AUSTRALIA'S OCEAN POLICY

Management Instruments for Marine Allocation and Use

Oceans Planning & Management Issues Paper 2

A Report Commissioned by the Commonwealth Department of Primary Industries and Energy
September 1997

R. Greiner CSIRO Wildlife and Ecology, Canberra

M.D. Young CSIRO Wildlife and Ecology, Canberra

A.D. McDonald CSIRO Marine Research, Hobart

M. Brooks University of Tasmania, Hobart

ISBN 0 642 54506 5

CONTENTS

EXECUTIVE SUMMARY

The Australian Government is committed to developing a comprehensive and integrated Oceans Policy to manage effectively the resources and uses of the Exclusive Economic Zone (11 million square kilometres) and, potentially, another 5 million square kilometres of waters under State and Territory responsibility.

This report focuses on management instruments. It displays a wide range of incentive instruments and exemplifies their potential role for the management of marine resources and uses. The term incentive instrument is interpreted broadly, including financial and economic instruments as well as legal and regulatory instruments, education, co-management, voluntary approaches, community-based mechanisms and research.

A set of criteria is established for the evaluation of individual management instruments. These criteria are:

- effectiveness and dependability;
- precaution;
- productive and economic efficiency;
- continuing incentive and innovation;
- administrative feasibility and cost;
- equity and distributional effects; and
- community and political acceptability.

The management instruments are further placed in the context of principles for policy design which include:

- user pays and polluter pays;
- cost sharing;
- sense of community, ownership and stewardship;
- adaptive systems; and
- ecosystem approach.

The report discusses the potential and applicability of an appropriate selection of incentive instruments in the context of managing marine resources and uses. It explores potential management instruments to:

- improve water quality of streams; estuaries and oceans;
- create sustainable fisheries;
- ensure sustainable marine tourism and recreation;
- manage conflict between user and interest groups; and
- ensure environmentally sound marine transport, petroleum exploration and mining.

With respect to administrative arrangements, the report suggests alternatives to the current institutional framework which may be better suited to managing the ocean-land interface and the multiple uses of the oceans in a sustainable manner.

1. INTRODUCTION

1.1 CONTEXT OF THIS REPORT

The Australian Government is committed to developing a comprehensive and integrated Oceans Policy for the effective management of the Exclusive Economic Zone, covering an area of over 11 million square kilometres of marine waters and their resources. The purpose of an Oceans Policy is to provide a single and strategic framework for the planning, management and ecologically sustainable development of Australia's fisheries, shipping, petroleum, gas and sea bed resources while ensuring the conservation of the marine environment. Oceans serve a variety of important functions. They are a:

- source of food and income;
- source of non-living resources;
- source of recreational enjoyment;
- medium for transport;
- recipient of waste products and pollutants; and
- source of biodiversity and ecological processes that underpin most of the above functions.

The size of economic activity of the major marine industries is estimated in excess of $30 billion annually. In order of their importance:

- marine tourism and recreation contribute 50 per cent;
- oil, gas and engineering contribute 27 per cent;
- shipping, transport and ship building 13 per cent; and
- commercial fishing and aquaculture 5 percent.

The majority of economic activity is related to marine biodiversity and ecological processes. Consequently, economic sustainability relies on ecological integrity of the oceans.

The 1997 Oceans Policy Consultation Paper identifies a range of issues that are seen as relevant to an Oceans Policy. The analysis of these issues, and identification and understanding of the underlying pressures and causes, is the basis for policy analysis. Some of the most pressing issues that oceans management has to address include declining water quality, pollution, habitat loss and the introduction of exotic pests.

Current pressures include those associated with declining fish numbers from overfishing, bycatch, wastes and runoff from land, oil pollution (mainly from land-based sources) and increasing beach and litter pollution. An increasing number of people use the sea and coastal environments for food, income and recreation, resulting not only in the (danger of) degradation of marine and coastal habitats but also in increasing conflict between various uses and, within the same use, between commercial, recreational and indigenous interests.

This consultancy report focuses on incentive instruments and elaborates on their potential role for oceans management. Its purpose is to examine how, in what circumstances and in what combinations, can regulation, economic and financial instruments and other incentives achieve national management goals for our marine resources. The terms of reference stress particularly that the study should analyse a wide range of potential management instruments against evaluation criteria and guidelines, without imposing conceptual constraints on instrument choice.

This study complements a research project by Sainsbury et al. on multiple use management in the Australian marine environment, commissioned by Environment Australia. Another study, by Pitts, prepared for the Commonwealth Department of Primary Industries and Energy, investigates best practice mechanisms for marine use planning.

To set the conceptual framework, this report begins with a definition of the environmental issues concerning oceans and the multitude of uses. From there, it introduces the concept of incentive instruments for supporting sustainable use and management of marine resources.

The term incentive instruments should be interpreted broadly and, although they play an important part, the list is not limited to market-based instruments. The spectrum of available instruments include financial and economic instruments such as emission permit trading, user charges, developer contributions, performance bonds and management levies. They also include legal and regulatory instruments, including punitive measures designed to avoid misuse of resources, and precautionary standards. The report evaluates the instruments with particular respect to their applicability for the management of marine resources. Each instrument is described with respect to a set of criteria that cover aspects of economic efficiency, equity and environmental effectiveness. Examples of potential applications and policy mixes are given.

The report goes on to explore alternative institutional arrangements that may facilitate the implementation of an effective Oceans Policy.

An Oceans Policy, if it is to provide a comprehensive framework for the sustainable management of marine resources, must foreshadow mechanisms that address the entire range of issues and embed them in the institutional framework of local government, State and Commonwealth Law and International Conventions on the Oceans. This report seeks to explore and identify opportunities to use different incentive mechanisms to improve the health of Australia's oceans and the opportunities that they offer for the people who use and value them.

1.2 KEY ENVIRONMENTAL ISSUES ASSOCIATED WITH THE USES OF MARINE RESOURCES

While the focus of this report is on oceans, it is essential to realise that many of the threats to marine biodiversity and marine productivity arise from land-based activities. Land-based activities, estuaries, coastal zone and marine environment are all intrinsically linked to each other. Figure1 develops a conceptual framework of the biophysical relationships relevant to oceans management and depicts the general geographical and institutional settings. Arrows represent impact relationships and indicate their directions.

It should be borne in mind that Figure1, in the interests of clarity, simplifies a highly complex system and abstracts the relationships. Complex biological systems such as oceans may not show immediate and linear responses to use and management activities but are characterised by threshold behaviour as well as time lags and spatial distance between cause and effect. Many impacts are indirect and some are cumulative.

The oceans are recipients of a cocktail of by-products from land-based production and consumption activities. Heavy metals are released in industrial production processes and bacteria and other biological carriers come from human and animal waste. The population increase along Australia's shorelines and corresponding industrial development have seen a rapid increase of sewage outflow into rivers, estuaries and oceans. In recent times, several incidents of people falling sick after the consumption of contaminated oysters have shown the direct impact of sewage and waste treatment and outflow on aquaculture and food safety. This reality is in conflict with the principles of waste minimisation and environmental protection.

Land use and storm water systems influence the nutrient load of rivers as well as turbidity and sedimentation. These are important factors for the health of estuaries, which are very important as nursery areas for many fish species and other marine organisms. Examples of such species include school prawns, yellowfin bream, luderick and sea mullet. The water that flows from estuaries also influences the surrounding coastal and marine environment. Key problems arising here include dieback of seagrass and the loss of coastal saltmarshes and mangroves through land fill and reclamation. Declaring some of these areas as marine protected areas helps to reduce direct impacts on marine biodiversity but does not stop the flow of pollutants onto them with implications for habitat modification.

A large percentage of marine activities centres around fishing, even though this industry only accounts for five per cent of gross income from economic activity associated with the oceans. Fishing is an exploitative activity and, although fish are a renewable resource, catch in a growing number of species has been declining5. Commercial fishing is organised around target species and

has a large impact on their populations. Bycatch is inevitable and affects other fish, birds, mammals, turtles and marine organisms. Some fishing methods, such as trawling, have a lasting effect on the marine flora and ecosystem. Recreational fishing and indigenous fishing are concentrated in estuaries and on the shorelines. The major impact is on the populations of target fish species. As recreational fishing is not dependent on income from fishing, cultural shifts such as towards `catch-and-release' can be an integral part of a new philosophy for the sustainable use of living marine resources. Recreational fishing remains largely unmanaged despite its potentially large impact.

Off-shore petroleum production is of great economic and strategic importance to Australia. Some 72 per cent of domestic fuels and natural gas comes from off-shore wells in Bass Strait, the Timor Sea and the North West Shelf6. General public concern over accidental releases or spills stems from their potential toxicity, their potentially large volumes and their unpredictability. Australian off-shore petroleum exploration and production holds a good environmental record with few small production spills of minor environmental impact. Other environmental impacts, some of which are cumulative, include effects of seismic surveys on marine organisms, the construction of platforms and laying of pipes, disposal of `produced water' which is present with the oils and contains traces of hydrocarbons, contamination by drill fluids and effects of increased shipping activity.

Marine transport is critical to Australia due to its isolated geographical position. Shipping and port operations produce a variety of environmental impacts such as pollution from oil, hazardous cargoes, antifouling paints, litter and sullage. A common and classic image of pollution is the grounded oil tanker. World-wide, however, operational discharges from bilge pumping and ballast discharges account for more than 70per cent of oil pollution from ships8.

A significant source of concern is the marine organisms foreign to Australian waters contained in ballast water which is being deposited along shipping routes and in harbours. Introduced organisms may change the existing marine flora and biodiversity through predation and competition and have the potential of causing severe economic damage to ocean-based industries. One example of ballast-water-introduced organisms is the Northern Pacific Seastar which has caused severe damage to aquaculture industries and to native species since it was introduced to Tasmanian waters in 1986.

Marine tourism and recreational activities are the major income earners within the industries that use estuaries, coast and oceans. Although this includes recreational fishing, non-exploitative recreational activities form a substantial part of this industry. Tourism businesses that offer snorkelling and scuba-diving activities, for example, rely essentially on healthy ecosystems to show their customers a large variety and number of fish and other marine fauna and flora. For maximal visitor experience, the impression of an intact marine environment must be coupled with good visibility. Visibility is a function of the sediment load of the water which is, at least in part, related to human activity. Other recreational activities such as whale, dolphin and seal watching depend on the reliability of sightings and therefore substantial populations of the `target' species.

Marine tourism and recreation are generally considered to be `clean' industries. However, they encourage coastal development for tourist facilities, accommodation and transport which are typically placed on or close to particular attractions. Negative environmental effects may include beach and dune erosion, loss of habitat, declines in wildlife and fisheries, and decline in water quality. A specific source of pollution associated with marine tourism is boat sullage which is being deposited into the marine environment. Although on-boat storage capacity is one impediment to bringing sullage on-shore, the major handicap to proper disposal is the inability of sewage treatment systems to cope with salt water.

2. INCENTIVE INSTRUMENTS

2.1 THE NEED FOR INCENTIVE INSTRUMENTS FOR MANAGING MARINE RESOURCES AND USES

Instruments for environmental and natural resource management can be defined as administrative mechanisms adopted by government agencies to influence the behaviour of those who value the natural environment, make use of it, or cause adverse impacts as a side-effect of their activities9. Young et al.10 describe incentive instruments to include motivational, voluntary, financial, property rights and regulatory mechanisms.

The Inter-Governmental Agreement on the Environment (IGAE)11, signed in 1992 by the Commonwealth of Australia, all States and Territories and the Australian Local Government Association, calls for the effective integration of economic and environmental considerations in decision-making processes. It identifies the need for the nation's international competitiveness to be maintained and enhanced in an environmentally sound manner, and it requires that the measures adopted are cost-effective and are in proportion to the significance of the environmental problems being addressed.

On the matters of valuation, pricing and incentive mechanisms, the IGAE demands that, in principle,

- environmental factors be included in the valuation of assets and services,
- the polluter should pay, ie those who generate pollution and waste should bear the cost of containment, avoidance and abatement,
- the users of goods and services should pay prices based on the full costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes,
- once established, environmental goals should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.

