

Criteria to Evaluate the Application of Policy Instruments Designed to Internalise Externalities from Commercial Fisheries

*Report to Ministry of Fisheries
(SEC 1999/05 – objective 2)*

**Ross Cullen
Ken F.D. Hughey
Geoffrey N. Kerr
Ali Memon**

December 2000

Research Report No. 250

**Agribusiness and Economics Research Unit
PO Box 84
Lincoln University
Canterbury
New Zealand**

**Ph: (64) (03) 325-2811
Fax: (64) (03) 325-3847**

**ISSN 1170-7682
ISBN 0-909042-29-2**

Research to improve decisions and outcomes in agribusiness, resource, environmental, and social issues.

The Agribusiness and Economics Research Unit (AERU) operates from Lincoln University providing research expertise for a wide range of organisations. AERU research focuses on agribusiness, resource, environment, and social issues.

The AERU conducts research contracts for clients. University research can be supported by AERU through supervision of postgraduate research. Research clients include Government Departments, both within New Zealand and from other countries, international agencies, New Zealand companies and organisations, individuals and farmers. Research results are presented through private client reports, where this is required, and through the publication system operated by the AERU. Two publication series are supported: Research Reports and Discussion Papers, with ISBN and ISSN numbers respectively. The list of AERU publications below illustrates recent research projects completed. The list of publications inside the back cover illustrates recent research projects completed by the AERU.

The AERU operates as a research coordinating body for staff in the University. It can call upon the expertise of staff in all six divisions of the University and has close links with Commerce (45 academic

staff), Applied Management and Computing, Environment Management and Design, and Human Sciences Divisions.

The major research areas supported by the AERU include: natural resources, environment and public policy; agricultural economics; rural sociology; and marketing (both institutional and consumer). In addition to the research activities, the AERU supports conferences and seminars on topical issues and AERU staff are involved in a wide range of professional and University related activities.

Founded as the Agricultural Economics Research Unit in 1962 from an annual grant provided by the Department of Scientific and Industrial Research (DSIR), the AERU has evolved to become an independent, major source of business and economic research expertise. DSIR funding was discontinued in 1986 and in 1987 the name of the organisation was changed to the Agribusiness and Economics Research Unit. In 1999 the AERU became part of the Commerce Division but continues to provide research on agribusiness, resource, environment and social issues.

DISCLAIMER

While every effort has been made to ensure that the information herein is accurate, the AERU does not accept any liability for error of fact or opinion which may be present, nor for the consequences of any decision based on this information.

A summary of AERU Research Reports, beginning with #242, are available at the AERU website www.lincoln.ac.nz/aeru/

Printed copies of AERU Research Reports are available from the Secretary.

Information contained in AERU Research Reports may be reproduced, providing credit is given and a copy of the reproduced text is sent to the AERU.

AERU STAFF 2000

Director

Ross Cullen, BCom(Hons) PhD Dip VFM.

Senior Research Officer

J R Fairweather, BAgSc BA MA PhD

Research Officer

G Greer, BAgSc(Hons)

Research Assistants

P Mayell, BA(Hons) MA

N Robertson BA(Hons) MA

C Tomlinson BA(Hons)

A Cook BRS MAppSc

Secretary

A Christie

Contents

LIST OF TABLES		i
LIST OF FIGURES		iii
PREFACE		v
ACKNOWLEDGEMENTS		vii
EXECUTIVE SUMMARY		ix
CHAPTER 1	Introduction	1
CHAPTER 2	A Framework for Decision-Making	3
CHAPTER 3	Criteria for Selection of Management Tools for Marine Fisheries Externalities	5
	3.1 Rationale for Criteria	5
	3.2 Criteria Identification	6
CHAPTER 4	Environmental Criteria	9
CHAPTER 5	Rights Guaranteed Under The Treaty of Waitangi	13
CHAPTER 6	Socio-Economic Criteria	15
CHAPTER 7	Recreational Criteria	19
CHAPTER 8	Management Criteria	21
CHAPTER 9	Judging the Effectiveness of Instruments	23
CHAPTER 10	Overall Assessment and Guidance in Use of the Criteria	29
CHAPTER 11	Conclusions	31
REFERENCES		33
APPENDIX 1	Summary of Internalisation Instruments	35
APPENDIX 2	Publications from this Work	37

List of Tables

1. Areas of 'Impact' Associated with Type of Fishing Activity and Classification of Marine Impacts. 23
2. Evaluative Weightings Against Which Criteria Designed to Measure the Performance of Alternative Policy Instruments can be Weighted. 24
3. Effectiveness of the Use of Internalisation Instruments Against Wide Ranging Criteria (scale 4= totally effective; -2 is negative) 27

List of Figures

1. Preliminary Framework for the Decision Support System 4
2. Hierarchical Framework for Considering Instruments Employed to Internalise Environmental Externalities 30

Preface

SEC 1999/05 is a contract for fisheries research awarded to Lincoln University in 1999. The research concerns the identification of instrument to internalise the externalities associated with commercial fisheries in New Zealand. There are three objectives for the research. Hughey et al (2000) report on objective 1, i.e., identification of instruments; this report is designed to meet the requirements of objective 2, i.e., development of criteria to evaluate the effectiveness from implementing these instruments; and Kerr et al (2000) report on objective 3, i.e., development of a draft 'Decision Support System' to implement this approach.

Ross Cullen
DIRECTOR

Acknowledgements

We appreciate the comments about instruments and effectiveness criteria by Cath Wallace (ECO), Barry Weeber (Royal Forest and Bird Protection Society), Piripi Grimshaw (Te Runanga O Ngai Tahu), Doug Saunders (Talley's Fisheries), Peter Ackroyd (SeaRight Investments) and Nick Wyatt (Ministry of Fisheries).

Executive Summary

New Zealand has the world's fourth largest Exclusive Economic Zone and a very large commercial fishery. Arguably this fishery is one of the best managed in the world. Nevertheless, many problems remain to be solved, especially environmental problems. Many of these problems can be categorised as externalities from commercial fishing. We (Hughey et al. 2000) have identified a wide range of policy instruments which can be applied to the internalisation of these externalities. In this report we:

- identify criteria against which each of these instruments should be evaluated before it is considered for implementation. The criteria are environmental, Treaty of Waitangi, socio-economic, recreational and management, respectively;
- Evaluate the effectiveness of chosen instruments against these criteria.

All of these tools can be used to enhance decision making in fisheries management and a framework for this decision making is proposed.

Chapter 1

Introduction

The stated overall objective of the MFish research project, SEC 1999/05 is:

“to determine methods or processes to internalise the environmental externalities of fishing that will allow fisheries managers to address the obligations in the Fisheries Act 1996 to avoid, remedy or mitigate the adverse effects on the aquatic environment”.

With respect to objective 1, “To review the economic, environmental, and resource management literature, including case studies relating to internalising environmental externalities, having regard to a full range of regulatory, economic, social, institutional, and behavioural policy instruments”, we concluded that a range of negative environmental effects are associated with commercial fishing activities in many New Zealand fisheries (Hughey et al. 2000). We developed an Environmental Impact Assessment framework for fisheries management in New Zealand and determined that where some impacts are significant, others are not. Many efforts have been made to reduce significant adverse effects by means of a variety of policy instruments.

We also examined a wide range of regulatory, economic, social, institutional and behavioural policy instruments covering resources other than fisheries. Some, but not all, of these instruments are already employed in NZ fisheries, to greater or lesser extents, either explicitly (e.g., regulation), or implicitly (e.g., modifying behavioural expectations). New mechanisms of potential value to fisheries management have been identified.

The aim of this report, specifically in relation to objective 2, is, “from the results of Objective 1, to determine appropriate criteria to facilitate the evaluation of alternative internalisation mechanisms”. As part of the process of preparing this report we have consulted with a variety of interest groups about the instruments and about the criteria for evaluation. The organisations consulted were:

Talleys, Nelson
Royal Forest and Bird Protection Society, Wellington
ECO, Wellington
SeaRight Investments Ltd, Christchurch
Te Runanga O Ngai Tahu, Christchurch.

Many useful suggestions were made in these discussions and at a subsequent meeting of the MFish Socio-Economic Research Group and these have been incorporated into development of this report.

