where emissions are from a point source such as a pipe, or smoke stack discharging from an industrial facility than when emissions are from diffuse sources (eg, agricultural run-off). This is due to differences in the feasibility and cost of monitoring stable 'point' sources versus populations and activities that are atomistic, opportunistic or volatile.

The feasibility of applying a trading system to a diffuse source (such as the flow of nitrates into Lake Taupo) will be heavily influenced by how reliably policymakers can monitor and attribute pollutant flows. Measurement and attribution are important dimensions for a trading system.

The choice of price-based instruments is influenced by a key set of institutional rules — rules about who is responsible for paying the cost of mitigation. These rules are often less formally institutionalised than property rights and often set on a once-off basis in specific legislation. In an investigation of market-based approaches, CSIRO (2004) noted that precedent is often an important basis for institutional rules — environmental charges are much more likely to be politically acceptable where there is some tradition of making the polluter pay. Likewise, incentive payments and tendering approaches are more likely to be politically acceptable where there has been a tradition of charging the general public for provision of public environmental goods (CSIRO 2004, p 33).

### ***Tradable permits***

Trading systems are likely to be feasible and appropriate for situations in which:

- there is a willingness to grant private property or exclusive access rights to a common pool resource;
- the traded commodity is relatively homogeneous and significant qualitative differences do not apply; and
- resource or environmental conservation is a principal objective.

However, a range of factors can also mitigate their performance and these need to be taken into account in determining their suitability for purpose. The OECD (2003) has highlighted these attributes and the potential for combining trading with other approaches. A brief discussion of these cases is provided in Box 3.1. They highlight the desirability of a market with many players and good acceptance of the tradable unit for liquidity purposes and the possible role of supplementary ‘market support’ measures and mechanisms for covering off the risk of a cost ‘blow-out’.

## Box 3.1

**LIMITS AND COMPLEMENTARITIES IN THE USE OF TRADABLE PERMITS**

- Dealing with spatial differentiation of impacts

Work on tradable permits has revealed that it is important for the smooth and efficient functioning of the market that the permit market be very broad. However, for pollutants whose impacts vary by place of emission, this implies that the permit price will only be incidentally associated with marginal damages for most emitters. There is, therefore, a trade-off between efficiency in the market for permits and the equalisation of marginal abatement costs with marginal environmental damages. In order to mediate this trade-off it may be preferable to use direct regulations as constraints on trading, rather than complicating the permit regime itself.

- Technology market barriers and failures

Most tradable permit regimes target emissions (or a close proxy). Under perfect market conditions, such a regime should 'call forth' the optimal rate and direction of technological change to reduce these impacts. However, if there are significant market failures which adversely affect the development of technologies for abatement, then it may be necessary to introduce complementary policies to overcome such failures if the environmental damages are to be reduced at least costs. Instruments such as subsidies and renewable energy credits may serve such a role.

- Expanding regulatory scope

The flexibility of tradable permit regimes allows them to play an important role in expanding the scope of the regulatory authority's reach, particularly when used in conjunction with other instruments. For instance, effective combinations can be devised to allow for voluntary adherence to tradable permit systems or to encourage regulated firms to improve environmental performance in unregulated firms. Using tradable permits can be a lower-cost option than extending regulatory reach by expanding the scope of direct regulations to areas which are difficult to reach.

- Reducing cost uncertainty

Tradable permits have the singular advantage of environmental effectiveness. Unlike any other instrument – including direct regulations – the achievement of a particular environmental objective (if expressed in terms of emissions) can be achieved with certainty. However, they have uncertain cost implications. Using taxes as a cap on permit prices and subsidies as a floor, can reduce this uncertainty. By reducing risk, this can have benefits both for affected firms and for the regulatory authority.

Source: OECD Working Party on National Environmental Policy (2003), p 33.

Use of environmental offsets is also relevant here, as an approach that embodies a trading function with an onus on policymakers ensuring that a 'like for like' or 'equivalent value' (or higher) exchange is being made. Issues can arise in determining circumstances and thresholds that trigger 'offset' requirements, the type of trades that are allowable, and situations where environmental or biodiversity assets are so unique that they cannot be adequately replaced or compensated for. These are judgements that must be made by governments.