The Productivity Commission12 notes that the costs of meeting environmental objectives can frequently be reduced by employing outcome-oriented regulation and market-based instruments that provide firms with the flexibility to modify their production and/or consumption so that the requirement is met in a least-cost fashion. Governments in Australia are increasingly realising the benefits of employing a range of incentive instruments13. Victoria, for example, combines regulation with discharge licences, accredited licences and education programs in an effort to reduce water pollution. Overall, there is scope for a wider range of incentive instruments to be used more extensively.

This is particularly true for the management of the natural resources which are oceans based and comprise living and non-renewable resources. This report examines marine resources as a matter of national interest, deliberately disregarding the difficulties associated with a complex jurisdictional setting and consequent conflict between State and Commonwealth agencies. We present to the reader a listing of incentive instruments that have the potential for contributing to the sustainable use and management of these resources. The report exemplifies (potential) applications of the instruments and does not claim to be exhaustive.

Marine policy must deal with:

- the diversity of uses of the marine environment;
- the complexities of the biological system involved and the limited knowledge available;
- the common property characteristic of marine resources;
- the vastness of the Australian EEZ; and
- the difficulty of enforcing regulations.

Market-based incentive instruments have been suggested as being particularly suited to the sustainable use and management of this environment.

2.2 CRITERIA FOR EVALUATING INCENTIVE INSTRUMENTS

As natural resources have become more scarce, governments have looked into new approaches for environmental management. There are many uncertainties about how to design appropriate administrative systems for achieving environmental objectives. Market-based instruments have been a fairly recent addition to policy making. As a matter of general principle, it is very unusual for one instrument to be capable of solving a complex problem. Instead, a mix of instruments is necessary to achieve the desired outcome which requires concerted activities from a range of stakeholders and individuals, and to account for the variability in bio-physical conditions. Questions that require answers are whether direct regulations can and should play a supportive role and whether the introduction of a wider range of incentive instruments needs to be accompanied by a change of administrative arrangements for environmental and resource protection.

Government, financial, administrative and community resources are limited and must be deployed where they are most likely to have the greatest positive impact. Therefore it is important to assess the strengths and weaknesses of the range of possible incentive instruments in terms of the stated objectives and to identify the circumstances in which they are most likely to make a positive contribution to the outcome sought.

Three core criteria are commonly applied for policy evaluation. They are economic efficiency, equity, and environmental implications. In the literature, this core set is expanded to lists of criteria of varying form and number. In close relation to the criteria listed in Reimbursing the Future14, we employ the following criteria to evaluate incentive instruments for the use and management of Australia's oceans. Some of the criteria are inherently related but may be used to evaluate the policy instrument from different perspectives.

- **Effectiveness** and **dependability** relate to whether an instrument is technically suitable for achieving a specified goal and whether it will deliver a desired target even when knowledge about likely responses is uncertain. The type of environmental and natural resource system may be critical for the success or failure of particular instruments. Performance indicators are needed to monitor the effects of policies. Complex species and ecological interdependencies in marine ecosystems complicate their management, because they tend to give rise to the need for detailed information and complex enforcement procedures.
- **Precaution** is a criterion of utmost importance to the management and use of living natural resources when scientific information about systems behaviour is limited. This is particularly true for marine ecosystems which are far less well researched than land-based natural systems. Complex biological systems do not always show immediate and linear responses to use and management activities but are characterised by threshold behaviour as well as time lags and spatial distance between cause and effect. Precaution assesses whether an instrument avoids the chance of serious or irreversible consequences.
- **Efficiency** comprises two aspects. First, is deals with the effects of a policy on industry profitability. In general, productive efficiency of the industry will improve if a policy mechanism allows structural adjustment. Second, it looks at the economic efficiency in a collective sense, assessing the total benefits of the associated change in resource allocation against its total costs.
- **Continuing incentive and innovation** address the question whether an incentive instrument encourages experimentation and change and provides an ongoing incentive for improvement of industry efficiency and environmental improvement beyond a set target. In general, because they are designed to save costs and improve efficiency in the use of natural resources and the environment, some market-based instruments and administrative systems based on co-management principles provide an ongoing impetus to improve environmental technologies and management practices. They achieve this, in part, by taking advantage of intrinsic motivation. Intrinsic motivation is a characteristic of people who are already complying. Use is made of such motivation to design policy instruments that encourage people who are not complying to change their behaviour, without crowding

out the behaviour of intrinsically motivated individuals. Industry and stakeholder involvement in policy design and administration (co-management) is an important aspect of utilising intrinsic motivation. In contrast, regulatory instruments seek to achieve compliance through reward for just-compliance and punishment for non-compliance, thus leading to extrinsic motivation.

- **Administrative feasibility and cost** evaluates whether there are impediments to putting a policy mechanism into practice, assesses the risk of government and administrative failure, considers transaction costs, and assesses the efforts involved in administering and policing the instrument. In regulatory systems, these costs may be allocated to industry, especially under a policy of self-regulation (which, in turn, needs to be monitored by government or impartial industry associations). Incentive instruments may be set up for the specific purpose of raising revenue to cover administrative costs incurred by government agencies.
- **Equity** is a criterion that examines the **distribution effects** of a policy instrument within and among generations. At an industry and individual level, this includes an assessment of who are the winners and who are the losers when a new instrument is introduced and what are the regional employment impacts and flow-ons to other sectors of the economy. The long-term implications of natural resources management decisions lead to the issue of intergenerational equity, asking whether future generations may be disadvantaged by the introduction of a management system. Equity implications with respect to industry and consumer groups are important for the political acceptability of an incentive instrument.
- **Political and community acceptability** ask whether the policy is consistent with the previous commitments and philosophies of the parties in power and not likely to contribute to the loss of a subsequent election, and whether the industries involved and community in general are willing to support the policy. This criterion addresses the cultural, historic and social understanding of a society. Political acceptability is often linked to the compatibility of a new instrument with existing institutions and the acceptance by all members of parliament. Acceptability is a necessary condition for the durability of a policy. As a general rule, market-based policies minimise political and bureaucratic rents and the risk of government and bureaucracy failure because they apply to all people (in an industry) equally and in a transparent and durable manner.

Unfortunately, a single instrument may not be able to satisfy all these criteria simultaneously. Appropriate combinations of instruments can, however, achieve improvements in economic efficiency and equity, and may minimise environmental risks.

2.3 PRINCIPLES FOR INSTRUMENT DESIGN

Just as there are criteria for instrument evaluation, there are a few additional principles that need to be considered in policy design. The following list is not exhaustive but includes the most essential paradigms.

- **User pays** and **polluter pays** . The increasing awareness that natural resources are scarce and valuable has seen a move away from the notion that society should pay for their provision for production and consumption purposes. Increasingly, the users of resources are having to pay the full cost of being able to use or consume the resource (as is the case with irrigation and domestic water in Australia). The notion that individuals and companies who want to dispose of waste products into the natural environment should pay for this right to the extent that costs arising from negative impacts of this pollution are internalised (ie. costed by the polluter). An area where the polluter-pays principle has been successfully applied is air pollution in major industrial centres in the USA. Although reducing external costs is an important aspect of policy design it is equally important to recognise that the reduction in external costs may reduce the social benefits that arise from the private use of resources. The idea here is to achieve a balancing of benefits and costs at the margin. Polluters can be made to pay either via a direct charge or indirectly via the allocation of property rights. The user pays principle underlies the COAG water reform in Australia, which will see the full cost of supplying water to consumers and (irrigation) industry reflected in the water price.

- **Cost sharing** is a principle that takes a comprehensive look at all direct and indirect costs and benefits arising from the use of natural resources. In addition, it applies efficiency and equity considerations and requires that those groups in society who benefit from the provision of non-marketable public goods compensate the people who provide these goods. On this basis contributions to be made by individuals, user groups and society are apportioned. Society pays for those benefits, generated by individuals' activities, that do not translate into private benefit, and may finance activities that go beyond what is considered a reasonable individual level of duty of care. Industry pays for those aspects which are part of its duty of care for the resources it uses. When duty of care is redefined, some transitional payments may be justified.
- **Sense of community, ownership, and stewardship** . This principle is closely related to the concept of intrinsic motivation. It acknowledges the fact that individuals are heterogeneous and motivated in their actions by a myriad of philosophies, of which the pursuit of narrow self-interest is but one extreme abstraction. Pure altruism would be another extreme. The overall use of natural resources is the outcome of the sum of individual activities. It is important that individuals who comply with policy objectives for whatever motivational reason be reinforced in their behaviour. Intrinsic motivation goes beyond pricing and regulation, particularly in the case of open and common property resources. If incentive instruments want to achieve an improvement in the management of natural resources, it is imperative that they do not crowd out intrinsic motivation, which would result in a reduced effort to satisfy certain standards of environmentally sound behaviour. Many people have an inherent wish to feel that they play an active role in the solution of a problem, rather than being part of the problem. At the same time, reinforcing `good' behaviour may be complemented by mechanisms which sanction the `bad guys' and put pressure on them to comply with environmentally safe standards.
- **Adaptive systems** . Incentive instruments should be designed so that better information, as it becomes available, can be easily incorporated into the application of the mechanism. It is therefore essential to make provisions for conditions that specify when and how the framework will be reviewed.
- **Ecosystem approach** . Rather than addressing individual problems by trying to rectify symptoms, it is crucial that systems behaviour be analysed and causes of problems be identified and addressed in a systemic manner. The underlying causes of a problem and its physical reality need to be understood in a holistic manner.

2.4 CLASSES OF INCENTIVE INSTRUMENTS

This report emphasises the need to develop optimal policy mixes in accordance with articulated policy design principles. We want to stress the need to match specific mixes of instruments with the threats to the sustainable management and use of marine resources occurring in specific circumstances.

A substantial literature seeks to set up and analyse different classes of policy instruments. Generally, a distinction is drawn between direct regulations and market-based instruments. Regulations are primarily based on legislative and regulatory provisions and are implemented through directives from regulatory authorities. On the other hand, market-based instruments, while supported by legislation, tend to devolve decision making and opportunities for innovation to the market place. They usually allow for adaptive choice and constrained risk-taking by those whose behaviour is to be modified.

We reject a separatist view of policy instruments because we feel that categorising policies according to economic, legal or other criteria encourages unproductive debate about the classification. Instead, we propose the inclusion of the full range of policy instruments that might be used to ensure sustainable management and use of the environment including natural resources and call them incentive instruments or management instruments. This definition is comprehensive and includes not only economic incentives and regulation but also voluntary approaches, education and community based mechanisms and research. Moreover, we avoid talking about `positive' and `negative' incentives because views about this distinction may differ greatly.

Once it is acknowledged that a wide range of incentive instruments have legitimate and important roles to play in an Oceans Policy, it is possible to move beyond an `either or' debate and ask how: which current policies provide perverse incentives and therefore must be removed? And: in what circumstances, and in what combinations can regulation, economic mechanisms and other instruments achieve optimal policy outcomes?

Table1 lists a range of instruments available for consideration in a policy package for Oceans management and use. An appropriate selection of these instruments will be explored in detail in Section3 of this report.

Table 1: Incentive instruments available for managing marine resources and uses

Property Rights	**Charges and Fees**	**Leases and Licences**	**Regulations**	**Financial Programs**
(Tradeable) quotas	Pollution charges	Harvest licences	Fishing permits	Grants
(Tradeable) fishing shares	Entry fees	Load-based licences	Area, temporal and fish size restriction	Compensation payments
Private ownership	Royalties	Export permits	Output controls	Free advice
Conservation covenants	User fees		Input controls	
Enforcement	**Bonds and Deposits**	**Accreditation**	**Empowerment**	**Information**
Fines	Security deposits	Status agreements	Third party rights	Education
Forfeiture of rights	Conditional resource security	Labelling	Rights of access to information	Extension
Director liability	Assurance bonds	Industry accreditation	Co-management	Research
Audit	Performance	Prizes	Self-regulation	Monitoring bonds
Institutional Mechanisms	**Tax policy**	**Leverage Mechanisms**	**Awards**	
International conventions	Accelerated depreciation	Cross compliance	Awards	
Constitutional settlements	Tax deductions for research	Conditional grants	Prizes	

Adapted from Panayotou, T., 1994, Economic instruments for environmental management and sustainable development. International Environmental Program, Harvard Institute for International Development, Harvard University: Massachusetts.