Chapter 2

A Framework for Decision-Making

Selection of the most appropriate response to managing environmental externalities in fisheries entails a process that may be split into a number of sequential decision-making stages. The nature of those stages and the processes adopted within them are potentially quite diverse. The approach adopted here is termed mixed scanning (Mitchell, 1997). The mixed scanning approach uses a mixture of processes to identify desirable changes. This approach does not attempt to obtain complete information on, or even to identify, all possible alternatives, but still allows for the possibility of fundamental change by scrutinising a limited number of options that are significantly different from the status quo.

Each option for addressing environmental externalities has two component parts, the action and the policy instrument/mechanism. Actions are behaviours undertaken in the context of fishing. They may include aspects such as: the gear used, how gear is deployed, when fishing occurs (time of day, or time of year), how long fishing occurs for, the amount of effort applied to fishing, the number, quality and type of fish either discarded or landed, fishing location. There are a number of policy mechanisms that may bring these actions about, either voluntarily or involuntarily. These policy instruments include: laissez faire, moral suasion, regulation, incentives (or disincentives), and property rights allocations.

Each policy instrument for addressing environmental externalities may be described by its components. For example, common fishery management options include regulations restricting use of specified gear and property rights specification for volume of fish landed. Clearly, the number of options is immense. Within categories there are many sub-options (e.g., types of gear that could be used, variations on incentive mechanisms), so the theoretical number of combinations of policy instruments and actions is very large. The approach described above is proposed as a mechanism for limiting to manageable dimensions the number of options receiving close scrutiny.

The decision framework is depicted in Figure 1.

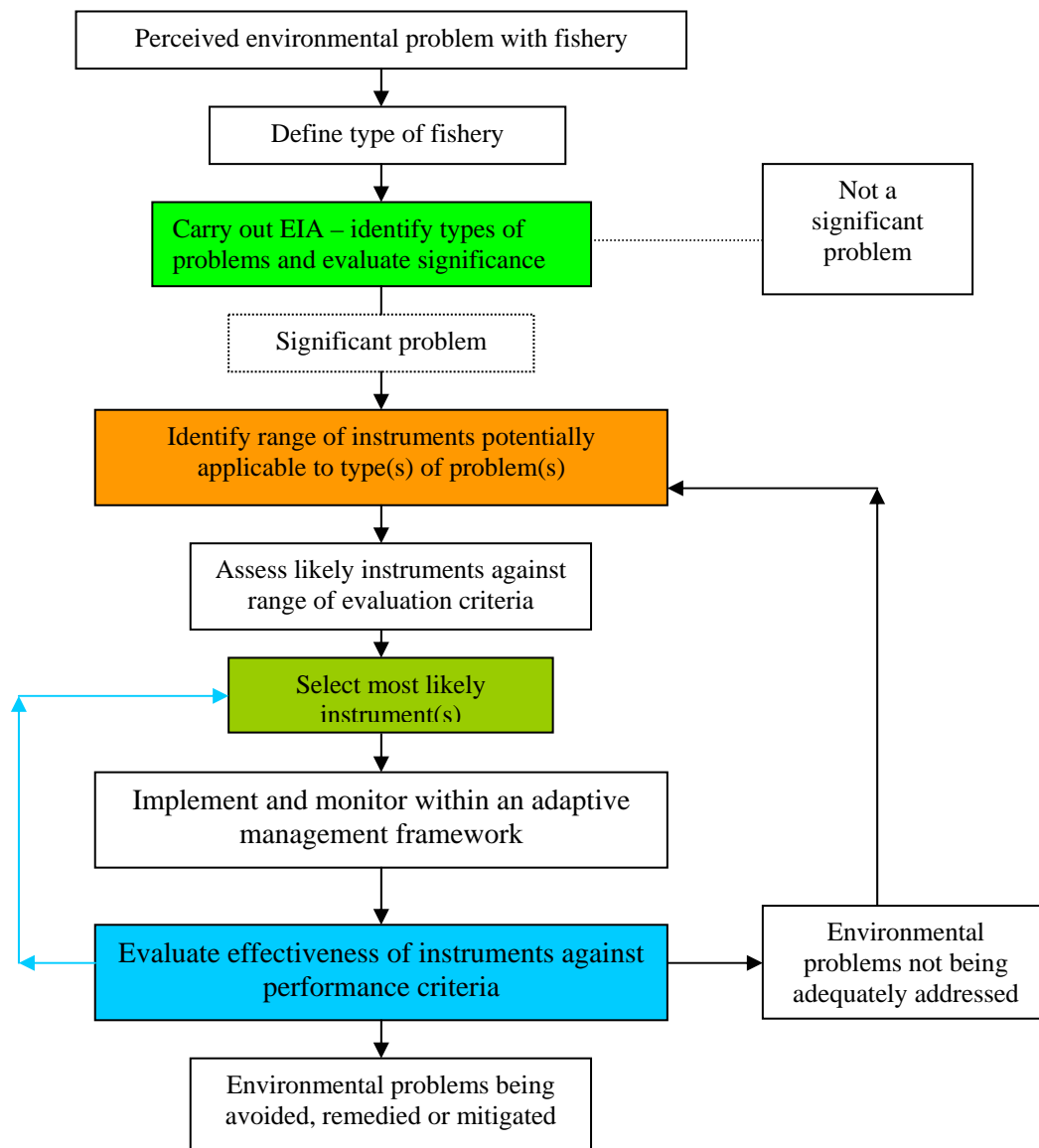


Figure 1
Preliminary Framework for the Decision Support System

Chapter 3

Criteria for Selection of Management Tools for Marine Fisheries Externalities

3.1 Rationale for Criteria

Rational policymaking requires evaluation of expected outcomes against criteria to identify the implications of courses of action. Where multiple evaluative criteria exist there needs to be a process for trading-off outcomes across competing criteria in order to identify the preferred option. A useful discussion of these approaches in a New Zealand context is provided by Strategic Policy Group (1995), although none of the five case studies deal with fisheries. Nevertheless the basic principles of their work are included in the following discussion.

Fishery management entails both strategic policy planning and operational planning aspects. Strategic policy takes a broader perspective than operational policy and consequently primarily addresses macro-level concerns. Evaluative criteria developed from this arena typically occur at the national or fishery level. In contrast, operational policy often has effects that are felt at the micro level and it can produce criteria quite different from strategic policy. For example, a strategic policy might be to limit harvest to some specific level. This may be achieved by an operational policy that restricts vessel size. Fishers will be concerned about profitability, safety, location and logistic concerns of this policy that may have little or no importance at the strategic policy level. Environmental policy spans both strategic and operational aspects of fisheries management and consequently criteria from both areas have relevance to the evaluation and selection of management tools.

In an analysis aimed primarily at strategic fisheries policy, Anderson (1986 p.192) suggested that “a proper regulation regime should have the following characteristics:

It should encourage innovation and research into new fishing methods.

It should be flexible enough to allow for proper reaction to changes in economic and biological conditions.

It should have the support of the majority of fishers involved.

It must also take full cognisance of the costs of negotiations, research, and enforcement necessary to undertake the program; if these costs are not less than the benefits to be gained from regulating, the program cannot be justified.

Finally, its effects on the distribution of wealth and on other management objectives such as maintaining employment, improving the balance of trade, etc., must be acceptable.”

These criteria are equally applicable at the strategic and operational levels, but may be somewhat narrow. Most early investigation of fisheries management was undertaken with the purpose of limiting harvest in order to protect target fish stocks and thereby protect harvests. That would be appropriate if the only purpose of fishing were to catch fish. This is not the case, people fish for a number of motivations, including income, recreation, lifestyle, cultural reasons, or food (Payne 1990). Fisheries are also managed to enhance other societal objectives, including community structure and employment (Hannesson 1985). These motivations suggest a role for socio-cultural analysis of fisheries management alongside traditional bio-economic approaches.

Environmental externalities associated with fishing require management to take an even broader view than this, however. In particular, Section 9 of the Fisheries Act (1996) requires management decisions to take account of environmental principles, including:

maintaining long term viability of species which are associated with or dependent upon the harvested species;
maintaining biological diversity of the aquatic environment; and
protecting habitats of particular significance to fisheries management.

In addressing the need for other regulations to supplement an ITQ fishery management process, Anderson (1999) suggests the following strategy to identify which approach is best for management of environmental externalities in any particular context:

Describe exactly the conservation problem that will not be addressed by a basic ITQ program.

List possible ways in which the ITQ program can be modified so as to solve the problem.

List possible supplemental regulations that will address the problems.