### ***Subsidies and tax concessions***

Whilst providing an incentive to change behaviour, and in many cases giving polluters the flexibility to do this in the manner they choose, subsidies and tax concessions do not cause the polluter to internalise the costs to the environment of their polluting activities. In fact, by providing an additional — albeit earmarked — source of income to polluters, they can encourage expansion of the polluting industry and diminish the abatement outcome relative to a policy that caused pollution impacts to be internalised as a business cost (Baumol & Oates, 1988, esp. Ch 14, and Parry, 1997).

Subsidies and tax concessions may also have the undesirable effect of rewarding those who have been poor environmental performers prior to their introduction, or encouraging an increase in polluting activities in anticipation of a beneficial subsidy (linked to past emissions) in the future. Such payments may also be inefficient where they are made to those who would undertake action even in the absence of a financial incentive. These design and incentive issues are discussed at length in the economics literature in the context of ‘moral hazard’ and ‘adverse selection’.

Despite the arguments against subsidies and tax concessions, there may be situations where a firm is unable to capture sufficient benefits from undertaking a certain activity and the desired behaviour is unlikely to occur without the provision of an external financial incentive. In these cases, and where effective polluter pays measures cannot be devised, the use of subsidies and tax concessions may be desirable (Industry Commission 1997, p 17).

In principle, subsidies may be appropriate in cases where:

- a socially or environmentally beneficial activity can be reliably targeted (producing a benefit is generally not equivalent to ceasing to generate a cost);
- mandatory coverage of a target population is not feasible; and
- budget constraints are not critical.

### ***Taxes and charges***

Taxes and charges are suited to situations where the individuals responsible for the problem or the polluting activity can be readily identified. However, the costs of monitoring and enforcement may still be high because of the need to ensure that all individuals responsible for the problem are subjected to the tax. Where a tax or charge is used, the individual or firm responsible for the environmental damage bears all of the costs of changing resource use or management practices.

Taxes and charges can be appropriate in situations where:

- the risk of ‘excessive economic costs’ dominate concerns about potential costs associated with insufficient environmental action;
- the action or commodity to be taxed is the direct cause of the negative externality being targeted, or is closely connected to it;
- there is clarity over the rate of tax necessary to reduce pollution output to socially acceptable levels,
- significant equity issues do not arise (ie, a tax approach that impacts heavily on a low-income or disadvantaged community may not be consistent with over-arching welfare objectives); and
- there is a desire for improved cost recovery, or expanded revenue.

### **3.3 Effectiveness of MBIs**

Experiences with MBIs offer some guidance to the conditions under which such approaches are likely to work well, and when they may face greater difficulties.

Where the costs and opportunities for pollution reduction differ widely among sources, or are uncertain or are likely to be changeable over time, a market-based system is likely to offer greater gains, relative to conventional, command-and-control approaches. This is because they do not mandate a blanket approach, but facilitate arrangements that attribute a price or value to community resources and allow individuals to adjust their consumption and activity patterns in accordance with that price and their own priorities and circumstances. The greater these uncertainties and divergences, the greater the potential benefits offered by MBIs.

However, implementing MBIs is not a costless exercise, and these costs and the costs that will be borne by administrators and participants in the system must also be taken into account. In comparing the effectiveness of MBIs with other regulatory options, it is necessary to consider the full set of compliance costs (taking account of production and consumption changes as well as transaction costs such as paperwork, brokerage, etc) implied by each, and the incentive structures established for resource management in the future.

In circumstances where policymakers have a good knowledge of costs and opportunities, and these are relatively homogeneous, it is feasible to make regulatory decisions on behalf of a broad population at a relatively low cost — and obviate the need for the significant cash transfers associated with taxes and charges, or the negotiating and contract costs associated with trading. This possibility is known as ‘efficient regulation’. However, in a dynamic setting in which tastes, technologies and prices change, it is inherently difficult to ensure that regulated outcomes will achieve community objectives at least cost. For this, the interaction and engagement of economic participants is important, and these dynamic benefits are a key advantage of MBIs.

Table 3.2 provides a broad summary of the relative strengths and weaknesses of a range of common market-based approaches. Their common link is that they influence behaviour through the use of a price mechanism — either by operating on an existing set of prices, or promoting explicit prices for community assets where none existed previously.

It is clear from the analysis that while some broad observations about the needs and performance of MBIs can be made, design and application of these instruments ultimately require consideration on a case-by-case basis.