3. OPPORTUNITIES FOR EMPLOYING INCENTIVE INSTRUMENTS WITHIN A POLICY FRAMEWORK FOR OCEANS USE AND MANAGEMENT

In this section of the report, we describe a selection of the incentive instruments listed in Table1 which are particularly relevant to the implementation of an Oceans Policy. We discuss their (potential) application and issues associated with their use. The list of incentive instruments is not exhaustive. Our selection is chosen to provide insight into the breadth of available policies and shows ways in which they can be combined and integrated to embrace the complexity of marine environments and uses. We do not imply that our examples of suggested incentive instruments are effectives when used in isolation to other policies or instruments. Rather, the purpose is to stimulate the Oceans Policy debate and encourage decision makers to think of more potential applications and mixes of incentive instruments in an innovative and creative manner. AppendixA provides a formal and referenced evaluation of (most of) these instruments according to the criteria established in Section2.2. In addition, we include a number of boxes in the text that illustrate our analysis through brief case studies.

The instruments are structured around activities by individuals and industries which directly or indirectly influence the bio-physical framework of the marine environment as outlined in Figure1. In our description, we include aspects of policy implementation, administration and enforcement and stress the need for research and monitoring to establish the benefits of incentive instruments.

We start with incentive instruments to reduce the pollution associated with coastal development and land-based activities and work our way to fisheries, tourism, mining and petroleum, and shipping. Table2 summarises our assessment of the range of incentive instruments on an instrument by instrument basis. AppendixA shows how we come to this judgement. The discussion below focuses on their potential for wider use in the mix of instruments used to manage Australia's oceans.

3.1 INCENTIVES TO IMPROVE WATER QUALITY OF STREAMS, ESTUARIES AND OCEANS

An effective way of reducing a stream's load of sediments and nutrients from non-point or diffuse sources is through vegetation filter strips along streams. A filter strip is a band of land along creeks and rivers that is be kept under native vegetation with dense ground cover and understorey and has the capacity to filter runoff water before it flows into a river system or estuary. Filter strips have been successfully introduced in parts of Europe and the United States of America to improve stream water quality. The incentive instrument used to establish filter strips is a covenant. Covenants either involve a compensation payment or granting of permission to sub-divide and develop the remaining land. Administratively, filter strips need to be protected by covenants which are attached to the land title, binding current and future landholders. Landholders receive annual compensation payments for the loss of income opportunities and costs associated with special management requirements on the designated areas. Covenants on filter strips effectively inhibit housing and industrial development in close proximity to streams. On the other hand, they have additional beneficial effects for the environment by providing habitat for native fauna and flora. This is why they are often used for protection of biodiversity.

The question of who should pay for the establishment and maintenance of filter strips is a complex one. Downstream fishers are the immediate beneficiaries from the establishment of filter strips and, conceptually, fishers could play an active role in administrating filter strip covenants if legislative changes would support this. Society as a whole gains in many ways from a reduction in stream and ocean pollution and improved biodiversity and there is a case for some government funding out of consolidated revenue. The polluter-pays principle suggests that rural landholders should pay but, if the notion of a transitional policy is accepted, then a case for fishers paying for some of the cost can be made. This is especially the case when either a government or catchment committee fails to make polluters pay. As yet, no filter strips in Australia are protected by covenants. This reluctance, in comparison to Europe and America, can be explained as a result of two factors. Firstly, in contrast to these geographical settings, the Australian environment is characterised by a rather erratic climate and research is required to establish the effectiveness of filter strips here. Secondly,

filter strips in these countries are financially attractive because they reduce agricultural production and thereby reduce commodity price subsidy payments.

Another approach to improving stream water quality is by addressing the causes of non-point source pollution in general and reducing soil erosion in particular. In Australia, soil conservation measures at a farm scale through, for example, through structural works have been shown to successfully reduce soil erosion. Farmers have been encouraged to engage in soil conservation measures through a combination of education, subsidies and income tax incentives. In the last decade, the focus has shifted from controlling soil erosion at the paddock scale to promoting integrated land and water management at a catchment scale. This approach is directed at reducing off-site costs of pollution and supporting the sustainable use of natural resources for agricultural production in their geographical context. This process has been supported by the establishment of new management and consultative bodies, integrated catchment management committees. South Australia has recently taken the step of empowering these committees with some legislative and fund raising powers.

The second general source of stream pollution is from point discharge such as industrial effluent. This can be controlled and reduced by establishing a load-based licensing system and then making them tradeable. The mechanism first sets a total volume of discharge, capping pollution loads. It then assigns pollution rights to emitters, for different substances over a specified period of time. Usually, the dischargers pay a fee for this licence, based on the amount of legal discharge. Ideally, the fee makes polluters pay the costs associated with the administration of this mechanism and costs that (may) arise downstream from the remaining discharge. Critics argue that the concept of licensing pollution is rooted in the long discredited notion of assimilative capacity and dilution as a solution to pollution. We understand licensing as a way of introducing scarcity, consequently establishing a cost for pollution, and creating a means as well as an incentive for reducing it.

To increase effectiveness and economic efficiency of load-based licences, they can be traded within a market system. Tradeable discharge rights enable polluters to sell surplus licences and allow new businesses to enter the industry. This mechanism also provides an elegant way of reducing the total load, by government buying back licences. This system has been successfully applied in the USA for reducing air pollution. Rules may have to be introduced into the market to ensure its operation and to prevent major licence holders from extracting monopoly rents from their licences. An alternative approach is to give all users shares of the total allowable discharge and make those shares tradeable. Under a share system, total emissions can be reduced without paying compensation. Neither system is used in Australia.

Increasing population and rapid urban development along the coastline have caused a dramatic increase of sewage discharge into rivers and the oceans. It threatens the health of aquatic ecosystems and directly and indirectly affects human health and recreational opportunities along the coast. Tertiary sewage treatment is necessary as a precautionary measure to achieve a high level of discharge quality and reduce these risks and other uncertain consequences of sewage pollution with long-term effect. Regulations to that effect would have been implemented in some but not all States. Once implemented, those authorities who do not comply come under pressure to do so. Tertiary treatment has been standard in Europe for three decades and has made a substantial difference to stream water quality.

In comparison to primary treatment, tertiary systems require expensive investments and have higher running costs. A higher level of treatment can be regarded as improved service to the community and, in accordance with the user pays principle, funded through an adjustment of use-based sewage service charges to households. Equity considerations concern the effects of the increased charges on low-income households. Mechanisms, if they are not already in place, may have to be included that relieve the financial burden on this group of society.

Zoning, by local government, is an important mechanism for preventing ongoing habitat loss which is the single most important threat to biodiversity, in land and marine environments. Traditional zoning does not prevent the gradual intrusion of industrial and urban development into important habitats such as mangrove swamps and salt marshes. Rather, it surrenders to the tyranny of small decisions.

In the USA, an alternative off-set system has been trialed which defines as a base requirement that there must be no net loss of ecological function in an area. Thus, if a wetland or mangrove is drained, this loss must be off-set by the reclamation of construction of an equivalent area elsewhere. Consistent with the polluter and user pays principles, the destruction of ecologically highly valuable land might incur the obligation to replace sometimes twice or thrice the area. There is substantial controversy as to whether the mechanism is ecologically effective because a potentially large variety of fully functional ecosystems may be replaced by standard-type juvenile re-establishments that take a long time to mature. Rare types of habitat may be lost forever when replaced by common ones.

To ensure that construction of new `off-setting' habitats will occur, an off-set licence may be complemented with a performance bond whereby the developer, as a condition of development approval, pays an adequate amount of money into a trust fund reserved for that purpose. The trust fund can be managed by community groups most affected by the loss, for example fishers, or by local council, catchment management groups or government authorities. Experience in Germany shows that developers prefer to do the work themselves, opting for least cost replacement and construction. Illustrating the power of an integrated policy approach, an off-set system may be complemented by zones where some types of habitat may be protected in perpetuity via a conservation covenant.

3.2 INCENTIVES FOR SUSTAINABLE FISHERIES

Fishing activities are either commercial or recreational. Policies that seek to control fishing have focussed on commercial fishing activities. the impact of recreational fishing which, in some fisheries, can make up a substantial proportion of the total catch. Indeed, in some coastal areas well over 50per cent of the total harvest is by recreational anglers.

Biological controls have been used in the form of temporal and spatial restrictions of fishing activities and size restrictions. These types of regulations have the general purpose of protecting fish stocks. Seasonal closures and area closures generally apply to breeding and nursery grounds while size restrictions seek to limit the catch of immature stock. Biological controls are ecologically effective measures if the terms and conditions are set extensively enough to satisfy precautionary considerations. However, even when effectively enforced, input controls do not restrict the race between individual fishers for fish in times when and areas where controls do not apply.

Input controls stipulate a maximum amount of effort that can be used for fishing. They generally target number of boats (limited licences), amount of fishing gear employed (effort quotas) or restrict the size and other dimensions of each fishing unit (gear and vessel restrictions). Input controls provide an indirect means for managing catch and are based on the questionable assumption that fishery inputs and catch are positively correlated and not subject to error. For multi-species fisheries where individual species account for small amounts of total catch, input controls may be the only feasible way of managing fishing activities. Input controls are widely used in fisheries management across the world because they are easy to establish and cheap to administer. Inspections can be sporadic and minimal paper work is required. The limitations of input controls are exemplified in Box1 in the case of the Southern Rock Lobster fishery.

There are several instruments that are intended to control the output of fisheries. Setting a total allowable catch (TAC) in a single-species-based fishery caps the amount of harvest to a set maximum. On its own, this is a controversial instrument as it increases the race to fish because individual fishers seek to maximise their proportion of the TAC.

Total allowable catch may be broken down into individual quotas for the members of the fishery. The introduction of individual quotas moves an open access system to a quasi-common property system. Total allowable catch systems that are not supported by individual quotas tend to have a negative effect on the economic efficiency of a fishery, resulting in over-capacity, fluctuating landings, and increased harvesting and processing costs. In contrast, individual quotas provide individual fishers with resource security that generates improved resource rents and profits and motivate fishers to preserve their resource in the long term. Tradeable individual quotas improve

economic efficiency of output controls by allowing structural adjustment. Output controls are administratively feasible in large fisheries but enforcement costs are high. The major concern regarding equity relates to the initial allocation of individual catch quota. Another problem is the adjustment of individual quotas which may be necessary when resource assessments change.

A daily bag limit is an output control instrument applicable to recreational fishing. The idea is to limit the recreational catch per person but complete enforcement of this regulation is virtually impossible as is full compliance of anglers with size limits applicable to various species. Compliance can be increased, however, by ensuring that recreational fishers are informed and educated about their impact on fish species, marine ecology, the areas where they fish and regulations, with the purpose of increasing awareness, responsibility and intrinsic motivation to do the 'right' thing.

Increasing ecological awareness is reflected by sports anglers who have adopted the widely televised habit of releasing the fish after they had the pleasure of reeling it in. A change in general perception of people that fishing is not a right but rather a privilege may be engendered by a policy under which recreational (amateur) fishers require licences to engage in fishing. Recreational fishing licences would apply in addition to bag limits and size limits applicable to various species. The primary objective of such mechanism would be an educational one. Licensed anglers could be registered thus enabling information to be targeted more effectively. The instrument can also be used as a means to finance monitoring and enforcement. By penalising non-compliance with the bag limit and size restrictions with the loss of their licence, the incentive for recreational anglers to abide by the rules can be increased substantially.

Cross compliance mechanisms can also be used to increase compliance. Conceptually, a person who loses his fishing licence may also be prohibited from holding a boat licence. This would be particularly effective in controlling pseudo recreational fishers who sell part of their catch commercially.