Determine which of the potential solutions derived in Items 2 and 3 best addresses the problem and specify a modified ITQ program which incorporates these additional rules or procedures.

Compare the basic ITQ program with the modified ITQ program to determine which one most adequately addresses the management objectives. If the modified one is judged superior, it should be adopted; if not, the basic program should be used (assuming that an ITQ program is to be used). The basic issue is to make sure that the modifications do not introduce problems worse than those they solve.

In proposing the need for these supplementary policies, Anderson acknowledges that strategic policy (ITQs) does not necessarily address all operational concerns. His strategy implies two major evaluative steps. First, in step 4, is the requirement to determine which potential solution is “best”, and second (step 5) is the requirement to determine whether the best alternative is superior to the status quo. The five evaluative criteria Anderson provided earlier are still relevant at this level, but do not address the full range of impacts that may arise.

3.2 Criteria identification

Criteria can be applied to assess the feasibility of management alternatives (implementation criteria) and the desirability of management alternatives (performance criteria). Antunes and Santos (1999) categorise these criteria as:

Implementation Criteria:

Institutional setting, legal authority: there must be an institutional setting and legal framework to allow for the setting of a governance regime;

Enforceability: related to the ability to enforce and monitor compliance;

Public and stakeholders acceptance: the measures/instruments must be acceptable to the public and actors in the process;

Technical and economical feasibility;

Opportunity for action;

Other institutional aspects: e.g., flexibility and compatibility with other sectoral/regional policies.

Performance Criteria:

Economic efficiency: maximise the net benefit;

Cost-effectiveness: maximise the benefit in a chosen indicator for a given expenditure or minimise the cost to attain a given objective;

Environmental effectiveness: extent to which environmental objectives are met;

Equity: refers to the allocation of gains and losses across the different agents, and in time and space. It is related to the perceived fairness of the policy;

Response time: in some cases it is important to minimise the time needed to achieve the desired policy targets;

Indirect effects: some measures/instruments aimed at an environmental problem can reduce (or increase) another one or create a new problem.

Sapsford (1998) identifies desirable characteristics of biodiversity management instruments and provides several additional items to those proposed by Antunes and Santos (1999). In particular, he notes that instruments should be:

Robust: deliver relatively predictable results in situations of uncertainty about both biodiversity and changes in price, climate, etc;

Precautionary: minimise the chance of serious irreversible consequences due to uncertainty;

Flexible: able to be adapted to changing knowledge;

Durable: create ongoing incentives for innovation towards [improvement] as technology, prices, climate, etc. change;

Informative: encourages active self-monitoring and the dissemination of this information.

While there is some overlap between the two sets of criteria, Sapsford (1998) adds the dimension of uncertainty (whether for biological, economic, or other reasons) and focuses on the need to be able to adapt to an uncertain future. These needs are echoed in Section 10 of the Fisheries Act (1996), that describes information principles to be taken into account to address uncertainty.

A different approach is adopted by Costanza et al. (1999), who identify the causes of oceanic environmental problems as the contravention of one or more of six “Lisbon principles of sustainable governance”. The corollary of their argument is that proposed solutions can be evaluated according to whether they remove the violation(s) or introduce new violations. The six principles are:

Responsibility principle: Individual and corporate responsibilities and incentives should be aligned with each other and with social and ecological goals.

Scale-matching principle: The appropriate scales of governance will be those which have the most relevant information, can respond quickly and efficiently, and are able to integrate across boundaries.

Precautionary principle: In the face of uncertainty about potentially irreversible environmental impacts, decisions concerning the use of environmental resources should err on the side of caution.

Adaptive management principle: Given that some level of uncertainty always exist in environmental resource management, decision makers should continuously gather and integrate appropriate ecological, social, and economic information with the goal of adaptive improvement.

Full cost allocation principle: All of the internal and external costs and benefits of alternative decisions concerning the use of environmental resources should be identified and allocated.

Participation principle: All stakeholders should be engaged in the formulation and implementation of decisions concerning environmental resources.

We consider these principles might be adopted as part of guidelines for using the Decision Support System that is the product of this project.

The broad range of policy objectives influencing, and influenced by, fisheries management suggests that evaluative criteria for environmental externality management methods must be drawn from the social, economic, biological, cultural and legal arenas. This perspective has been adopted by the New Zealand Ministry of Fisheries, as identified in the founding principles of its “Fisheries 2010” policy. These principles, “help to minimise or resolve conflicts between environmental, economic and social objectives, and are already enshrined in environmental legislation such as the Resource Management and Fisheries Acts, in the Environment 2010 Strategy, and in international conventions.” The twelve principles are:

- Inter-generational Equity
- Biodiversity
- Environmental Bottom Lines
- The Precautionary Principle
- Research, Science and Technology
- Protecting our International Competitiveness
- Sustainable Property Rights
- Least-cost Policy Tools
- Pricing of Infrastructure
- Internalisation of External Environmental Costs
- Defining the Limits of Fishery Resource Use and Substitution
- Social Costs and Benefits

In addition, New Zealand has particular cultural concerns arising from the impacts of fishing on the environment because of the cultural significance of that environment to Māori and the requirement to adhere to the principles of the Treaty of Waitangi.

The criteria presented below are in five sections. Criteria within each of the sections vary in terms of the strength of direction they give, i.e., the environmental and Treaty of Waitangi criteria are prescriptive because they are mandatory under existing legislation; economic and social criteria are less prescriptive because policy advisors and decision makers have greater latitude to consider these; management criteria fall in-between: in the main, they reflect attributes of good policy analysis.

Within each category, for which criteria have been identified, both an overall generic criterion and specific criteria are listed (except Treaty of Waitangi for which only one criterion is identified). For general guidance purposes each generic overall criterion can be used as a coarse sieve of the range of instruments. Recourse to the specific criteria will help identify particular strengths and weaknesses of the instrument(s).

Chapter 4

Environmental Criteria

The development of environmental criteria requires consideration of:

- Fisheries Act (1996) requirements
- Other relevant/associated NZ legislative requirements
- NZ's international treaty obligations
- Government 'resource management/environmental' policy
- Industry self-management environmental principles.

The Fisheries Act (1996) has been developed in an integrated way, reflecting many international commitments to sustainable fisheries management. It draws on international conventions (e.g., UNCLOS Convention) and is complementary to related legislation (i.e., the RMA 1991) and policy (e.g., the Environment 2010 Strategy (MfE 1995)). Because of this approach to development of the legislation, it has been possible to integrate more recent environmental management considerations into development of fisheries policy and its implementation. Specifically, development of the Proposed Environmental Performance Indicators of the Marine Environment (MfE 1998) builds on key Fisheries Act requirements.

As part of the implementation process of the Fisheries Act 1996, MFish is developing implementation guidelines for key sections of the Act¹. This work has been made available to us and is referred to, or adopted, where relevant. Additionally, decision making under the Fisheries Act is principally based on Section 10, the Information Principles. All of the criteria identified below need to be assessed in light of 'best available information' requirements (Auditor-General 1999) and a precautionary approach, as required under that section of the legislation.

¹ **PART II: PURPOSE AND PRINCIPLES**

8. Purpose – (1) the purpose of this Act is to provide for the utilisation of fisheries resources while ensuring sustainability.

(2) In this Act-

“Ensuring sustainability” means-

- (a) Maintaining the potential of fisheries resources to meet the reasonable foreseeable needs of future generations; and
- (b) Avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment:

“Utilisation” means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being.

9. Environmental principles – All persons exercising or performing functions, duties, or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability, shall take into account the following environmental principles:

- (a) Associated or dependent species should be maintained above a level that ensures their long-term viability.
- (b) Biological diversity of the aquatic environment should be maintained.
- (c) Habitat of particular significance for fisheries management should be protected.

10. Information principles – All persons exercising or performing functions, duties, or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability, shall take into account the following information principles:

- (a) Decisions should be based on the best available information:
- (b) Decision makers should consider any uncertainty in the information available in any case:
- (c) Decision makers should be cautious when information is uncertain, unreliable, or inadequate:

The absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act.

The following environmental criteria are largely based on provisions of the Fisheries Act 1996. As a general principle all of the criteria below should be assessed/applied within the context and requirements of meeting international fisheries/UNCLOS obligations for which the New Zealand government is a signatory. Another principle underlying development of these criteria concerns Section 8(2)(a) of the Fisheries Act 1996, i.e., 'maintaining the potential of fisheries resources to meet the reasonable foreseeable needs of future generations'. It is our view that the combination of criteria and their successful application takes into account the reasonable foreseeable needs of future generations.