Table 3.2

**SUMMARY OF MARKET-BASED INSTRUMENTS**

| Instrument type                       | Advantages   | Difficulties / disadvantages   | Relevance   |
|---------------------------------------|--|--|---|
| Emission and effluent charges / taxes | Low transaction and compliance costs for firms or individuals.<br>Promote technological innovation.<br>Create long-term incentives.<br>Raise revenue.<br>Create flexibility for polluters.<br>Useful when damage per unit of pollution varies little with quantity of pollution. | Setting charge / tax at the right level.<br>Require monitoring.                            | Discharge from point sources.<br>When monitoring is viable at a reasonable cost.<br>When pollution abatement is feasible.   |
| Product / user charges                | Reduce use of harmful products (for product charges).<br>Raise revenue.<br>Create flexibility for users.<br>Simple to administer.  | Setting charge at the right level.<br>Require monitoring.<br>Often weak link to pollution. | Products used in large quantities.<br>Where not feasible to monitor pollution from individual sources.<br>For products whose demand or output is sensitive to price changes.<br>Effective when sources are numerous and damage per unit of pollution varies little with pollution quantity. |
| Deposit-refund systems                | Reduces volume of waste / pollution.<br>Encourage safe disposal, reuse and recycling.<br>Create flexibility for users.   | Transaction costs may be high.<br>Markets for recycled products may not be well developed. | Most effective if applied to products with an existing distribution system and where reuse and recycling is technically and economically feasible.<br>For waste disposal- related problems.   |

| Instrument type                  | Advantages  | Difficulties / disadvantages  | Relevance  |
|----------------------------------|---|---|--|
| Tradable permits                 | Allocate resources to highest valued use.<br>Reduce information needs for regulators.<br>Create certainty regarding pollution or resource use levels.<br>Can reduce compliance cost.<br>Create flexibility for polluters.<br>Create long-term incentives. | Establishing an efficient market.<br>Setting overall level and initial allocation of permits.<br>Transaction costs involved in trading.   | Where environmental impact is independent of pollution source.<br>When environmental impact does not correlate with time of production.<br>Where there are enough sources to establish a market.<br>Effective when damage per unit of pollution varies with amount of pollution. |
| Subsidies                        | Encourage actions to overcome environmental problems.   | Externalities are not internalised by polluter.<br>May reward poor environmental performers.<br>May pay those who would undertake activity even without subsidy.<br>Cost to budget.<br>May stimulate too much activity.   | Where other instruments do not work or are too expensive.  |
| Property rights / market support | Enable goods / services to be identified, which can then have value attached, which in turn allows trading to occur.<br>Improves efficiency of market.  | May not be feasible where there exists environmental benefits for which payment cannot be extracted.<br>Jurisdictional issues can arise for example; international 'commons' such as the ocean or atmosphere offer limited opportunity to enforce property rights on the full set of users. | Where ownership of 'environment' is uncertain or non-existent.<br>Where significant information asymmetry is present.<br>Where environmental or social values are unpriced.  |

Adapted from: Industry Commission (1997) and UNEP (2002)

MBIs require some fundamental conditions to operate. Chief among these are:

1. a pre-existing market or capacity to create or award property rights;
2. a trackable target population that is influenced by cost and profit considerations, and which can substantially influence attainment of the resource management objective; and
3. a readily identifiable and homogenous metric that can be used as the focus of the instrument, changes in the value of which will drive behavioural change and outcomes that are consistent with the resource management objective.

It is via a focus on prices and measurable units in the hands of responsive market participants that MBIs drive change. Importantly, the effectiveness of MBIs will generally be a function of how well each of the above conditions is met. Determining this is a largely qualitative exercise and it is difficult to build a set of diagnostics that can be applied to reliably assess this in advance.

MBIs must be applied and tailored to particular resource needs. In many cases, commercialisation and privatisation actions on the part of governments can be understood in terms of the need to create a framework of private responsibility for resources, and the incentives for ongoing stewardship that that often entails.

## Chapter 4

# Applying MBIs in a marine context

The marine environment represents a large and diverse common property resource. The legal powers of governments over that resource vary from sovereign rights in in-shore areas to ‘economic’ rights to off-shore areas. Oceans and marine areas produce a rich mix of economic, cultural and environmental outputs that need to be managed to ensure benefits are maximised and an appropriate balance is achieved between consumption aims and the desire to enjoy these benefits, undiminished, over the long term. In New Zealand, government action has been directed toward optimising this mix through regulating some activities, and access to key resources. Some activities are open to all but are subject to general constraints.