The potential of private ownership in fisheries as an alternative property rights framework to open access or common property is limited to a few special cases in which the individuals of target species are locally affixed. Oysters and abalone are such cases. In the case of abalone, illegal and over-quota catches have occurred because of a highly lucrative black market. Allocating private ownership over certain reef areas to fishers who hold abalone licences increases their resource security and will result in an improvement in the control of the fishery if the discount rate of the fisher coincides with the social discount rate.

Box 1: The Southern Rock Lobster fishery

The Southern Rock Lobster fishery illustrates the problems that may occur if several jurisdictions are involved in managing the fish stock and they do so with a variety of management regimes. Commercial fishing of Southern Rock Lobster occurs in waters off South Australia, Victoria, Tasmania and New Zealand. South Australian and Victoria have separate zones which they manage independently. The New Zealand lobster fishery is also subject to zonal management, while the Tasmanian fishery is managed as a single stock. Biological evidence indicates that the entire fishery may be a single stock, which suggests that multi-jurisdictional management, as is currently practised, is likely to be sub-optimal.

At present, each management body considers its zone as being independent of all other zones, setting management objectives and imposing control measures accordingly. Size limits apply in the Victorian and South Australian zones, but are different for the two States. In South Australia, the northern zone is managed using input controls (gear type and fishing days). The southern zone is managed principally by individual transferable quotas which are complemented by some input restrictions. The neighbouring Victorian fishery uses input controls. The Tasmanian and New Zealand zones are managed using a combination of input

controls and quotas.

Individual catch quotas were introduced as a result of declining stocks following a prolonged period of input controls. Community and political acceptability of input controls has traditionally been much greater than that of quotas but as stock depletion progressed it became clear that a change in management was needed to avoid catastrophic failure of the fishery. Four factors are particularly relevant to both the stock depletion phase and the subsequent period. First, compliance with input controls was problematical, especially in locations close to jurisdictional boundaries where some fishing firms are licensed to fish in both jurisdictions. Second, control of some inputs encouraged input substitution. The introduction of electronic navigation aids, in particular, resulted in input controls being less effective in containing the rate of stock depletion than had been anticipated. Third, stock assessment based on local jurisdictions has possibly resulted in misleading estimates of local population dynamics because they individually form only part of the southern rock lobster stock. Fourth, as input substitution occurs, it is difficult to keep track of fish populations because the effective sampling method (i.e. fishing) changes as technology changes, thus increasing the degree of uncertainty surrounding stock assessment.

Another interesting point is that, although managers in some jurisdictions have introduced individual catch quotas, they have retained a degree of input control. One can only surmise that enforcement and compliance problems related to quota systems have been recognised in other fisheries and that managers of the southern rock lobster fishery have felt that the combination of input and output controls offers the best means of achieving sustainability of the stock.

Fishery share systems can be viewed as a package that contains a mix of traditional management mechanisms and innovative incentive instruments for fisheries management. They are characterised by three features. Firstly, they move from individual catch quota to shares in the total opportunities of a fishery, defined in terms of total catch and fishing gear, which greatly facilitates the adaptive management of fisheries. Secondly, they abandon the traditional single-species management regime in favour of a multi-species system which reflects a move towards an eco-system approach. Thirdly, they do not rely on a single policy mechanism but seek to employ a selection of the input and output control techniques discussed above to combine their advantages, minimise the weaknesses, and encourage co-regulation and cooperation. Fishery share systems have the potential to be expanded into a framework which combines fisheries policies with coastal, estuary and land-based management policies relevant to fisheries.

Fishery share systems take full advantage of common property processes and are based on a cooperative concept which, importantly, integrates recreational fishing by allocating a share of total opportunity to it. By integrating various fishing interests (stakeholders) in the decision making process co-management principles are introduced. In addition to providing business security, the system utilises intrinsic motivation for ecologically effective fisheries management. Shares are tradeable and share transactions, along with membership fees and penalties (fines, loss of shares) for non-compliance, provide funding opportunity for the management body of the share system.

The concept of a fishery share system has been developed and its implementation proposed for the NSW fisheries. This concept allows for the adaptive management of the available resources through regular performance review and agreed guidelines for policy adaptation.

The incentive for stewardship can be increased in all quota and share systems by making these rights completely secure and fully mortgageable. Introduction of co-management arrangements can further reinforce this incentive.

3.3 INCENTIVES FOR SUSTAINABLE MARINE TOURISM AND RECREATION

To improve its image and reputation, an industry can develop guidelines for operation and performance and encourage its members to comply with voluntary codes of conduct. Voluntary codes act as a motivational incentive for all members to raise standards and thereby increase profits. They are particularly important to the tourism industry where countries, regions, or sectors of the industry seek to develop a specific tourism product and create an image that appeals to their target audiences or creates the impression of being `better' or `the best'. For example, the on-boat lesson that some tour operators provide to visitors headed for the Great Barrier Reef improves the subsequent visitor experience and enhances the image of the industry, the Reef and the region as a whole with positive implications for word of mouth promotion. The development of standards relies on various sectors of a (regional) tourism industry sharing a long term vision which is specific enough to lead to agreed procedures and ways of conduct. Voluntary codes rely on intrinsic motivation and while there is no legal obligation for compliance with the codes, peer group and industry pressure on `black sheep' of the industry are high. The costs associated with compliance are borne by the individual businesses. There is very little administrative effort involved. Grants to industry organisations can be used as a cost-effective means to encourage development of voluntary codes. Annual tourism awards recognise businesses of high environmental and professional standards and provide them with a marketing edge that spurs on other operators to do better.

Accreditation is particularly applicable for commercial tourism operators. Operators learn about their responsibility for the environment which is the essence of the existence of their businesses. This constitutes an important step in the implementation of the duty of care principle. Accreditation not only ensures that operators are informed about the impact their operations have on the environment but also encourages them to educate their clients about the environment they visit. This mechanism increases the appreciation of visitors for the environment they come to see and uses the intrinsic motivation of people to minimise their impact on the place. It improves the visitor experience and may have more far reaching consequences for encouraging environmentally sound behaviour once people are back home. Accreditation can be a voluntary measure and therefore a distinctive feature of an operator or, in combination with a licence, it can have a regulatory basis that requires accreditation as a necessary condition for being granted a licence for operating a tour-based tourism business.

Marine areas such as reefs are highly sensitive to nutrient increase. Reefs that are visited frequently are threatened by increasing nutrient loads in the surrounding water which is (partially) caused by boats releasing sullage into the sea even though this is done at some distance from the reef. To stop pollution from sullage, boating licences could be introduced that require boats to be fitted with equipment which facilitates land-based sullage treatment. Regulations of this kind are called performance standards and provide an incentive for people to develop cost-effective solutions. Operators complain that this would require, in the first instance, a solution to the technical problem of salt-water-based sullage upsetting fresh-water-based sewage treatment systems. In the second instance, on-boat storage capacity of sullage would have to be addressed. In practice, however, these problems have been solved. To reduce transitional inequities, such standards are often phased in.

Performance bonds are a monetary security that (tourism) developers are required to set aside to ensure that adequate funds will be available for rehabilitation of a site in the event the activity ceases or is abandoned. Performance bonds are commonly used in Australia, particularly in the mining industry. The Great Barrier Reef Marine Park Authority (GBRMPA) requires performance bonds to be posted in those circumstances where construction of semi-permanent or temporary structures is involved. It is required as part of a regulatory permit issued by the GBRMPA. Precaution is a major rationale for this instrument. It ensures that sufficient funds for rehabilitation are set aside and readily available so that the community is not left with the costs of clean-up if a developer goes bankrupt. Performance bonds are an expression of the user pays and polluter pays principles and they are easy to administer because the payment is a necessary condition for the issue of a development licence.

In the environmental literature, assurance bonds have also been proposed. Assurance bonds operate like a prepaid fine which is returned when an activity ceases. Consistent with the precautionary principle, both mechanisms shift the responsibility of care from the regulator to the resource user. As the user has to show compliance to recover the bond, he has a much greater incentive to comply with the conditions than when, in the absence of a bond, it is uncertain that he may be fined for non-compliance.

Zoning, by local government, is again an important tool in controlling tourism-related development in the coastal zone. In addition, environmental and building standards can be used to achieve policy objectives.

3.4 MANAGING CONFLICT BETWEEN USER AND INTEREST GROUPS

Conflict between user groups exists where the different uses are not compatible and conflict among users within the same group results mainly from resource scarcity. The concepts which can be applied to a conflict situation between user groups are joint use and multiple use. Joint use describes a situation where all separate user groups have rights to do things irrespective of the rights of the other groups. In contrast, multiple use is a concept whereby a statutory body decides on the combination and intensity of uses by applying trade-offs. The multiple use concept seeks to reach an acceptable balance of outcomes across the entire range of uses and users which is consistent which the four fundamental principles of multiple use management. They are:

1. Maintenance of ecosystem integrity;
2. Wealth generation and resource use;
3. Equity; and
4. Participatory framework for decision making.

One multiple use tool is the declaration of marine protected areas. There are a number of Marine Protected Areas in Australia, the best known being the Great Barrier Reef Marine Park, which are managed by Commonwealth authorities. Marine protected areas differ from terrestrial National Parks in that they often permit the removal and harvest of resources from zones within the protected area. Conservation is an important use which is balanced with a variety of commercial and recreation uses including fishing, boating, scuba-diving, and others. Being an area-based concept, multiple uses are managed primarily by zoning, permitted different uses and combinations thereof in different parts of the marine protected area while prohibiting access to particularly sensitive areas.

Consistent with the user-pays principle, management costs may be (largely) covered by user charges, such as the reef `tax' for day visitors to the Great Barrier Reef and licence fees for boat operators, while some funding from consolidated government revenue is justified given the long-term ecological and social functions of marine protected areas. Experience both nationally and internationally suggests that political and community acceptance of such arrangements is greater when the money is passed to a trust controlled by representatives of those stakeholders who contribute to it.

Sequential use management is another way of reconciling different uses in the same area. For example, trawling areas may be spelled for a number of years for conservation purposes before being re-opened to the fishing industry. However, this approach may not be suitable for various combinations of uses. For example fishing and tourism may be incompatible in a sequential use framework because some fishing methods can destroy the very features that scuba-divers appreciate and render the area long-term unsuitable for important aspects of recreational use. Nevertheless, sequential use management could provide a powerful incentive for the development of adaptive approaches to the management of Australia's oceans. It is consistent with the user-pays principle.

3.5 INCENTIVES FOR ENVIRONMENTALLY SOUND MARINE TRANSPORT AND PETROLEUM EXPLORATION AND MINING

Marine transport is critical to Australia due to its geographical position. Ports, shipping and offshore petroleum industries may affect the marine environment through water pollution, particularly by hydrocarbons, and loss of habitat.

A significant source of concern are the marine organisms foreign to Australian waters contained in ballast water which is being deposited along shipping routes and in harbours. Introduced organisms may change the existing marine flora and biodiversity through predation and competition and have the potential of causing severe economic damage to ocean-based industries. One example of a ballast-water-introduced organisms is the Northern Pacific Seastar which has caused severe damage to aquaculture industries since it was introduced to Tasmanian waters in 1986.

The issues surrounding ballast water are outlined in Box2. Some technical approaches and regulatory mechanisms are outlined there as well. Technical treatment approaches are still being developed, both in Australia and internationally, but it may be some time yet before a practical and efficient treatment solution is found to minimising the risks of introduction of harmful marine pests and disease pathogens. In the meantime, Australia relies on compliance to voluntary ballast water management guidelines. Most ships claim to comply with the current voluntary guidelines, but compliance remains a decision of the ship master who considers the requirement against aspects of ship safety and length of voyage. Monitoring of compliance requires appropriate verification testing of ballast water in addition to the current AQIS target species sampling and analysis program.

Experience shows that, in general, ships are reluctant to comply with the voluntarily guidelines. One idea would be to combine voluntary guidelines with a hefty landing fee on all incoming vessels proportional to the (estimated) volume of ballast water they carry. Shipping companies could seek exemption from this levy under the condition that they exchange ballast water at sea and agree to regular checks on their compliance. The administration costs would be financed by the revenue collected from fees paid by non-complying companies. Companies who wish to participate and not pay the non-compliance fee could be required to lodge an assurance bond.