OVERALL ENVIRONMENTAL CRITERION:

The Policy Instrument(s) safeguards the life supporting capacity of the marine environment in a healthy functioning state.

SPECIFIC ENVIRONMENTAL CRITERIA require that the policy instrument:

avoid or minimise non-target fish bycatch, at least to the point where affected fisheries are maintained at viable levels;

protects marine habitats, especially those on the seabed, from disturbance and damage that would compromise their ability to provide for dependent communities

ensures fishing related mortality of marine mammals is below a maximum allowable fishing-related mortality;

ensures fishing related mortality of birdlife is below a maximum allowable fishing-related mortality;

ensures fishing related mortality of invertebrates, flora and bryophytes is below a maximum allowable fishing-related mortality;

minimises the effects of pollution on the marine environment including dependent ecological communities; and/or

protects fish habitat generally.

The criteria above are based on the following points, many of which are mandatory requirements of the Fisheries Act (1996).

Environmental Principles

Section 9 sets out the environmental principles that must be taken into account by all people making decisions or exercising powers under the Act in relation to the utilisation of fisheries resources or ensuring sustainability. These principles are:

(a) *Associated or dependent species should be maintained above a level that ensures their long-term viability:*

(b) *Biological diversity of the aquatic environment should be maintained:*

(c) *Habitat of particular significance for fisheries management should be protected.*

According to MFish (pers. comm./work in progress) the environmental principles should guide proactive fisheries management and research, including proposals for fisheries development. They should also serve as a basis for guiding reviews of existing fishery management regimes. For example, the environmental principles should be used to guide:

The Minister's decisions
Priority decisions for fisheries research
Development of fisheries plans
Review of fisheries in the Adaptive Management Programme
Proposals for development of new fisheries
Continuous improvement in the management of existing fisheries.

We consider they should also be used to guide the selection of instruments used to internalise the externalities from commercial fisheries management².

Principle (a) Associated or dependent species should be maintained above a level that ensures their long-term viability.

MFish (pers. comm. 2000) consider that the intent of section 9(a) is to provide a management strategy for those species that can not be commercially targeted, but which are actually affected by the taking of other species. *Non-harvested or associated or dependent species* are those that are specifically prohibited from being targeted commercially. The species defined as being associated or dependent vary according to the commercial fishing regulations applying to each fisheries management area. The exceptions are those species protected under the Wildlife and Marine Mammal Protection Acts, which cover all areas.

Principle (b) Biological diversity of the aquatic environment should be maintained

Biological diversity is defined in Section 2 of the Act as “the variability among living organisms, including diversity within species, between species, and of ecosystems”; and, “Aquatic environment”:

Means the natural and biological resources comprising any aquatic ecosystem; and, Includes all aquatic life and the oceans, seas, coastal areas, inter-tidal areas, estuaries, rivers, lakes and other places where aquatic life exists.

The principle that the biological diversity of the aquatic environment should be maintained is derived from the Convention on Biological Diversity, 1992. Biological diversity includes consideration of biodiversity at the level of *ecosystems, species, and genes*.

The New Zealand Biodiversity Strategy proposes a number of desired outcomes for marine biodiversity for 2020. Briefly, these are:

² MFish have identified the following principles that have guided the development of their proposed evaluative criteria:

- Practicality and ease of use;
 - Consistency across each of the three environmental principles; and
 - Compatibility with the purpose of the Fisheries Act 1996.
- MFish propose the following evaluative criteria to determine the environmental effects of fishing for each of the three environmental principles:
- What are the ‘ecological’ effects of fishing?
 - What is the likelihood of any positive or adverse ‘ecological’ effect (including cumulative effects)?
 - Are there any potential ‘ecological’ effects of high probability, or of low probability but with a high potential impact?
 - What could be done to avoid, remedy or mitigate any adverse ‘ecological’ effect?

We do not consider these are criteria in the strict sense of the term, i.e., ‘a principle or standard that something can be judged by’ (Concise Oxford Dictionary). These proposed ‘criteria’ therefore need to be re-considered in terms of the aims and requirements of our research and also in line with the Proposed Environmental Performance Indicators of the Marine Environment (MfE 1998). The most simple means of doing this is to ask the question: ‘Will the proposed policy instrument meet the requirements of section 9 of the Fisheries Act?’ To do this we need to explain section 9 and develop clear evaluative criteria.

natural marine habitats and ecosystems are maintained in a healthy functioning state
a full range of marine habitats and ecosystems representative of indigenous biodiversity is protected
there are no human induced extinctions of marine species
marine biodiversity is appreciated, and any harvesting or marine development is done in an informed, controlled and ecologically sustainable manner.

Actions in the NZ Biodiversity Strategy to support these goals include:

integrating marine biodiversity protection priorities into programmes for sustainable fisheries use, such as fisheries plans, using an ecosystem approach
identifying species and habitats sensitive to harvesting and put in place measures to avoid, remedy or mitigate adverse effects from commercial, recreational, and Māori customary fishing activities
using the precautionary principle when setting sustainability measures in the absence of information or where there is uncertainty
integrating environmental impact assessment into fisheries decision-making processes
avoid, remedy or mitigate the adverse impacts of human activities on marine biodiversity and develop habitat restoration programmes where appropriate
achieve a target of protecting 10% of New Zealand's marine environment by 2010 with a view to establishing a network of representative protected marine areas
protect and enhance marine species threatened with extinction.

Because the NZ Biodiversity Strategy integrates legislative requirements amongst the range of extractive resource users it is proposed that internalisation mechanisms should address key aims of the strategy.

Principle (c) Habitat of particular significance for fisheries management should be protected.

MFish (pers. comm. 2000) notes the following: a useful starting point for defining habitat of particular significance for fisheries management is the Magnuson-Stevens Fishery Conservation and Management Act (USA). This defines "essential fish habitat" to mean: "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity".

In general, habitat protection has not been included in traditional fisheries management, which has tended to focus on fishing activities. However habitat is essential to healthy fish stocks. Pollution, freshwater influx, some fishing methods (e.g., dredging and trawling), and other human activities can degrade fish habitats. The maintenance of healthy fish stocks requires the mitigation of these threats to fish habitat. Effective management of significant fish habitats requires fisheries managers to collect information on those habitats and identify the factors that might pose risks to them.

Chapter 5

Rights Guaranteed Under the Treaty of Waitangi: Treaty Rights Criteria

The Treaty of Waitangi 1840 is the founding document of New Zealand as a nation. It is part of the law of New Zealand to the extent that it is incorporated into statute. A number of statutes relating to the marine environment incorporate reference to the principles of the Treaty and to the values and traditional relations of Māori with natural places and resources.

By the Treaty, the Crown confirmed and guaranteed the existing rights of tangata whenua to land and resources, including rights in respect of intangible taonga. For this reason, it is imperative that the choice of management tools to avoid, remedy or mitigate environmental externalities associated with commercial fisheries is assessed in terms of their implications for Māori tribes, which have guaranteed to them under Article II the right to retain (and have restored to them if taken without consent) tribal resources and taonga, and the right to manage them according to their cultural preferences.

TREATY OF WAITANGI CRITERION:

The policy instrument(s) chosen will protect Māori customary fishery rights and practices.

Consideration and implementation of this criterion requires careful consideration of the potential effect(s) of an instrument on matters of tikanga and kaitiakitanga (see chapter 10).

The Principles of the Treaty

The recent changes to the legislation for management of the marine environment now make it mandatory for all responsible for administering these Acts to take into account the principles of the Treaty of Waitangi. Apart from the Fisheries Act 1996, these statutes include the Conservation Act 1987 and the Resource Management Act 1991.

While these statutes refer to the principles of the Treaty, many iwi and hapu refer to the Treaty itself, and to the Māori language document, rather than to broader “principles” or concepts more recently developed. Principles with particular references to the management of the marine environment, and relevant to evaluating management tools, are:

The principle of partnership, incorporating the obligation on the Crown and tangata whenua to act in utmost good faith and to accord each other reasonable co-operation on major issues of common concern. This principle also obliges the Crown to consult, to ensure early and appropriate involvement of tangata whenua in order that decisions are based on adequate information.