The challenge of managing the marine resource can take on different aspects because of the range of functions and services it performs, and competition to extract these benefits. The challenge also includes the physical remoteness and size of the marine environment, lack of information about the environment and impacts of activities on it, difficulty in monitoring activities and different types of jurisdiction in ocean precincts. A brief overview of key marine resource management and policy challenges, and the implications for using market-based instruments to address them, is provided below.

### 4.1 Challenges of marine resource management

Marine resource management involves a variety of challenges. A fundamental feature is the need to deal with a range of competing uses and services provided by a resource that is communal in nature. The deep ocean is also a largely unexplored resource, whose wealth and importance to coastal ecosystems is still the subject of scientific investigation. The legal powers of the New Zealand government over the marine environment vary from full sovereignty over the territorial sea to sovereign rights to explore, exploit, conserve and manage the natural resources of the Exclusive Economic Zone (EEZ) and the continental shelf.

New Zealand is in the process of refining a comprehensive and integrated oceans policy that takes in the littoral zone and its territorial waters and extends to the limits of its EEZ — up to 200 nautical miles offshore — and continental shelf beyond. A range of significant activities are underway or in prospect within New Zealand’s EEZ (see Box 4.1) — the imperative to effectively manage inshore areas can be expected to be even stronger due to the greater competition for space and amenity in these waters, and their exposure to land-based activities.

The dimensions and challenges of marine policy are also highlighted by the extensive content of the US oceans policy document — *An Ocean Blueprint for the 21<sup>st</sup> Century* (US Commission on Ocean Policy, 2004). This 522-page document (plus appendices) covers a wide range of issues in its 31 chapters including:

- managing coasts and their watersheds;
- guarding people and property against natural hazards;
- conserving and restoring coastal habitat;
- managing sediment and shorelines;

- supporting marine commerce and transportation;
- addressing coastal water pollution
- limiting vessel pollution and improving vessel safety;
- preventing the spread of invasive species;
- reducing marine debris;
- achieving sustainable fisheries;
- protecting marine mammals and endangered marine species;
- preserving coral reefs and other coral communities;
- setting a course for sustainable marine aquaculture;
- connecting the oceans and human health; and
- managing offshore energy and other mineral resources.

These headings serve as a shortlist of the interconnecting issues that must be managed in the formulation of marine policy.

Nevertheless, despite the integrated nature of many of these issues, experience in other areas of resource management can be brought into play to help identify the characteristics that could lead to over-use or under-provision of the benefits that the ocean can provide, and opportunities to correct or alleviate these problems.

Box 4.1

**RESOURCE ISSUES IN NEW ZEALAND'S EXCLUSIVE ECONOMIC ZONE (EEZ)**

"New Zealand's marine ecosystems and species are highly diverse. This is due to a combination of factors, including our geological history and isolation, the range and complexity of habitats, and the influence of major ocean currents. The result is a wide variety, if patchy, distribution of marine plants and animals.

"Habitats in the EEZ include plains of mud; volcanic vents such as those near White Island, whose micro-organisms 'breathe' sulphur rather than oxygen; and the great coral-festooned sea mounts of the deep ocean. New Zealand is visited by a number of migratory species, and provides habitats that are critical to the long-term viability of some of these species, particularly marine birds that breed in New Zealand.

"Marine scientists estimate that perhaps as much as 80% of New Zealand's indigenous biodiversity is found in the sea. While many of our marine fish also occur in other countries' seas, many of our benthic (bottom-dwelling) marine species are found only in New Zealand waters. Evaluating the state of New Zealand's marine biodiversity is difficult due to the very limited information we have about deep-sea species.

"New Zealand's EEZ also provides us with considerable economic opportunities. Fishing (including aquaculture) is New Zealand's fourth largest export earner. However, despite the size of New Zealand's EEZ, its waters are relatively deep (New Zealand's offshore fisheries are among the deepest in the world) and not particularly rich in nutrients, so the productivity of our fisheries resources is relatively low.

"Oil and gas have been discovered in several parts of New Zealand's offshore territory, although the only commercial production has been the development of the Maui field, extending 35 to 50 km off the Taranaki coast. The government's recent decision to prioritise and create incentives for gas exploration (due to the decline in the Maui field) has stimulated petroleum exploration activities in the EEZ. A number of offshore oil and gas fields in the EEZ are being appraised and are expected to be developed over the next few years.