Similar to voluntary codes of conduct, importers of goods may see the potential of gaining a competitive advantage in the market place by shipping their goods to Australia on vessels that exchange ballast water at sea if they are permitted to label their products accordingly. This instrument may be particularly appealing to manufacturers of high-profile consumption goods such as cars where a positive environmental image is an important sales factor. The labelling, fee-system and assurance bonds could be combined for maximum effectiveness.

AQIS envisages that at some point in the future a regulation will be introduced following the adoption of a ballast water Annex to MARPOL. The effort and costs involved in monitoring and enforcing compliance can be expected to be substantial.

Box 2: Ballast water

Ballast is necessary for the safety and stability of many vessels, especially empty or partly loaded cargo vessels. Ballast is pumped directly from the port waters into the ships while they are unloading their cargo. A wide range of marine organisms and disease pathogens are pumped into the ballast tanks along with the water. Many organisms survive long voyages in the ballast tanks and are then discharged along with the ballast water when the vessel approaches the port or begins loading cargo. Viable organisms isolated from ballast water discharges include fish, crustaceans, molluscs, bacteria, and others.

One of the most graphic illustrations of the devastating marine biological effects caused by unwanted organisms discharged with ballast water is the Northern

Pacific Seastar, Asterias amurensis, which was introduced to Tasmania in 1986 and has since impacted on wild fisheries and aquaculture industries. The seastar is a prolific breeder, grows very large and is a voracious predator. It has proved impossible to eradicate.

Solutions to the ballast water problem are made difficult by a number of factors including the volumes of ballast water involved, the inaccessibility and complex design of many ballast tanks, safety issues and operational requirements of the vessels.

The Australian Quarantine and Inspection Service (AQIS) introduced voluntary guidelines for the management of ships' ballast water in 1990. However, as with other maritime environment issues, effective local action depends on international cooperation at global and regional levels. In 1991 the Marine Environment Protection Committee (MEPC) of the International Maritime Organisation (IMO) adopted a set of voluntary international guidelines for ships' handling of ballast water. However, compliance with these guidelines has been inadequate thereby creating a need for additional incentive instruments.

A range of ballast water treatment options has been discussed. Chemical treatment of ballast water is likely to be ineffective, impractical, too expensive for general use, or environmentally unacceptable. Physical treatment, such as microfiltration, is capable of removing the majority of unwanted organisms, but the cost for treating the quantities of water used in large ships is likely to be prohibitive. Heat treatment utilising waste heat from the main engine cooling system during transit could provide an effective solution in some cases, and a current research program is exploring this option further.

Ballast water exchange at sea, which is the basis of the AQIS guidelines, is currently the most universally recommended and utilised procedure for the minimisation of risks associated with the discharge of ballast water, and can be effective if carried out correctly. However, the safety and effectiveness of this technique relies on an understanding of the mechanics and procedures for the various options.

Mandatory controls would involve a high level of administrative effort and cost and require hefty sanctions for vessels that fail to meet the standards. For example, they may be prevented from visiting Australian waters in the future.

The Australian Ballast Water Management Advisory Council (ABWMAC) was established in 1996, comprising key stakeholders in ballast water issues, including fisheries and aquaculture industries, shipping, port authorities, environment interests and State and Commonwealth government agencies. Its role is to develop effective ballast water management policies, liaise internationally, and initiate research that assesses risks and damage and develops tools to assist management strategies.

Low-frequency high-cost accidents such as ship collisions and oil spills may cause substantial ecological damage, demand expensive rescue missions, and incur massive clean-up costs as has been exemplified in the case of the Exxon Valdez oil spill in Prince William Sound, Alaska, in March 1989. The risk of such accidents can be minimised by a series of management instruments. Ships

that carry hazardous goods can be subject to high technology and safety standards. Shipping lane regulations confine the movements of vessels or ships that carry hazardous material to `safe' corridors. Non-compliance needs to result in severe fines that minimise the temptation of captains to take short-cuts to save time.

While accidents may have severe ecological impacts on the surrounds of the site and guarantee wide media coverage, operational discharges from bilge pumping and ballast discharges make up the vast majority of oil pollution from ships. Port disposal facilities, if they are available, often remain unused because shipping companies seek to avoid associated charges and delays. This seems to indicate that increased surveillance of off-shore water, in combination with severe penalties for improper disposal are required to alleviate the problem and associated cumulative impact on the marine ecosystem. Revenue from fines could be used to fund the monitoring service.

Off-shore petroleum production is of economic and strategic importance to Australia. The Australian off-shore petroleum exploration and production holds a good environmental record with few production spills of minor environmental impact. Due to the geographical specifics of petroleum exploration and production, the upholding of environmental safety standards relies on co-management with the industry. This is irrespective of whether these standards are legislated or voluntary codes of conduct. Co-management is essential for the minimisation of risks of production spills, as well as for activities with ongoing (cumulative) environmental impacts. The effects of seismic surveys on marine organisms, the construction of platforms and laying of pipes, the disposal of ‘produced water’ which is present with the oils and contains traces of hydrocarbons, contamination by drill fluids, and effects of increased shipping activity. Are all significant examples of the environmental impacts.

Performance bonds and assurance bonds for the marine petroleum industry provide useful tools for shifting at least part of the environmental risks and costs associated with exploration and mining to the industry. Performance bonds would be particularly applicable to ensure the environmentally safe removal, dismantling and disposal of platforms once they are no longer required. Alternatively, performance bonds could ensure that decommissioned platforms are turned into artificial reefs through partial removal, toppling of the structure or relocation of the structure under consideration of the natural environment, commercial and recreational fishing patterns, and safety of marine transport.

3.6 OPPORTUNITIES OF INCENTIVE INSTRUMENTS WITHIN AN OCEANS POLICY

We have discussed the potential of a suite of conventional and innovative incentive mechanisms which we regard as a useful starting point for discussing a comprehensive policy framework that can deliver sustainable management and use of oceans. Figure2 provides a graphical representation of how these incentive instruments may combine to form a holistic framework for managing human activities that take advantage of the various opportunities that marine environments and resources provide. These opportunities, or functions, are interrelated, as indicated by bold arrows in the centre of the figure.

A summary evaluation of the above incentive instruments with respect to their applicability for the management and use of marine resources and environments is given in Table2. This collation provides a quick reference guide to the applicability of incentive instruments to various aspects involved in the use and management of oceans. It also enables one to picture the strength and weaknesses of individual instruments and some management frameworks, such as fishery share systems and marine protected areas, which combine a series of instruments for a specific purpose.

The policy assessments presented assume that each instrument is introduced firstly, in an effective manner, ie. there is no government failure in setting the number of licences etc., and secondly, into a previously unregulated situation, ie. that there is open access to each `sink' or `source' function supplied by the oceans. Importantly, the table explicitly differentiates the criterion of economic efficiency into its interpretations as industry profitability and economic efficiency in a collective sense.

4. ALTERNATIVE ADMINISTRATIVE ARRANGEMENTS

The management of Australia's oceans is complicated by the various jurisdictions which have legislative and management functions and by the inconsistency of the policies across States. Institutional arrangements provide the backbone for management instruments because the people they power and the processes they establish determine the effectiveness and dependability of many instruments. Three principles are worth noting.

Firstly, through most areas of natural resource management, there is increasing recognition that prospects for sustainable use and development of natural resources will be greater if representatives of resource user groups are, through co-regulation arrangements, involved in and accountable for administrative decisions made about the resources they use.

Secondly, resource management is likely to be more cost effective and encounter fewer administrative problems if resources are managed in an integrated manner that accounts for ecological processes as well as social and economic arrangements. Recognition of the benefits of an integrated ecosystem focus for resource management has led to the development of catchment management committees and to the New South Wales proposal for the allocation of rights to fisheries rather than individual species.

Thirdly, arrangements will be more cost-effective if the nature of interactions between ecosystems is as transparent as possible. So, for example, flows of pollutants from the land to the ocean are quantified.

From a broad ecosystem perspective, three regions can be identified

- land systems that are a source of water, nutrients and pollutants to Australia's oceans;
- the continental shelf including Australia territorial waters; and
- the continental slope and rise.

From an oceans policy perspective, it is useful to imagine the range of options that might be considered if there where no pre-existing administrative structures and no constitutional barriers to the attainment of the objectives being articulated for Australia's oceans. We assume also that the prime policy objective is to maximise the sustainable value of Australia's oceans over all potential uses. Having done that, we can then return to the pragmatic impediments to attainment of the ideal administrative structure.

4.1 THE OCEAN-LAND ADMINISTRATIVE INTERFACE

As illustrated in Figure1, land-based activities have a large impact on the oceans. The main opportunities to control the impact of land based activity on Australia's oceans lie with the appointment of oceans representatives to the bodies that manage (rural) land and that implicitly permit non-point source pollution from rural land or discharge of storm water and sewage from urban areas. The inclusion of marine issues could substantially strengthen the mission of integrated catchment management. On the other hand, one problem with a direct representational approach is that the ocean representatives might often by outvoted by others on the board of management.

An alternative option is a property-rights approach where users of land-based resources and fishers and other people interested in the welfare of oceans are engaged in negotiations in order to avoid violations of their individual property rights. The obvious opportunity is the introduction of arrangements whereby Oceans Authorities and/or marine industries can acquire rights that prevent upstream users from polluting streams, estuaries, etc. For example, assuming that the effectiveness of filter strips in the Australian environment is established, legislation could be passed which allows these people or organisations to take out covenants over designated filter strips which ensure use of this land for maximum filter effect. Appropriate institutional change can significantly strengthen the effectiveness of a management instrument.

For urban pollution sources like storm water run-off and sewage, it is possible, at least in principle, to require that these sources obtain a pollution permit. The permit could be issues by an Oceans Authority rather than an Environment Protection Authority. Whilst the establishment of a separate Oceans Authority may seem radical as a proposal, this property-right solution would give Australia's oceans a status equivalent to that which, under the London Convention, prohibits dumping of wastes and other matter in the High Seas. Pursuing this concept further, it is not difficult to imagine this Oceans Authority setting ecologically based limits for total allowable load and/or discharge concentration for each coastal catchment. Towns could be issued licences to emit pollutants into the sea and would be charged on the basis of the volume and concentration of load they discharge.

An alternative but essentially equivalent option would be for an Oceans Authority to issue a total allowable pollution level to an EPA or equivalent body and then let it find the most efficient way to keep land-based sources of pollution within the limits defined through employing a mix of instruments such as those identified in this report. Introduction of such mechanisms would give administrative bodies a strong incentive to pursue use of wide range of incentive instruments.

4.2 THE OCEANS

The question we now turn to is: What is the most efficient and dependable mechanism to administer Australia's Oceans? If the guideline for more integrated management above is correct, then one way to achieve this is to create either an Australian Oceans Management Authority or, alternatively, a series of Authorities which, linked together, would manage all of Australia's continental shelf. Under this latter option, Australia's continental shelf would be managed by a series of organisations each resembling the Great Barrier Reef Marine Park Authority or the Murray Darling Basin Commission.

If the above advice on representation is accepted, then each Authority would include a commercial representative, a recreational representative, an environmental representative and probably two government representatives. It could be responsible for managing the full range of issues and impacts identified in Figure 1. Coherence between regions could be achieved by appointing one person to act as the Chair or Commissioner of all Authorities and having a Deputy Commissioner as the person responsible for the management of the region on a day to day basis.

If State interests are put to one side, as few has four regions could be established; eight would be necessary if each region is to follow a state boundary.