The principle of active protection of the Māori interest, which involves more than passive recognition or consultation. "...the duty of the Crown is not merely passive but extends to active protection of Māori people in the use of their lands and waters to the fullest extent practicable” (Māori Council v Attorney-General [1987] NZLR 664).

It has been suggested that the principle of active protection also applies in regard to the natural resources and environment themselves:

“New Zealand has a heritage of indigenous species, in forests and wetlands, sea coasts and fisheries, held to be guaranteed as taonga by the Treaty of Waitangi. To remain taonga their prime requirement must be to exist...extinction is irreversible.” (Morton, 1995)

and

“...it can be maintained that Crown policies which have led to environmental degradation ...are in themselves breaches of the Treaty.” (Office of the Parliamentary Commissioner for the Environment, 1999, p. 67.)

Principles identified by the Waitangi Tribunal include:

The right to manage resources, places and other taonga according to tikanga and cultural and traditional values and methods.

Recognition that taonga include tangible and intangible dimensions and values.

Māori Customary Fishery Rights

Section 5 of the Fisheries Act 1996 stipulates that this Act should be interpreted in a manner consistent with the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. The latter statute settled Māori claims to commercial fisheries and confirmed in law Māori customary fishery rights. These include the rights to harvest, monitor and manage traditional seafood resources.

Section 12 of the Fisheries Act 1996 makes provision for consultation with Māori in regard to the setting of sustainability measures for fish stocks or areas. It also provides for the input and participation of tangata whenua having a non-commercial interest in a fishery or having an interest in the effects of fishing on the aquatic environment in the area concerned. This section also requires that particular regard is accorded to Kaitiakitanga. Thus, Section 12 gives Tangata kaitiaki/tiaki a significant role in Ministry management processes, including providing comment on the activities of commercial and recreational fishers, which may affect Māori customary fishing.

Part IX of the Fisheries Act provides for taiapure and customary fishing. The object of providing for taiapure is to recognise rangatirantanga and the right secured in relation to fisheries by Article II of the Treaty of Waitangi. Regulations have been enacted recently to manage customary fisheries. The powers and responsibilities of tangata kaitiaki/tiaki are set out in detail in these regulations.

Further Clarification of Māori Property Rights

There are uncertainties about the full extent of Māori rights to fisheries and the marine environment. These uncertainties relate to the separation of Māori commercial development rights to fisheries from Māori rights to customary or subsistence use of fisheries resources, rights to indigenous flora and fauna and the nature of property rights of tangata whenua in natural resources “as the common property of a people” as opposed to “the private property of individuals”, and the relationship of those rights to the public interest (Parliamentary Commissioner for the Environment, op cit, p. 68). There are also unresolved claims and court actions relating to Māori ownership of foreshore and seabed (pp. 68-69).

Chapter 6

Socio-Economic Criteria

There are four broad socio-economic requirements for assessment of the performance of policy instruments to address environmental externalities:

Cost-effectiveness/least cost policy;

Internalisation (full cost principle);

Consideration of sudden changes in viability of fishing firms and fishing dependant communities; and

The need to minimise transaction costs. While transaction costs are dealt with in the discussion below, associated criteria are identified in the 'management' section (chapter 8).

The following 'overall' and 'specific' criteria are designed to reflect these requirements:

OVERALL SOCIO-ECONOMIC CRITERION:

The Policy Instrument(s) provides the least cost way of achieving internalisation of the externality(s).

SPECIFIC SOCIO-ECONOMIC CRITERIA require that the policy instrument:

is the least net cost way for commercial fishers to achieve the desired environmental objective;

forces the person causing the environmental externality to face all (or more) of the costs that they impose on the environment or on others; and/or

avoids significant regional distributional effects.

The following points explain the intent of these criteria. While these paragraphs do not exactly match the criteria, in combination they do explain their general intent.

Efficiency

Efficiency is normally assessed using a cost-benefit analysis (CBA) framework. The CBA framework allows three main measures of policy impacts to be derived. These are net present value (NPV), internal rate of return (IRR) and benefit/cost ratio (B/C). The latter measure is analogous to output/input ratio measures of efficiency in other disciplines. The three economic measures are intimately related, but which is preferred is generally determined by the nature of the problem being addressed. Investment opportunity choices, especially where there are many small competing and non-mutually exclusive opportunities, are generally best investigated using the IRR and B/C measures. The NPV measure is preferred where policy choices are mutually exclusive, a situation that would normally be expected to arise when choosing policies to address externalities.

Profitability

International competitiveness is a factor in industry profitability, which is also influenced by domestic factors. As profitability is the more general concern and is the issue of relevance to the industry, it will be the focus here³. Profitability is concerned only with market impacts and is therefore a narrower concept than efficiency. Environmental (and other) policies should not award significant windfalls, nor impose wipeout losses on industry participants.

³ It is assumed that industry participants are not concerned about whether profits are derived from domestic or international sales.

Fisheries managers need to be sensitive to the likely impacts of proposed policies, and ensure that they do not have windfall or wipeout effects.

Akroyd *et al.* (1999) describe how the price of quota can be used *ex post* to assess profitability of fishing for species under ITQ. However, evaluation of potential policies requires an *ex ante* measure of the impacts on profitability, sometimes for species that do not require ITQs. This task requires application of a cost benefit analysis framework applied from the industry perspective (rather than the social perspective). Analysis should be restricted to monetary revenues and costs incurred within the industry.

Introduction of fisheries management policies can have significant effects on some communities that are heavily dependent on fishing for employment and income. The New Zealand Government acted precipitously in 1983 to remove part time fishers from the industry by declaring all fishers who received less than 80 percent of their income from fishing, to no longer be eligible to fish commercially (Memon and Cullen 1996). Selection of fisheries management policies in some instances must consider the impact on communities.

Market power effects are important determinants of efficiency. However, the impacts of aggregation of market power are not always negative. For example, monopolisation of quota holdings (if that were possible) would provide optimal incentives for overcoming congestion externalities. It could also allow exploitation of economies of scale, where these exist. On the other hand, monopolisation of other services can skew relative prices and result in sub-optimal resource allocation into and within the fishing industry.

Internalisation

Perfect markets require that every actor faces the full costs of their actions. This is a necessary, but not sufficient, condition for free-market efficiency. Externalities arise in situations where actors do not face the true costs of their actions. Many environmental concerns arise in situations where people can use services of the natural environment for nothing, or below full cost, but where their actions force costs (or diminished benefits) on others. It is often possible to achieve efficiency in the face of environmental externalities requiring internalisation. Approaches that do not internalise the externality result in gains to the externality-creating industry (relative to internalisation solutions) and may lead to strong pressures to expand the industry, or to avoid the regulations. Effective internalisation corrects these anomalies.

Transaction costs

Transaction costs are real costs of doing business. They entail the costs of obtaining knowledge, contracting, monitoring and enforcing agreements. Transaction costs can vary widely for different policy options. For example, it is much cheaper to monitor mesh size than to monitor effort. In some cases the transaction costs may be so high as to outweigh the benefits of policy implementation. It may be better, from an efficiency perspective, to live with the original problem.

Dynamic Efficiency

It may be possible to identify the best intervention to address environmental externalities now, but that solution may not remain optimal as changes occur in market conditions, technology or fishery ecology. Solutions based on achieving stated environmental outcomes (e.g. bycatch of less than x sea lions) have better dynamic efficiency than solutions that prescribe gear, fishing methods, or other operational parameters. The latter approaches reduce the incentive to design new gear, methods or operational procedures that could achieve the environmental objective while yielding larger profits from the industry. Where impacts

cannot be monitored, or enforcement is unlikely, then outcome-based policies may provide little or no incentive to innovate.

Chapter 7

Recreational Criteria

There is one major area for criteria development here:

- a. Maintain access to fish for recreationists.

The suggested criteria are:

<p>OVERALL RECREATIONAL CRITERION:</p>

<p>The Policy Instrument(s) will not have undesirable impacts on recreational fishers.</p>

<p>SPECIFIC RECREATIONAL CRITERIA</p>

<p>The policy instrument will protect access by recreational fishers to adequate fish stocks to satisfy their current and future needs.</p>

Recreational Fishing

The rights of recreational fishers are different from those of commercial quota holders, and have not as yet been well defined. Compared to the QMS and the ITQ, and the recently established regulations for Māori customary fishing, the recreational sector has no equivalent framework for precisely determining rights in the marine resource. For many New Zealanders, however, the freedom to go fishing is considered a birthright. It is imperative that tools to manage environmental externalities associated with commercial fisheries are evaluated in terms of how they may impact on access by recreational fishers to fishery resources.