"New Zealand's EEZ also connects us to the rest of the world, with undersea telecommunication cables, ships and aircraft passing through the zone. Almost 85% of New Zealand exports by value (99% by volume) are carried by sea, and around 90% of international telecommunication services with New Zealand are carried on submarine cable systems (the remainder are carried via satellites). Consequently, a submarine cable failure could have a serious impact on the New Zealand economy.

"The oceans offer great potential for innovation and investment in a range of different wealth-creating activities. While a large amount of New Zealand's land-based and fisheries resources are already being utilised, the EEZ and continental shelf offer significant untapped space and resources for future developments."

Source: Ministry for the Environment (NZ) (2005), p 2.

***Sources of inefficiency in the use of marine resources******Common property characteristics***

Much of the marine environment is freely available for use. There are no natural barriers that restrict access to it, and there is nothing to inhibit those that wish to enjoy — or exploit — the benefits that it can provide. In a wide range of common property resource examples (such as air pollution and downstream pollution discharge on water usage) experience has shown that an absence of consumption 'rights' has also tended to be associated with an absence of resource 'responsibility'. In fact, signs that the resource is being depleted by over-consumption can lead to an expansion of effort to extract what is left before it is reduced further by someone else. The unco-ordinated consumption that is a hallmark of common property resources is an inevitable threat to ecological sustainability objectives; it is also associated with inefficiently high levels of harvesting or extraction effort, as productivity levels are reduced.

Common property and associated resource depletion problems are a well known feature of unregulated fisheries, and can also apply to other marine resources where over-crowding and unfettered access are characteristic. Recognition of these problems has, in many cases, led to a regulatory or market-based policy response. However, where present, these characteristics continue to act as a fundamental rationale for government action. The choice then becomes one of whether a regulatory or market-based approach represents the best response option.

#### *Unpriced positive externalities*

In addition to providing resources for wealth creation and private consumption, the marine environment also projects a range of social and environmental benefits that are enjoyed by the community. These ‘public’ benefits represent services that are freely provided and widely valued but go unpriced. The community value of these unpriced benefits represents a ‘threshold’ price that should be at least matched by any activity that would diminish the flow of these benefits. That is, policymakers must ensure, through appropriate valuation of prospective changes in social and environmental benefits, that marine-based economic activities enhance rather than diminish community wellbeing.

Positive externalities can be associated with biodiversity and ecological values, aesthetics and recreational amenity, health, cultural attachment, and water and air quality.

Spillovers and complementarities between activities can also be important. Examples could include opportunities to align offshore disposal with the creation of artificial reefs that benefit fish populations, aquaculture and recreational fishing and opportunities for eco-tourism.

#### *Pollution and other negative externalities*

The value and productivity of marine resources can also be threatened by pollution and other factors that impose costs that are not reflected in market processes. Just as the process of agreeing prices in a market framework can undervalue a resource when positive externalities are present (because the full set of beneficiaries are unrepresented), the presence of negative externalities can lead the market to over-estimate the value of (and hence over-produce) a good or activity.

Options for addressing these issues through the use of market-based instruments are discussed in the following section.

## **4.2 Aligning marine and MBI characteristics**

It is possible to view the use of market-based instruments through the lens of marine issues and population characteristics. As noted, a range of location and stakeholder-specific issues can and will arise that mean that this exercise must be undertaken with expert input on a case-by-case basis.

Nevertheless, the critical and common MBI requirements identified in the previous chapter represent an initial filtering device for testing the applicability of MBIs to a broad set of marine policy challenges. A demonstration of this is provided in Table 4.1.