In his summarising comments of an Oceans Policy Consultancies Workshop in Canberra on 1/8/97, Ian McPhail painted the range of options for the implementation of an Oceans Policy as a continuum ranging from a `soft' option that would apply in Commonwealth waters only, to a `heavy' option whereby the Commonwealth would apply reserve powers and legislate inside the 3-nautical-miles zone. Specifically, the range of options may include:

1. a Commonwealth Oceans Policy which would follow and implement cabinet-endorsed principles and operate in Commonwealth waters only;
2. a National Oceans Policy which would be COAG endorsed and applicable to State, Territory and Commonwealth waters;
3. an Oceans Policy Commissioner, Champion, or Advocate whose national non-statutory office would establish regional arrangements on a large marine ecosystem scale, implementing national principles endorsed by COAG and reporting to Parliament;
4. an `Entity' or statutory Authority, modelled on the Murray Darling Basin Commission and its Ministerial Council, which is legislated, consensual, does not derogate from State powers and would need to be generously endowed with money;
5. a `heavy' National Oceans Policy implemented by a statutory body with State, Territory and Commonwealth powers referred to it; and
6. a `heavy Commonwealth' Oceans Policy whereby the Commonwealth applies reserve powers and legislates inside the 3-nautical-miles zone.

If Commonwealth - State jealousies are put to one side, a separate Entity or Authority would probably offer the best means of managing Australia's marine resources. At present, responsibility for activities that impact on Australia's oceans are distributed among many institutions. Moreover, few of the institutional structures operate at the regional scales necessary to trade off competing production and conservation objectives.

We judge the `heavy' options5 and6 mentioned above to be politically unacceptable. Option1 does not address marine issues in State waters. Options2 and3 raise the issue of enforcement. As the MDBC has demonstrated, the main advantage of an Authority is that it can gradually acquire functions in a manner that attract support from all States, Territories and agencies interested in oceans management.

The Authority would focus on principles for oceans use and management and the States and Territories would be given financial incentives to adopt measures consistent with these principles. Implementation could be achieved by converting an existing body into the Authority or by creating a new one. A COAG process similar to that used for water reform may be useful to help establish such an Authority. A possible structure is outlined above.

As the debate about an Oceans Policy develops, the advantages of a separate Authority will be investigated further.

5. CONCLUDING COMMENTS

International experience in the use of incentive instruments is considerable and the Australian experience in their application is growing. The main purpose of this report has been to highlight some of the many opportunities that Australia has to make greater use of incentive instruments as a means to improve management of Australia's oceans.

The report begins by identifying the complex web of interactions, biophysical and socio-economic, that determine the status of Australia's oceans and their capacity to support income-generating activities. It then develops a set of criteria against which management instruments ought to be evaluated and lists the core principles for designing policies and administrative frameworks for Australia's oceans. The immediate observation that arises from this analysis is that the present set of policies and arrangements is complex. In some instances, it sets perverse incentives and is inconsistent with accepted guidelines for sustainable resource management. In a number of cases, particularly in the interface between the oceans and the land, even the most traditional guidelines are rarely followed.

The areas that offer greatest opportunity for improvement include

- re-designing administrative arrangements to emphasise the motivational benefits of co-management;
- paying attention to maximising the use of intrinsic motivation;
- developing new institutional structures that build management consistency within marine ecosystems;
- improving the specification of property rights to use ocean resources;
- introducing formalised adaptive management structures;
- recognising the impact of land-based activities on oceans; and
- introducing mechanisms that provide incentives for water quality improvement.

REFERENCES

Commonwealth of Australia 1992, Intergovernmental Agreement on the Environment. Australian Government Publishing Service: Canberra.

Commonwealth of Australia 1997, Australia's Oceans: New Horizons. Oceans Policy Consultation Paper, Department of the Environment, Sport and Territories, Canberra

Connell, D.W. 1995, Occurrence and effects of petroleum hydrocarbons on Australia's marine environment. Technical Annex 2 in: The State of the Marine Environment Report for Australia. DEST: Canberra.

Department of the Environment Sport and Territories 1995, Our Sea, Our Future: Major Findings of The State of the Marine Environment Report for Australia. Canberra.

DPIE 1997 Oceans Policy Workshop 31/7-1/8/97 Draft Report. Canberra.

Environment Canada 1997, Environmental Effects of Petroleum Hydrocarbon Releases. WWW.

Great Barrier Reef Marine Park Authority 1990, Permit Procedures Manual. GBRMPA: Townsville.

Great Barrier Reef Marine Park Authority 1990, Permit Procedures Manual. Townsville.

Hundloe, T. 1997, Achieving environmental objectives by the use of economic instruments: Fisheries. Paper presented for the Environmental Economics Round Table, Parliament House 10 July 1997.

Independent Scientific Review Committee 1994, Environmental implications of offshore oil and gas development in Australia. Australian Petroleum Exploration Association and Energy Research and Development Corporation.

Industry Commission 1992, Cost recovery for managing fisheries. Report No17.

Industry Commission 1997, Role of economic instruments in managing the environment. IC: Melbourne.

James, D. 1997, Environmental Incentives. Environment Australia: Canberra.

Lal, P. and D. Brown 1996, Using performance bonds as an environmental management tool: the Great Barrier Reef Marine Park Authority's experience. Australian Journal of Environmental Management 3, pp 86-95.

Lal, P, Holland, P. and P. Power 1992, Competition between recreational and commercial fishers. ABARE Research Report 92.11. ABARE: Canberra.

OECD 1997 Synthesis report for the study on the economic aspects of management of marine living resources. Executive Summary. OECD: Paris.

Panayotou, T. 1994, Economic instruments for environmental management and sustainable development. International Environmental Program, Harvard Institute for International Development, Harvard University: Massachusetts.

Pitts, D. 1997, Best Practice Mechanisms for Marine Use Planning, Report to DPIE, Canberra.

Productivity Commission 1996, Stocktake of Progress in Microeconomic Reform. Australian Government Publishing Service: Canberra.

Resource Assessment Commission 1993, Coastal Zone InquiryFinal Report. Canberra..

Sainsbury, K., Haward, M., Kriwoken, L., Tsamenyi, M. and T. Ward 1997, Multiple Use Management in the Australian Marine Environment: Principles Definitions and Elements, Report to Environment Australia, Canberra.

Young, M.D. 1995, The design of fishing-right systemsthe New South Wales experience. Ocean and Coastal Management 28, pp45-62.

Young, M.D., Gunningham, N., Elix, J., Lambert, J., Howards, B., Grabosky, P. and E. McCrone 1996, Reimbursing the Future. Department of the Environment, Sport and Territories: Canberra.

APPENDIX

A1. INCENTIVES TO IMPROVE WATER QUALITY OF STREAMS AND ESTUARIES

A1.1 FILTER STRIPS ALONG STREAMS PROTECTED BY A CONSERVATION COVENANT

Description, purpose and examples. Filter strips along creeks and rivers have the goal of filtering sediments and nutrients out of runoff water that comes off agricultural land. Landholders along streams are paid to enter into a perpetual conservation covenant requiring land along the edge of streams to be kept under native vegetation with dense ground cover and understorey. The covenant is attached to the land title so that it binds future landowners. To be effective, filter strips need to have a minimum width and the vegetation needs to be vigorous with a dense year-round ground cover of tall grasses. Sediments, phosphorus, nitrates, other nutrients and (toxic) chemicals from diffuse sources are a major contributor to the total load of rivers which affects stream water quality and consequently the quality of water in estuaries, along the coast, and off-shore. This load reduces the habitat quality of breeding and nursery areas, it reduces the recreational attractiveness of beaches and the coast, and marine tourism destinations such as reefs are affected by reduced visibility and decline in quality of visitor experience. The instrument has been successfully introduced in parts of Europe and the United States of America to cut down on sediment, nutrient and pesticide loads of streams. Research needs to establish, though, whether the effectiveness of filter strips could be as high under Australian environmental and climatic conditions. In any case, filter strips should be integrated into an Integrated Catchment Management strategy which seeks to reduce runoff and soil erosion in the first place.

Effectiveness and dependability. If the filter strip system covers the critical stretches of the river system and the strips are wide enough and adequately managed for maximum filter effect, the effect on stream water quality is marked. While peak sediment loads in association with high-rainfall events will remain a problem, the total average load of sediments and nutrients from diffuse sources can be decreased dependably.

Precaution. There is a strong element of precaution in the concept of establishing filter strips because they control a significant source of water pollution. However, without support from mechanisms that address other sources of pollution, filter strips may not be sufficient for water quality control.

Efficiency. The instrument may affect the profitability of agricultural industry. Filter strips prevent stream pollution from diffuse sources. In terms of overall efficiency, if the value of lost agricultural production at the margin is less than the additional cost associated with cleaning up the waterway, then filter strips will represent an improvement in resource allocation. The instrument does, however, reduce the availability of (highly productive) land for agricultural production and may induce price increases for land. Also, filter strips may need to be fenced off for protection from livestock which involves a large establishment cost. But these costs must be weighed against the benefits of a cleaner marine environment.

Continuing incentive and motivation. Landholders who pursue purely economic objectives have little incentive to establish filter strips because they do not generate any income. To the contrary, some livestock farmers may view these strips as a fodder reserve for their animals during times of fodder shortage. It is therefore recommended that covenants be put onto the land designated for filter strips and that these covenants be owned either by local government or by fisher interest groups who have an interest in managing the strips for maximum efficiency. Also, as a stand-alone measure, filter strips do not encourage land-use practices that reduce soil erosion and runoff in the first place. This suggests that supporting policies would have to be adopted such as the appointment of representatives from the fishing industry to catchment management committees. In order to reduce potential conflict between the landholder and the catchment management committee it will be necessary to clearly delineate what rights the landholder and downstream users have to the filter strip.

Administrative feasibility and cost. While it is possible to delineate filter strips on the map and survey the management of the designated areas by air, it is imperative to minimise management and enforcement costs by designing a property-rights scheme which assigns control of these areas

to groups of individuals, government or industry which have a vested interest in maximising the environmental benefits of the filter strips. Co-management between landholders, marine resource users and local government may be desirable. In Europe and America, the costs of management payments are considered low because of the high agricultural commodity price subsidy levels. In an Australian policy setting, it could be a rather expensive incentive.

Equity and distributional effects. Landholders who lose productive land and freehold title to designated filter strips would have to be compensated for any associated loss of income.

Political and community acceptability. Filter strips are a simple and effective instrument for managing surface water quality. The benefits for anybody who engages in beach or oceans activities for recreation and/or income generation may be significant. It can be expected that community acceptability is high, except for landholder groups who are directly affected. Adequate compensation may be a prerequisite for political acceptability.

A1.2 LOAD-BASED LICENCES FOR WASTE DISCHARGE INTO RIVER AND MARINE SYSTEMS

Description, purpose and examples. A major source of water pollution is point discharge of a range of waste substances from production and consumption processes. Load-based licences control point-discharge of relevant pollutants. For every river or marine system, a total allowable load can be set by an agency such as the Environment Protection Authority. Annual shares of the total allowable load would be distributed to polluters and a market place must be established where dischargers can trade these rights. Tradeable air pollution licences have been operational in industrial areas in the USA for a decade. Total discharge limits and load-based licences were initially based on the concepts of assimilative capacity and dilution as a solution to pollution. We regard them as a means for introducing scarcity to industrial waste disposal, the level of which is reflected in the (marginal) price that industry is willing to pay for disposal or invest into pollution reduction measures.

Effectiveness and dependability. The effectiveness of tradeable load-based licences depends fundamentally on a comprehensive monitoring system and sanctions in excess of pollution abatement costs for non-compliance.

Precaution. Whether or not load-based licences can avoid the chance of serious or irreversible consequences depends largely on the range of substances captured in the licence system, the total allowable discharge, enforcement, and support from other instruments that address pollution from diffuse sources.

Efficiency. Crucial issues regarding efficiency are setting the total allowable discharge for different pollutants and allocating shares to various polluters. In comparison to fixed discharge limits, tradeable quotas will usually improve the economic efficiency of polluting industries.

Continuing incentive and motivation. Once the licence system is in place and enforcement is effective (with spot-checks and penalties for excess discharge) there is potentially a large incentive for polluters to increase the efficiency of their production with respect to discharge of pollutants. A licence constitutes a right to discharge pollutants. The lower the overall quota, the more valuable each share becomes. Therefore dischargers have an incentive to improve their abatement technology so that they can sell their excess licences. The success of their attempts to reduce abatement will depend on the availability and costs of the abatement technology. This policy provides dischargers with some flexibility to invest and react to changes in the economic environment because they have the option to adjust their discharge licences through acquisition or disposal of rights in the market place.