Chapter 8

Management Criteria

Fisheries managers have limited resources available to achieve management objectives. They can be expected to search for internalisation instruments/mechanisms that can be implemented at moderate cost, are effective in achieving externality internalisation, including in less than optimal circumstances.

OVERALL MANAGEMENT CRITERION:

The Policy Instrument(s) is capable of being implemented within existing management constraints.

SPECIFIC MANAGEMENT CRITERIA require that the policy instrument:

is cheap to administer;

does not require specific infrastructure that is not available at an acceptable price or in reasonable time;

requires low levels of information about the state of the fishery, the activities of the fishing companies and the effectiveness of the internalisation instrument;

does not make unacceptable demands upon the skill, capability, safety, and health of fisheries management staff;

does not fail in non-ideal operating conditions;

The policy instrument(s) is/are easily introduced;

The policy instrument(s) is/are easily modified.

Fisheries managers can consider the following ‘managerial’ factors when evaluating internalisation mechanisms.

Administration Costs

Answers to that question will be determined by the location of the fishery – inshore/mid water/deepwater; by the ease or difficulty in achieving compliance with the system; by the costs of monitoring fishing activities. Budgetary pressures will force fisheries managers to prefer low administration cost mechanisms. Is the internalisation instrument self funding? Some mechanisms have potential to be self-funding by requiring payment of fees by industry participants. This feature will increase their likelihood of acceptance by fisheries managers.

Specific Fisheries Management Infrastructure Requirements

Some internalisation instruments may require that fisheries managers have specific items of equipment, e.g., for monitoring, or enforcement such as deepwater capability ships. Where these are not available to fisheries managers, alternative mechanisms must be selected to avoid the infrastructure requirement. A widely used alternative is to negotiate or require that fishing companies carry observers on board ships, or self report, to obviate the need for fisheries management vessels.

Information Requirements

Regulatory authorities often have poor information supply about those items and this can restrict their ability to successfully apply internalisation instruments. Where information availability is weak, fisheries managers will select internalisation instruments that make least information demands. Section 10 of the Fisheries Act deals with the Information Principles – good practice guidelines can be used here.

Pressure on Fisheries Management Staff

Some fisheries internalisation instruments require frontline staff to tackle risky tasks, or to deal with unpleasant situations. These pressures require specially trained fisheries management staff, payment of higher wage rates, and their overall effect is to increase costs of fisheries management. Internalisation instruments which do not lead to confrontation, do not require specially trained staff, or expose fisheries staff to risk, are likely to be more attractive to fisheries managers.

How Well do the Internalisation Mechanisms Perform in Sub-Optimal Conditions?

A first best internalisation instrument in optimal conditions may perform poorly in sub optimal conditions. Fisheries managers often operate in second best worlds of limited resources, poor information availability, variable causes of externalities, etc. Their preference may be for versatile internalisation instruments that operate satisfactorily in many situations, rather than a mechanism which only performs well in ideal conditions.

Introduction and Modification

Some fisheries policies require new legislation to introduce. Others can be introduced and varied by a change of regulations – a much simpler process. Managers who want to achieve speedy improvement in situations where externalities are present will favour instruments that can be readily introduced and varied.

Chapter 9

Judging the Effectiveness of Instruments

We have identified 7 types of fisheries:

Trawl netting
 Seining
 Set netting
 Dredging
 Line fishing
 Pot fishing
 Diving.

For each type of fishing there is a range of possible environmental impact classes:

Bottom/sea bed disturbance
 Non-fish bycatch, which can in turn be subdivided into: marine mammals; birds; and invertebrates, flora, bryophytes, etc.
 Non-target fish bycatch
 Pollution.

Combining these classifications provides the following matrix (Table 1):

Table 1
Areas of ‘Impact’ Associated with Type of Fishing Activity and Classification of Marine Impacts

Type of fishing activity	Impact classification					
	Bottom/ sea bed disturbance	Non-fish bycatch –			Non-target fish bycatch	Pollution
		Marine mammals	Birds	Invertebrates, flora, bryophytes, etc.		
• Trawl netting	4	4	6	4	4	4
• Seining	4	4	6	6	4	4
• Set netting	6	4	4	6	4	4
• Dredging	4	6	6	4	4	4
• Line fishing	6	6	4	6	4	4
• Pot fishing	6	6	6	6	4	4
• Diving	6	6	6	4	6	4
TOTAL POSSIBLE IMPACTS	3	3	2	3	6	7

KEY: 4 Fishing activity can cause a significant environmental impact
 6 Fishing activity unlikely to cause a significant environmental impact

Analysis of the matrix indicates there is a total of 24 fishing activity-impact combinations. Each of these has a possible 22 (see appendix 1) internalisation instruments⁴ that can be applied to it. Clearly, choice of best instrument can be viewed as an imposing exercise. However, for most types of fishing activities it is unlikely there will be more than 2 potentially significant environmental impacts. Consequently, the array of instruments to choose from may be much more manageable in these cases.

Effectiveness can be predicted and can be evaluated ex post (see also Figure 1). Both applications are required here. The effectiveness criteria which follow are based on our judgements on what sustainable fisheries management requires in terms of ‘Avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment’ (Section 8(b) of the Fisheries Act 1996).

The range of criteria identified in preceding sections is summarised in Table 2 which also presents the criteria applied to measuring the effectiveness of each instrument in meeting these criteria.

Table 2
Evaluative Weightings Against Which Criteria Designed to Measure the Performance of Alternative Policy Instruments Can be Weighted

POLICY AREA	OVERALL CRITERION:	SPECIFIC CRITERIA require that the policy instrument:	WEIGHTINGS CRITERIA
Environmental	The Policy Instrument(s) safeguards the life supporting capacity of the marine environment in a healthy functioning state.	<ul style="list-style-type: none"> • avoid or minimise non-target fish bycatch, at least to the point where affected fisheries are maintained at viable levels; • protects marine habitats, especially those on the seabed, from disturbance and damage that would compromise their ability to provide for dependent communities • ensures fishing related mortality of marine mammals is below a maximum allowable fishing-related mortality; • ensures fishing related mortality of birdlife is below a maximum allowable fishing-related mortality; • ensures fishing related mortality of invertebrates, flora and bryophytes is below a maximum allowable fishing-related mortality; • minimises the effects of pollution on the marine environment including dependent ecological communities; and/or • protects fish habitat generally. 	<p>4 = Highly effective in meeting the environmental criteria. Implies the instrument will largely resolve the problem caused by the externality.</p> <p>3= Moderately effective in meeting the environmental criteria. Implies the instrument will help resolve the problem caused by the externality, but may need to be used with another instrument.</p> <p>2 = Somewhat effective in meeting the environmental criteria. Implies the instrument might help resolve the problem caused by the externality, but will need to be used with another instrument.</p> <p>1= Largely ineffective in meeting the environmental criteria. Might be worth considering using in association with other instruments.</p> <p>0 = Totally ineffective</p> <p>-1 = Negative consequence</p> <p>-2 = Large negative consequence</p>
Treaty of Waitangi	The policy instrument(s) chosen will protect Māori customary fishery rights and practices.		<p>4= Succeeds in protecting Māori customary fishery rights and practice.</p> <p>0= Fails to protect Māori customary fishery rights and practice.</p> <p>-1 = Negative consequence</p> <p>-2 = Large negative consequence</p>

⁴ The 22 names of instruments we have listed are in many cases labels for a range of instruments, e.g., co-management represents a spectrum of approaches, and charges can be lump sum taxes, taxes on inputs, taxes on catch, etc. Hence the 22 instruments can be ‘unpacked’ into large listings. Our scores of effectiveness in meeting criteria are therefore averages and must be considered in this context.