Table 4.1

**APPLICATION OF THE MBI PRE-CONDITION CHECKLIST TO HIGH-LEVEL MARINE MANAGEMENT ISSUES**

| Marine objective  | Critical MBI pre-conditions                             |   |   | Remarks  |
|---|---|---|---|--|
|   | Pre-existing market and / or property rights capability | Influential and price / cost-sensitive population | Transparent and homogenous metric available |  |
|   |   |   |   | (Prospective MBI areas are shaded darker)  |
| Managing coasts and watersheds                          | yes   | no  | no  | Diffuse source and metric issues problematic   |
| Guarding people and property against natural hazards    | yes   | maybe   | no  | Information and insurance markets relevant   |
| Conserving and restoring coastal habitat                | yes   | yes   | maybe                                       | Access rights relevant, restoration values difficult                                   |
| Managing sediment and shorelines                        | yes   | no  | no  | Natural forces at work, limited link between target outcome and human systems          |
| Supporting marine commerce and transportation           | yes   | yes   | yes   | Priority bidding and peak usage charges feasible                                       |
| Addressing coastal water pollution                      | yes   | maybe   | yes   | Point sources available, option of tax or quantity limit                               |
| Limiting vessel pollution and improving vessel safety   | maybe   | yes   | maybe                                       | Limited jurisdiction on foreign vessels, monitoring difficulties - fines recommended   |
| Preventing the spread of invasive species               | no  | no  | no  | Natural or illicit / accidental human phenomenon                                       |
| Reducing marine debris                                  | no  | no  | no  | Natural or illicit / accidental human phenomenon                                       |
| Achieving sustainable fisheries                         | yes   | yes   | yes   | Quota trading increasingly practised   |
| Protecting marine mammals and endangered marine species | yes   | yes   | maybe                                       | Can establish limited access marine parks and catch quota                              |
| Preserving coral reefs and other coral communities      | yes   | maybe   | maybe                                       | Can establish restricted mooring rights  |
| Setting a course for sustainable marine aquaculture     | yes   | yes   | maybe                                       | Can auction rights (with social reserve price) and establish tradable discharge rights |
| Connecting the oceans and human health                  | no  | maybe   | no  | Metric and relationship unclear, jurisdiction limited                                  |
| Managing offshore energy and other mineral resources    | yes   | yes   | yes   | Established markets, tax and trading opportunities available.                          |

Prospective cases for the application of MBIs can then be evaluated more deeply in terms of the particular characteristics that are likely to lead to poor resource use outcomes, and the potential for an MBI to form part of an effective management package.

An example of this assessment process is provided in Table 4.2. In reality this would be a relatively detailed exercise recognising that MBIs are not passive policy tools, but can be adjusted and combined to fit particular circumstances. Greater detail is provided in a case study (Appendix A).

Table 4.2

**DETAILED ASSESSMENT AND DESIGN STAGE**

| Marine objective   | Source of resource use inefficiency |                                 |  | MBI assessment  |
|--|-------------------------------------|---------------------------------|--|---|
|  | Common property resource            | Unpriced positive externalities | Pollution and other negative externalities |   |
| <b>Conserving and restoring coastal habitat</b>          |                                     |                                 |  |   |
| Parameters   |                                     |                                 |  |   |
| 1. High visitations in vulnerable zones                  | yes                                 | yes                             | no   | Over-use of the resource likely. Reduction feasible through allocation of access rights, or a user-charge approach. Establish threshold value of site for multi-use assessment. |
| 2. High concentrations of nitrates from local paper mill | yes                                 | no                              | yes  | Consider pollution tax to bring discharge to tolerable levels or implement an allowable quota arrangement with non-compliance penalty.  |
| 3. Aim to enhance habitat for migratory coastal species  | no                                  | yes                             | no   | Consider potential for offset arrangements in generic zones.  |

A staged exploratory approach is likely to be required in developing a resource management regime that is appropriate to regional characteristics and the full set of community and resource values. This should have the aim of:

- achieving a solid understanding of the ocean resource (and its various dimensions);
- designing appropriate management tools that recognise and integrate those multiple uses and ensure community benefits are maximised; and
- putting in place robust arrangements that allow for changes and transferability in resource use, and protect the sustainability and underlying value of the system.

This approach is tailored to the values and issues associated with the marine resource, and the degree of certainty associated with these values. The scientific and valuation aspects of some resources may take considerable time to establish. In these cases, significant risks can be associated with early long term commitments to particular usage regimes and provision of property rights. These risks can be associated with loss of flexibility in future management or a failure to maximise the stream of community benefits from Crown resources.

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## *Appendix A*

### **Multiple use in a coastal plan area — a case study**

A range of complexities and interactions apply to development of resource management tools. The assessment and design processes described in this report are best illustrated by way of a broad example. A hypothetical case study is developed below for this purpose.

#### **A.1 Scenario: managing competing in-shore interests**

##### ***The marine resource management challenge***

Zone A is an area that is recognised as being of ecological significance. It extends from the low-water mark to a distance offshore of 3 nautical miles and for a distance of 10 nautical miles along the coast. It supports a variety of species and seabed formations, and is also a popular destination for commercial and recreational fishermen. On weekends it supports a moderate numbers of beachgoers.