Administrative feasibility and cost. The American example of tradeable quotas for air pollutants suggests that the instrument is administratively feasible and that management costs, including monitoring and enforcement may be financed through penalties on non-compliance and levies on licence transactions.

Equity and distributional effects. The distributional effects of load-based licences depends crucially on the total allowable discharge and the initial allocation of shares. It is important that low-level dischargers are not 'penalised' for already having engaged in pollution abatement by taking previous discharge as the reference point for the initial distribution of quotas. The reference point for licence allocation should reward publicly minded producers.

Political and community acceptability. The instrument is transparent and straight forward to administer though complex to explain to the community. The concept fits well into market-based economies.

A1.3 SEWAGE TREATMENT REGULATION

Description, purpose and examples. With rapid urban development along the coastline, the discharge of sewage into the oceans has increased dramatically and municipalities have tended to react to beach pollution from effluent with the construction of longer outflow pipes rather than opting for the introduction and upgrading of sewage treatment. In parts of Europe and Australia, for example, tertiary treatment of human and industrial sewage was introduced in the 1960s and has resulted in significant water quality improvement. Primary treatment of sewage only removes physical particles from the effluent and it requires secondary and tertiary treatment to remove chemicals and nutrients as well as biological carriers that impose a health hazard to people and their food sources. State regulations may be introduced to phase in compulsory tertiary treatment of sewage and households would be charged on a water use basis or ideally on the household sewage discharge.

Effectiveness and dependability. Introducing tertiary treatment of sewage effectively removes polluting and potentially hazardous substances from effluent. Pollutants may be removed to various degrees and care has to be taken to address key pollutants adequately. Problems may occur when the treatment plants are flooded by storm water or the authority fails to maintain equipment.

Precaution. Enforcing tertiary sewage treatment recognises that sewage outflow into rivers and oceans changes aquatic ecosystems and may affect human health. Introducing tertiary treatment regulation is a policy approach implementing the precautionary principle.

Efficiency. In comparison to primary and secondary sewage treatment, tertiary treatment is more costly. Whether tertiary treatment is warranted depends on its cost relative to the value of the benefits of a reduced pollution load. If we assume that tertiary treatment becomes the standard for treating sewage, then further efficiency gains might be achieved by complementing the regulation with load-based licenses discussed above. In terms of collective efficiency, addressing a problem at its source is usually more efficient than trying to cover up the symptoms.

Continuing incentive and motivation. Tertiary sewage treatment is a service provided to residents and improved service results in a rise in service charges. Being linked to water consumption, such an instrument provides an incentive for people to use water more sparingly. If the regulation is coupled with, for example, discharge licences for industry, there will be an incentive to reduce effluent discharge.

Administrative feasibility and cost. The construction of tertiary sewage treatment facilities is high in comparison to less sophisticated methods. However, ongoing management costs are no higher.

Equity and distributional effects. Local government would roll over increased sewage treatment costs to the local community and people in low-income households would be hit hardest by the measure. However, current social policies could be expanded to provide financial relief for people in such situations.

Political and community acceptability. Community acceptability of compulsory tertiary treatment of sewage can be low in some areas despite a general feeling that it is inevitable, because of anticipated increases in sewerage service charges. The perception of political acceptability varies.

In some parts of the country, political parties are unwilling to sell the policy to the electorate while in others the need for tertiary treatment is well recognised by the community.

A2 INCENTIVES FOR SUSTAINABLE FISHERIES

A2.1 TEMPORAL AND SPATIAL RESTRICTIONS ON FISHING ACTIVITIES AND FISH SIZE RESTRICTIONS

Description, purpose and examples. Temporal and spatial restrictions on fishing activities are biological controls which are used to protect breeding and nursery grounds and to limit the catch of immature stock, and to generally protect stocks. They include seasonal closures and area closures.

Effectiveness and dependability. Depending on the control specification and the biology and ecology of the fish species, these controls may achieve their objective of stock protection and sustainable catch. For the controls to be effective, they have to be introduced before a population is overfished.

Precaution. Biological controls, if they are comprehensive, may be useful for setting a safe minimum standard for a target species. It is important to note, though, that although the instrument is set to protect a species from direct harm, it has been applied infrequently to for the purpose of protecting habitat and ecosystems.

Efficiency. Biological controls may result in substantial gains in economic efficiency from the viewpoint of the society even though they may cause higher short-run costs for the fishing industry.

Continuing incentive and motivation. Apart from an incentive to develop more profitable fishing techniques that still meet the controls, there is no additional incentive for the individuals to conserve the resource. Individual fishers remain caught in a race to catch fish before their competitors do. However, if the biological controls were set in collaboration with industry and a form a co-management was put in place, then advantage could be taken of any intrinsic motivation.

Administrative feasibility and cost. Biological controls are commonly used in over-developed fisheries. They are suited for localised fisheries where temporal and spatial fishing restrictions can be patrolled by aircraft and on-ground spot checks. It is important to monitor fish stocks and catch so that adjustments can be made if necessary.

Equity and distributional effects. The implications of biological control are the same for everybody in the industry, if the control involves temporal and spatial closure. Small boats may be disadvantaged if gear limitations are applied, especially if they require significant investment to meet the new standards.

Political and community acceptability. The instrument is simple and transparent. The industry is familiar with the notion of spatial and temporal closure and a high degree of acceptability is apparent.

A2.2 INPUT CONTROLS

Description, purpose and examples. Input controls stipulate a maximum amount of effort that can be used for fishing and generally targets number of boats (limited licences), amount of fishing gear employed (effort quotas) or restrict the size and other dimensions of each fishing unit (gear and vessel restrictions). The instrument assumes that catch is positively correlated to fishing effort and it is generally expected that licence limitations will result in resource conservation. Input controls are widely used in fisheries management across the world.

Effectiveness and dependability. Input controls are an indirect method of controlling the fish stock. It is necessary to establish the relationship between different types of fishery inputs and catch. There

are a number of examples where use of the instrument has failed to prevent a fishery from collapsing. For input controls to be effective, there must be limited opportunities for input substitution by fishers. Under such circumstances effective fishing effort is restricted and therefore the impact on the fish stock remains at the targeted level. Such circumstances arise rarely: the norm being that input substitution alters fishing patterns and therefore invokes revision of the instrument with possible introduction of output control.

Precaution. Due to a high risk of being ineffective, use of the instrument often fails to avoid the chance of serious or irreversible consequences for the populations of target species.

Efficiency. Across the range of fisheries investigated in an OECD study over-capitalisation and increased harvesting costs were shown to occur with limited licences. This is a result of input substitution away from the controlled inputs. At the same time, input controls restrict access to the industry and thereby assist the profitability of existing businesses. With respect to the overall economic efficiency of resource use, input controls rarely result in a better outcome.

Continuing incentive and motivation. Input controls do not encourage careful use of a fishery but rather encourage fishers to maximise catch subject to allowable input limits. As fishers attempt to maximise expected profits there is an incentive to substitute away from controlled inputs such as electronic navigation and acoustic equipment. This type of innovation runs counter to the public interest, assuming that the management objectives reflect the public interest.

Administrative feasibility and cost. Boat numbers in commercial fisheries are easily controlled. Input controls become harder to administer and enforce when there are many control variables or when input use can be easily disguised.

Equity and distributional effects. Because all fishers in a certain fishery are affected by input limits, the instrument can be seen as being equitable within a fishery. Within the fishery, the initial allocation is a critical equity issue. As Hundloe points out, `grandfathering' is virtually inevitable.

Political and community acceptability. Input restrictions are a conceptually easy mechanism and have a long record of application. Where input levels are set by political decision makers, political rents can be gained and the instrument is subject to political rent seeking. However, input controls are easier to introduce than other measures. They are normally accompanied by other direct regulations, such as time or area closures which aim to meet environmental objectives.

A2.3 OUTPUT CONTROLS: TOTAL ALLOWABLE CATCH (TAC), INDIVIDUAL QUOTA (IQ) AND INDIVIDUAL TRANSFERABLE QUOTA (ITQ)

Description, purpose and examples. A total allowable catch sets a maximum on the (landed) catch allowed in a fishery for specific species, areas and time periods. An individual quota is the amount of catch of a target species that an individual fisher may harvest over a specified period of time. The sum of quotas sets the total allowable catch for a fishery. Quotas may be traded in a competitive market which promotes fishing by the least-cost fishers.

Effectiveness and dependability. TACs and ITQs are effective and dependable when set with reference to known stock and fleet dynamics. This requires careful evaluation of fishery and scientific data. It is rare for output controls to guarantee resource sustainability because an optimal harvest is difficult to determine and to enforce. Input controls are frequently employed as a complementary instrument in order to avoid the collapse of the fishery.

Precaution. TACs are supposed to conserve fish resources, but the OECD study found that over-exploitation was generally not prevented in fisheries managed by TACs. This may be due to the level at which the TACs were set and the fishers' lack of compliance with the TAC limit. Compliance will be improved with individual quotas because each fisher knows how much more he is permitted to catch. And fishers are motivated to preserve the resource in order to maintain their quota in the long term.

Efficiency. Under TACs the total catch should be set at a level which can achieve the management objective. In Commonwealth and many State managed fisheries sustainability and economic efficiency both feature in setting the objective. The idea here is to set the TAC to ensure that the biomass of the species does not fall below a prescribed level. The desirable TAC will depend on the dynamics of the fish population as well as the manner in which fishers locate their catch. The initial allocation of the TAC across fishers and the opportunity to establish ITQs has implications for industry profitability and economic efficiency. The OECD study found that TAC management without ITQs resulted in over capacity and fluctuating landings and that increased harvesting and processing costs were particularly evident. In contrast, individual quotas were shown to generate better resource rents and increased profits. Trading further improves the economic efficiency of output controls because it allows structural adjustment of the industry by reducing the number of participants in a fishery. TACs enable newcomers to enter a highly competitive fishery whereas there is a closed shop for individual quota systems, unless these quota are tradeable.

Continuing incentive and motivation. TACs increase the race to fish because each fisher tries to maximise his share of the total allowable catch. Individual quotas provide security of resource access for the individual fisher who can respond with better product quality within their quota, choice of safer working conditions, strategic timing of catch, and may improve gear to reduce by-catch.

Administrative feasibility and cost. Output controls are transparent incentive instruments. From an administrative perspective TACs are easy to handle but administrative costs increase significantly if quotas are set an individual level. Output controls are difficult to enforce and fisheries that are managed in this way tend to have a significant black market attached to them. Although enforcement costs frequently increase under individual (transferable) quota, there is an increased ability and willingness of fishers to pay these increased costs.

Equity and distributional effects. In the case of TACs, the equity issue is of an inter-generational kind. The larger the present-day quota, the higher the chance of over-exploitation of the fishery and the lower the likelihood of a long-term sustainable fishery. The most significant equity issue associated with ITQs is the initial allocation.

Political and community acceptability. Acceptability of TACs and ITQs is usually initially low but improves as the fishery is depleted.

A2.4 FISHERY SHARE SYSTEM

Description, purpose and examples. A fishery share system gives each fisher a share of opportunities in a regional multi-species fishery as opposed to an individual quota system which allocates a catch entitlement for a specific species in tonnes. A share is a set proportion of the aggregate opportunities of all fisheries in a region. The shares are tradeable. Legislation establishes a core property right in a periodically revised management plan for the species that comprise the fishery. Each fisher is entitled to a share of any allocation of quota and input restriction is made in proportion to the number of shares they hold. The management technique is a cooperative and mixed system and could contain elements of a number of incentive instruments. Importantly, it integrates recreational fishing into the management of the living marine resources by allocating a share of total opportunity to it. The concept of a fishery share system has been developed and its implementation proposed for the NSW fisheries. Potentially, share fisheries systems are also applicable for “ocean farming” systems whereby nutrient-poor waters are fertilised to increase the growth of micro-organisms that provide feed for fish.

Effectiveness and dependability. Cooperation between shareholders in the fishery is pivotal to the success of the system. Fishers hold shares depending on the total opportunities available which are re-assessed on an annual basis. This ensures that long-term concerns and peer control become fundamental elements which support the effectiveness and dependability of the management system. One question is what is the optimal size of a fishery (number of fishers) to achieve the best outcome.