Socio-Economic	The Policy Instrument(s) provides the least cost way of achieving internalisation of the externality(s).	<ul style="list-style-type: none"> • is the least net cost way for commercial fishers to achieve the desired environmental objective; • forces the person causing the environmental externality to face all (or more) of the costs that they impose on the environment or on others; and/or • avoids significant regional distributional effects. 	<p>4 = Highly successful in meeting the socio-economic criteria. Implies the instrument will: largely maintain the economic viability of the fishing industry and communities heavily dependent on the fishery; ensure that environmental costs are met by the firms who cause them; will not increase concentration ratio in the fishery.</p> <p>3= Moderately successful in meeting the socio-economic criteria. Implies the instrument will moderately increase costs, cause some reduction in profitability for firms, moderately reduce general prosperity in fishing dependant communities, or increase concentration ratios.</p> <p>2 = Somewhat successful in meeting the socio-economic criteria. Implies the instrument will significantly increase costs, reduce profitability of firms and prosperity of communities, or worsen concentration ratios.</p> <p>1= Largely unsuccessful in meeting the socio-economic criteria. Implies the instrument will cause major increase in costs, greatly reduce profitability for firms, and general prosperity in fishing dependant communities, or much worse concentration ratios</p> <p>0 = Ineffectual -1 = Negative consequence -2 = Large negative consequence</p>
Recreational	The Policy Instrument(s) will not have undesirable impacts on recreational fishers.	<ul style="list-style-type: none"> • The policy instrument will protect access by recreational fishers to adequate fish stocks to satisfy their current and future needs. 	<p>4= Maintaining recreational fishers' access to adequate fish stocks to meet their current needs.</p> <p>0 = Fails to maintain recreational fishers access to adequate fish stocks to meet their current needs.</p>
Management	The Policy Instrument(s) is capable of being implemented within existing management constraints.	<ul style="list-style-type: none"> • is cheap to administer; • does not require specific infrastructure that is not available at an acceptable price or in reasonable time; • requires low levels of information about the state of the fishery, the activities of the fishing companies and the effectiveness of the internalisation instrument; • does not make unacceptable demands upon the skill, capability, safety, and health of fisheries management staff; • does not fail in non-ideal operating conditions; • The policy instrument(s) is/are easily introduced • The policy instrument(s) is/are easily modified 	<p>4 = Highly successful in meeting the management criteria. Implies the instrument will have low cost to introduce and administer. Requires little new information or specific infrastructure. Does not make unusual demands of fisheries management staff.</p> <p>3= Moderately successful in meeting the management criteria. Implies the instrument will have moderate cost to introduce and administer. May require moderate amount of new information or specific infrastructure or make some demands of fisheries management staff.</p> <p>2 = Somewhat successful in meeting the management criteria. Implies the instrument will have significant cost to introduce and administer. May require significant amount of new information or specific infrastructure or make significant demands of fisheries management staff.</p> <p>1= Largely unsuccessful in meeting the management criteria. Implies the instrument will have large cost to introduce and administer. May require large amount of new information or specific infrastructure or make large demands of fisheries management staff.</p> <p>0 = Totally ineffectual -1 = Negative consequence -2 = Large negative consequence</p>

We have gone the next step of determining, in a preliminary way, the potential effectiveness of each instrument within one of the combinations concerned, i.e., trawling (see Table 3). However, our attempts at evaluating this potential are based on very limited information. A defensible evaluation requires each instrument to be subjected to the same information requirements or principles (i.e., Section 10 of the Fisheries Act 1996). An additional concern is the particular context within which the rating of effectiveness is made, e.g., institutional considerations. Improvements, over time, of information should (re)inform the effectiveness rating. Summing, by some means, the effectiveness across the likely range of applicable instruments provides us with a means of identifying those most likely to internalise and correct the externality.

Table 3

Effectiveness of the Use of Internalisation Instruments Against Wide Ranging Criteria (scale 4= totally effective; -2 is negative)

Instrument	Non-target fish bycatch	Marine habitats/seabed disturbance	Mammal bycatch	Bird bycatch	Invertebrate, flora and bryophyte bycatch	Pollution	Fish habitats	Māori customary rights & practices are protected	Recreationists access to fish is maintained	Least net cost to commercial fishers	Internalisation	Avoids large distributional changes	The management mechanism is cheap to	Necessary infrastructure is cheap and readily	The mechanism has low information needs	Does not require highly skilled management staff	Effectiveness in non-ideal conditions	The management mechanism is easily	The management mechanism is easily
No take zones	2	4	3	0	2	0	2	-2	2	3	0	2	4	4	4	4	4	1	3
Marine Reserve	2	4	2	0	2	0	2	-2	2	2	0	3	4	4	4	4	4	0	0
Temporary area closure	2	1	3	3	0	2	1	3	2	2	0	1	4	4	2	4	4	2	4
Closed seasons	2	1	4	3	0	2	0	-1	4	2	0	2	4	4	4	4	4	2	4
Size or sex selectivity	0	-2	-2	-2	-2	-1	0	4	2	3	0	3	2	4	4	4	1	4	4
Bycatch reduction devices	2	0	4	3	2	0	0	4	4	4	0	2	3	4	4	4	2	4	4
Technology ban	2	3	3	3	3	0	1	4	4	1	0	1	3	2	4	4	3	1	2
Input limitations (quantitative)	2	2	2	2	2	2	1	2	4	2	0	4	2	2	1	3	0	1	1
Catch limitations	2	2	2	2	2	1	0	3	2	2	0	2	2	4	3	4	3	1	1
Retention requirements	3	0	0	0	0	0	1	4	2	3	3	4	2	2	2	4	0	3	2
Tax variable inputs	2	1	1	1	1	1	0	4	4	1	3	1	1	1	0	2	0	2	0
Financial inducements	3	2	2	2	1	0	2	2	4	4	4	4	1	1	1	3	0	0	0
Subsidies	3	2	2	2	1	0	2	2	4	4	4	3	1	1	1	3	0	0	0
Environmental bonds	1	3	2	1	0	2	1	2	4	2	4	1	1	3	1	3	0	2	2
Property rights	3	2	3	1	1	0	4	0	2	3	4	3	3	2	0	2	0	2	0
Co-management	2	3	3	3	3	0	3	2	3	2	2	4	2	2	2	1	0	3	1
Codes of practice	2	2	2	2	2	1	2	2	4	4	1	4	4	2	2	4	2	4	4
Conservation easements	2	2	2	2	2	1	2	0	3	3	0	4	4	3	3	0	0	2	0
Tort law	1	1	1	1	1	0	1	0	4	2	2	4	1	4	0	0	0	0	0
Publications/guides	2	1	1	1	1	1	1	1	4	4	0	4	4	4	2	2	1	4	4
Informal regulation	1	1	1	1	1	1	1	1	4	4	1	2	3	3	1	1	4	4	4
Accredited EMS	3	3	3	3	3	3	3	3	4	2	4	-2	4	2	0	4	3	4	4

Chapter 10

Overall Assessment and Guidance in Use of the Criteria

The criteria identified above need to be prioritised/weighted to reflect the project requirements and the aims of the Fisheries Act 1996. In the field of Environmental Impact Assessment, criteria are often:

Differentially weighted;
Subject to matrix analysis;
Added, multiplied or subject to some other form of statistical treatment;
Used in checklist form.

It is our view that a combination of approaches is necessary here, i.e.,

- (a) Having completed an EIA and clearly defined the ‘type of fishery’ and its associated problem(s) then instruments can be chosen and subjected to evaluation under the Environmental Criteria which are accorded the top priority. This is because the Fisheries Act concerns sustainable fisheries and sustainable fisheries are reliant upon successful achievement of section 9 of the Act. Environmental criteria are also context specific, i.e., not all criteria need be met in every circumstance.
- (b) Subject to environmental criteria being met then Treaty of Waitangi requirements should be considered next.
- (c) Socio-Economic and recreational criteria are next in importance – e.g., if the instrument is ‘uneconomic’ then it is important to search for a more socially and economically appropriate instrument before considering recreational and management issues.
- (d) Management criteria should be dealt with separately.

Figure 2 shows the structure of how these considerations are prioritised. In undertaking this evaluation ‘best practice’ guidelines will indicate a need for consultation and consideration of other relevant legislation, e.g., Commerce Act, Conservation Act and the Treaty of Waitangi. Such concerns are vital if, for example, an instrument is being considered, but its application potentially compromises Māori tikanga or kaitiakitanga (also see chapter 5).

It is our view that priorities will vary by context. Policy analysts and others will choose different priorities according to changes in context.