Most of Zone A is classified to IUCN Category IV (ie, a habitat/ species management area), but a central area comprising 200 hectares offshore from the most popular beach is IUCN Category III (Natural monument) because of its rich abundance of sea life. This area also supports customary fishing activities.

In recent years, increased activity by the local trawler fleet has led to a decline in the fish population. Meanwhile, government has been approached by an aquaculturalist seeking to establish a floating pen covering 2 hectares adjacent to the main beach area. The supporting processing facility would discharge approximately 1.2 times the allowable level of biological residues into the ocean nearby.

#### **A.2 Analysis**

##### ***Step 1: Scope and discovery***

The marine resource is supporting a number of valuable activities:

1. commercial fishing;
2. recreational fishing;
3. recreational swimming; and
4. aesthetic and environmental values shared by the wider populace.

In the current usage regime, commercial and recreational values are increasingly in conflict, and fishing activities are also beginning to be affected.

An initial ‘scoping’ study is critical to evaluating the broad magnitude of the costs and benefits of the resource use issues involved. This evaluation is required to establish the level of further investment warranted in examining options and impacts.

Subsequent levels of investigative effort should be in line with (evolving) information on potential costs and benefits, and associated risks. Policymakers would consider alternative management options with due recognition of the:

- establishment and monitoring costs of alternatives;
- the full set of costs imposed on those affected;
- potential efficiency benefits;
- need to target effective outcomes at least cost; and
- desirability of combining particular management components into a ‘package’ that balances the costs and benefits to maximise the net return to the New Zealand community.

Project proponents would normally be required to fund research and in-depth evaluation of proposals where scoping suggested that there was significant potential for reduction in environmental or social benefits.

#### ***Identification of competing uses and externalities***

Access issues (competition for resources) arise in a number of areas:

- for fish – recreational fishers, commercial fishers, Maori fishers:
  - determine sustainable fishing level (eg, 300 tonnes per annum) and at-risk species, estimate degree of rivalry between uses, estimate value of resource access to non-commercial users (eg, via revealed preference or choice modelling techniques);
- for shoreline – aquaculture processing facilities, beach fishers, swimmers, boaters (ramp access):
  - assess impacts on availability of space;
  - how would this detract from beach amenity values;
  - if incompatible, favour highest value use;
- for inshore areas – aquaculture pens, eco-tourism, recreational boaters;
- for offshore areas – commercial fishers, recreational fishers and boaters.

Negative externalities:

- aquaculture residues (disease risk, nutrients):
  - allowable level established via scientific review;
- damage to sea floor from commercial trawling:
  - high level risks associated with intensive use of IUCN III area (potential for rapidly rising environmental and heritage costs, in parallel with weak increase in economic benefit) ;
- degraded aesthetics (aquaculture facilities and pens):
  - need to establish social costs associated with reduced beach amenity.

Potential positive externalities:

- protected habitat areas in customary zone may be a breeding ground for fish that disperse into commercial fishing zone:
  - investigate and if so, attribute higher value to this resource;
- aquaculture pens may enhance the environment in some way, eg, prevent beach erosion; or nutrients may increase the food supply for certain species of fish that is considered OK by recreational fishers but a poor commercial species:
  - investigate and if so, attribute a positive impact — to be assessed in an overall cost-benefit framework;
  - these dynamic effects are also important in developing a holistic management regime.

***Evaluate current management regime, and potential for MBIs***

What instruments are currently used to manage the commercial and recreational fishers and to promote environmental objectives?

Management options:

- commercial fishery:
  - implement tradable quota (requiring ongoing monitoring, and market development);
  - limited-entry fishery (licences, gear restrictions, restricted fishing times etc);
- recreational fishery:
  - unlimited entry (strong social value);
  - licences could be issued with annual fees and per trip catch limits. The annual fee could serve as a congestion tax;

OR

- restricted entry to area (significant environmental risks);
- auction off permits on a seasonal basis or provide permits free of charge using a ballot process;

OR

- invite fishing clubs to participate in tradable quota arrangement (possibly with free allocation);
- trade could be restricted to within the recreational fishing sector or inter-sector trade could be a possibility.

Externalities:

- for a single aquaculture firm:
  - standards with penalties for violation;
  - offset arrangement ;
  - tax on discharge (set at appropriate level reflecting science on costs and benefits.