Precaution. The mix of instruments involved in a fishery share system is set to sustain a multi-species fishery and therefore seeks to avoid over-exploitation of single species and damage to the ecosystem.

Efficiency. The share system grants each fisher a guaranteed opportunity and compensatable right to a share in a fishery. This eliminates the race to fish and enables fishers to base investments on estimated returns, resulting in efficiency and profitability gains. At the same time, the collective efficiency of the fishery is greatly improved.

Continuing incentive and motivation. As outlined earlier, the share fishery system intrinsically motivates fishers to care for the long-term sustainability of opportunities of the fishery which they hold shares in. While the shares remain constant, the income that they translate into depends on an assessment of the overall status of the fisheries. This cooperative element also encourages peer control.

Administrative feasibility and cost. In comparison to individual quota systems, initial administrative effort is higher because of the complexity of the system. Once the rights associated with each share are established, management and administration is easy. The management can be financed through a levy on share transactions

Equity and distributional effects. A fishery share system is highly equitable. All shareholders are guaranteed the same rate of return. The market-based concept allows new entries to the industry. Commercial fishers are not disadvantaged in comparison to their amateur counterparts. The ease of adjusting the input and output benchmarks of the fishery reinforces a long-term management perspective and equal opportunities for future generations.

Political and community acceptability. While the fishery share system is perceived to be fair, it is quite complex and demands comprehensive stakeholder consultation from the outset of its design.

A2.5 FISHING LICENCES FOR RECREATIONAL FISHERS

Description, purpose and examples. Fishing licences are permits issued to anglers which allow them to employ specified gear for the purpose of catching fish. Licences offer a mechanism to educate recreational fishers about fishing regulations and standards and, also, finance further research in this area. The introduction of management instruments for recreational fishing are a reflection of a change in public perception that fishing is not a right but a privilege. It is logical and necessary to integrate the management of commercial and recreational fishing to ensure that fish stocks are shared efficiently and conserved for the future. Registered anglers would be members of an association and receive information brochures and newsletters, conveying scientific knowledge in a lay manner, advising on area and time restrictions, and offering educational games and competitions for young readers. They may be requested to fill in short questionnaires upon renewal of their licences. Compliance to the policy largely depends on voluntary uptake because, unless issued in association with boat licences, recreational fishing licences are hardly enforceable. An annual fee would apply to finance administration of the policy but membership for under age anglers would be free.

Effectiveness and dependability. Fishing licences for recreational fishers have to be regarded as a means of distributing information in an educational sense and monitoring the effort in recreational fishing rather than an instrument for protecting fish populations.

Continuing incentive and motivation. Recreational fishing behaviour is subject to a change in purpose (from catch for food to sporting and recreational activity) and public perception as can be seen from the increasing acceptance of catch-and-release practices which are communicated through television programs. Fishing licences issued on an annual basis would be another avenue of promoting environmentally sound fishing.

Administrative feasibility and cost. The costs associated with issuing of licences could be financed through the fees attached to the licence. While licences for recreational fishing boats are enforceable in a similar fashion to car registrations, it would be illusionary to assume that all recreational anglers could be forced to take out a licence. If however, the benefits associated with such a licence, for example through regular newsletters etc, are high, voluntary registration may be high.

Equity and distributional effects. Recreational fishing licences acknowledge that recreational fishing plays an important part in harvesting the oceans' living resources. Fisheries management efforts have concentrated on commercial fishing despite the fact that recreational catch plays a major role in many fisheries. This instrument would help to balance the competition by complementing bag limits.

Political and community acceptability. The acceptability of recreational fishing licences can be regarded as low because people view it as a right rather than a privilege to be able to go and catch fish for sports and food gathering purposes. The acceptability could be improved by establishing a clear link between the licence fees and information benefits as well as effort into marine conservation.

A2.6 PRIVATE OWNERSHIP

Description, purpose and examples. Private ownership in fisheries is achieved by assigning total property rights to a fishing ground to an individual (or a group of individuals) in the way how land is owned by farmers. This is conceptually possible if the target species is confined to a well defined geographical area, as is the case with abalone or oysters. "Claims" would be assigned to individuals as areas where they have exclusive fishing rights.

Precaution. Managing the fishery in a sustainable manner is the indirect objective of this instrument which would be achieved through enforceable property rights. In practice, however, private ownership does not prevent farmers from mining their resources when they have a high private discount rate, or when they are ignorant of the consequences of their activities. While owners of, for example, abalone claims would have a strong interest in preventing other people from illegally harvesting these encrustations, they would be hard pressed to control their areas.

Effectiveness and dependability. The concept of private ownership is necessarily linked to species that do not move over significant distances. This constrains its applicability to few species which a strong local attachment.

Efficiency. The theoretical advantage of private ownership is that productive efficiency and environmental protection constitute the owner's self interest because he would seek to maximise his long-term benefits through either sustainable harvests or a high capital value of fish stock. Situations where one individual controlled a large share of the fishery (monopoly) would, through price control, reduce the social efficiency gains expected from the market mechanism. If such situations are avoided, gains in collective efficiency can be expected.

Continuing incentive and motivation. Private ownership, in principal, invokes a private interest to use a resource economically efficiently. If people have a high preference of present over future incomes, they may still exploit the resource at a rate that is higher than the rate at which the resource recovers.

Administrative feasibility and cost. From a social perspective, the costs of managing and enforcing controls would rest with the individuals who own the property rights, ie. costs would be internalised in true user-pays fashion. This would be in contrast to other management instruments where governments/society bears the cost of management, administration and enforcement.

Equity and distributional effects. The central equity issue centres on who will be allocated property rights. Potentially, the owners of a fishery could extract very high private rents, for example in monopoly or oligopoly situations.

Political and community acceptability. Fisheries are traditionally common resources and the idea of individuals having private ownership over fishing grounds is unlikely to be widely accepted. The principle of open access is firmly embedded in the mind of fishers and the general public.

A3 INCENTIVES FOR ENVIRONMENTALLY SUSTAINABLE MARINE TOURISM

A3.1 VOLUNTARY CODES OF CONDUCT

Description, purpose and examples. To improve its image and reputation, an industry can develop guidelines for operation and performance and encourage its members to comply with voluntary codes of conduct. Voluntary codes are particularly important in the tourism industry where countries, regions, or sectors of the industry seek to develop a specific tourism product and create an image that appeals to their target audiences or creates the impression of being “better” or “the best”. Developing standards essentially relies on various sectors of a (regional) tourism industry developing a shared long-term vision which is specific enough to be supported by agreed procedures and ways of conduct.

Effectiveness and dependability. Because of their non-imperative philosophy, the effectiveness of voluntary codes of conduct is limited and consequently the dependability questionable. Peer group pressure is essential for the mechanism to work before perceivable benefits reinforce compliance.

Precaution. The primary aim of this instrument is the promotion of the (tourism) industry in a region. It is indifferent to precautionary considerations.

Efficiency. Voluntary codes of conduct can have significant positive influence on the productivity of the tourism industry. For example, the on-boat lesson that some tour operators provide to visitors headed for the Great Barrier Reef improves the subsequent visitor experience . It therefore enhances the image of the industry, the Reef and the region as a whole with positive implications for word of mouth promotion thus increasing the stream of visitors to the region.

Continuing incentive and motivation. Voluntary codes make use of intrinsic motivation and, while there is no legal obligation for compliance with the codes, peer group and industry pressures on “black sheep” of the industry are high.

Administrative feasibility and cost. The costs associated with compliance are borne by the individual businesses and there is virtually no administrative effort involved.

Equity and distributional effects. The instrument is highly equitable. Compliance is not compulsory for members of the industry who, for whatever reason, reject the code of conduct.

Political and community acceptability. Voluntary codes of conduct seek to improve the image and profitability of an industry and are assured of broad-based acceptability.

A3.2 ACCREDITATION

Description, purpose and examples. Accreditation means that somebody who wants to conduct an activity which is subject to accreditation, must, as a necessary condition, fulfil certain conditions. Accreditation usually seeks to ensure that people who engage in a (commercial) activity are sufficiently educated. With respect to the marine environment and resources, accreditation is particularly applicable to commercial tourism operators, being part of the service industry. Operators learn about their responsibility for the environment which is the essence of the existence of their businesses. This constitutes an important step in the implementation of the duty of care

principle. Accreditation not only ensures that operators are informed about the impact their operations have on the environment but also encourages them to educate their clients about the environment they visit. Accreditation can be a voluntary measure and therefore a distinctive feature of an operator or, in combination with a licence, it can have a regulatory basis that requires accreditation as a necessary condition for being granted a licence for operating a tour-based tourism business.

Effectiveness and dependability. From an individual's perspective, accreditation is effective. From an industry perspective, it is only effective if a large majority of its members are accredited, which raises the issues of mandatory accreditation. Accreditation will dependably improve performance because a minimum standard of service is achieved.

Precaution. In general, accreditation is independent of precautionary considerations.

Efficiency. In similar fashion to voluntary codes of conduct, accreditation is bound to increase industry profitability and may also enhance economic efficiency of resource use from society's viewpoint.

Continuing incentive and motivation. Generally, a higher level of eduction on environmental issues will raise the level of intrinsic motivation to help conserve the environment.

Administrative feasibility and cost. Accreditation is easy to administrate and low-cost, particularly when a fee is attached to issue of the accreditation certificate.

Equity and distributional effects.

Political and community acceptability.

A3.3 PERFORMANCE BONDS

Description, purpose and examples. Performance bonds are a monetary security that (tourism) developers are required to set aside to ensure that adequate funds will be available for clean-up and rehabilitation of a site in the event the activity ceases or is abandoned. In 1993, the Resource Assessment Commission (RAC) Coastal Zone Inquiry recommended that `the use of performance bonds be extended to all new development projects in the coastal zone, unless equally effective alternative enforcement measures can be demonstrated to exist'.

Examples. Performance bonds are commonly used in Australia, particularly in the mining industry. The Great Barrier Reef Marine Park Authority (GBRMPA) requires performance bonds to be posted in those circumstances where construction of semi-permanent or temporary structures is involved. These bonds are required as part of regulatory issues by the GBRMPA. Up to 1993, there were 33 instances where performance bonds had been required as a condition of the issue of permits. Site-specific bond values vary from $1,000 for a small mooring to $1million required in the case of a floating hotel. Bonds are adjusted annually.

Effectiveness and dependability. The effectiveness of performance bonds in encouraging adequate rehabilitation and efficiency in resource use depends on the specifications with respect to use and the level and form of performance bond posted. Efficient rehabilitation is encouraged by stipulating the level of rehabilitation required rather than the cleanabilitation and efficiency in resource use depends on the specifications with respect to use and the level and form of performance bond posted.

Efficiency. From an investor's perspective, performance bonds may affect the economic efficiency of new tourism-related projects because they increase investment costs and associated risk of financial failure. From society's point of view they are a highly efficient instrument because they minimise the risk that governments have to meet rehabilitation costs.

Continuing incentive and motivation. Without a bond, there is little incentive for developers to carry out rehabilitation on their own accord since they gain little from such activities in comparison to the community at large. The performance bond stipulates an amount of money to be set aside for this purpose as a condition that a project can commence.

Precaution. Precaution is a major rationale for this instrument. It ensures that sufficient funds for rehabilitation are set aside.

Administrative feasibility and cost. The instrument is easily enforceable because it is coupled to granting of development proposals. Management costs are low and administrative feasibility is ensured because there is little effort involved in adjusting the fund annually. However, the administering agency will have to oversee that rehabilitation of sites meets the requirements.

Equity and distributional effects. Performance bonds are an expression of the user pays and polluter pays principles. They target developers and bond levels are set proportional to the size of a project and its environmental impact. The mechanism is a highly equitable way of ensuring environmental performance.

Political and community acceptability. Performance bonds have been successfully applied to mining and coastal development projects. While developers would not be in favour of their introduction, the community benefits in that taxpayers are prevented from having to pay for the problem that somebody caused in his pursuit of private benefits.