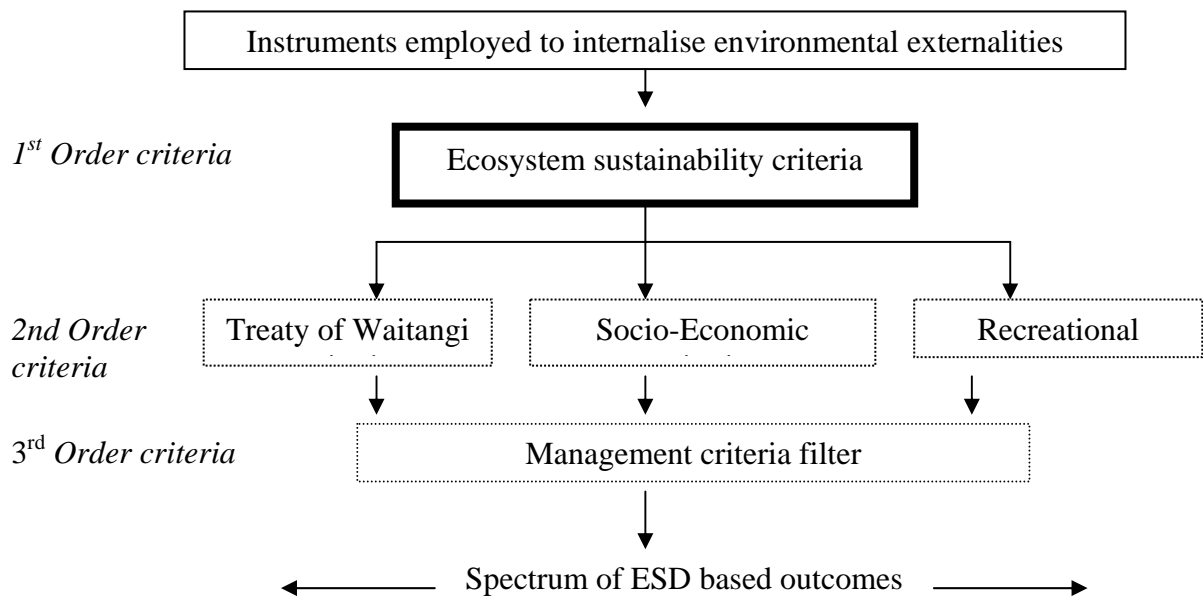


Figure 2
Hierarchical Framework for Considering Instruments Employed to Internalise Environmental Externalities

The third and final part of our work, development of a Decision Support System and associated guidelines, will establish how this process can be operationalised.

Chapter 11

Conclusions

Potential instruments for internalising the externalities from commercial fishing were identified in Hughey et al. (2000). We have now identified and developed a wide range of criteria that can be used to determine which policy instruments are best suited to resolving the environmental externalities. The principal decision criteria are those based around section 9 of the Fisheries Act, i.e., the Environmental Principles. Assuming there are instruments that can achieve these criteria then further criteria representing Treaty of Waitangi, socio-economic, recreational and management issues, need to be implemented. A Decision Support System can now be developed to operationalise the process.

References

- Akroyd, J.M.; Batstone, C.J.; Sharp, B.M.H. and Walshe, K.A.R. (1999). *Monitoring Performance of Commercial Fisheries Policy*. Report to Ministry of Fisheries.
- Anderson, L. G. (1986). *The economics of fisheries management*. Baltimore: John Hopkins University Press.
- Anderson, L. G. (1999). Selection of a property rights management system. *Paper presented at FishRights99*. Fremantle, Australia.
- Antunes, P., Santos, R. (1999). Integrated environmental management of the oceans. *Ecological Economics* 31, 215-226.
- Auditor-General. (1999). *Information Requirements for the Sustainable Management of Fisheries*. Fifth Report for 1999. Wellington: Office of the Controller and Auditor-General.
- Costanza, R., Andrade, F., P, van den Belt, D., Boesch, D., Boersma, D., Cantarino, F., Hanna, S., Limburg, K., Low, B., Molitor, M., Pereira, J. G., Rayner, S., Santos, R., Wilson, J., and Young, M. (1999). Ecological economics and sustainable governance of the oceans. *Ecological Economics* 31, 171-187.
- Hannesson, R. (1985). Inefficiency through government regulations: the case of Norway's fishery policy. *Marine Resource Economics* 2, 115-140.
- Hughey, K., Cullen, R., Kerr, G.N., Memon, A., Robb, C. (2000). Instruments for Internalising the Environmental Externalities in Commercial Fisheries. Agribusiness and Economics Research Unit, Research Report No. 242. Lincoln University. 2000.
- Memon, P.A., Cullen, R. (1996). Rehabilitation of Indigenous Fisheries in New Zealand. Pp 252-264, In: Howitt, R., Connell, J., Hirsch, P (eds). Resources, Nations and Indigenous Peoples: Case studies from Australasia, Melanesia and Southeast Asia. Melbourne: Oxford University Press.
- Ministry for the Environment. (1995). *Environment 2010 Strategy*. Wellington: Ministry for the Environment.
- Ministry for the Environment. (1998). *Environmental Performance Indicators - Proposals for the Marine Environment*. Wellington: Ministry for the Environment.
- Ministry for the Environment and Department of Conservation. (2000). *NZ Biodiversity Strategy*. Wellington: Ministry for the Environment.
- Mitchell, B. (1997). *Resource and Environmental Management*. Harlow: Longman.
- Morton, J. (1995). The future of New Zealand Conservation: Ethics and Politics, *Pacific Conservation Biology* 2(1),2-6.
- Parliamentary Commissioner for the Environment, (1999). *Setting Course for a Sustainable Future*. Wellington: Office of the Parliamentary Commissioner for the Environment.

Payne, D. (1990). Protecting our marine heritage: Unpublished manuscript.

Randall, A. (1987) *Resource Economics: An Economic approach to Natural resource and environmental policy, Second edition*. John Wiley and Sons.

Sapsford, R. (1998). *Options and incentives for biodiversity conservation - an initial review*. Wellington: Econnection.

Strategic Policy Group. (1995). Allocation and Internalisation: A Framework and Mechanisms for Allocating Environmental Resources. Wellington: Ministry for the Environment.

Appendix 1. A Summary of the Instruments

Instrument	Main world uses	Current NZ uses	Applicability to fishing
Regulatory			
No take zones	Protect juveniles, spawning areas etc – may target a specific species for protection	Hoki spawning areas	No fishing in specified zones means externalities not created
Marine Reserves	Protect juveniles, spawning areas etc protect habitat	Banks Peninsula, Long Bay etc	Area set aside for preservation of marine species
Temporary area closure	Protect juveniles, spawning areas, location of marine mammals, etc	Hoki-squid interactions - implemented when critical thresholds exceeded	No fishing during designated times and /or in prescribed areas.
Closed seasons	Protect closely associated/ dependant species	Whitebait fishery generally to protect migration of certain species	No fishing at certain times. Closely related to the above instrument.
Size or sex selectivity	Direct effort away from specified ages, sex individuals	Rock lobster, size requirement	Requirement for fishers to return to sea all prohibited catch
Bycatch Reduction Devices (BRD)	Reduce rate of bycatch of fish and other species	Pingers for Hector's dolphins	Vary technology used while fishing to reduce bycatch of fish or other species
Technology ban	Prevent externalities associated with specific harvesting technologies	Drift netting ban	Reduce bycatch by only allowing techniques which cause few externalities
Input limitations	Reduce externalities associated with number of potlifts, boat days etc	Foveaux Strait oyster fishery	Reduce volume of fishing activity and associated externalities
Catch limitations	Reduce externalities associated with effort	Foveaux Strait oysters	Limit total harvesting and associated externalities
Retention and utilisation requirements	Reduce dumping of target and non -target species	CAAQ, FAAQ	Allow non target catch to be landed, not dumped
Financial systems			
Charges (Tax variable inputs)	Provide incentive to reduce, eg, pollution	Conservation Services Levy, applied to some non-fish bycatch	Apply tax to variable inputs, boats, outputs, to reduce profits and externalities
Financial inducements	Bribe to behave in desired way	???	Financial reward if do not create environmental externalities
Subsidies	Reduce costs of inputs	R&D assistance	Reduce costs of developing BRD
Environmental performance bonds	Provide financial incentive to avoid creating externalities	Mining, biodiversity protection	Provide incentive to not damage habitat or marine ecosystem

Rights based			
Property rights (IQ, ITQ, IVQ CDQ, Share fisheries)	Reduce race to fish	NZ QMS	Creation of rights reduces need to race, provides incentive to maintain asset, so less externalities created
Voluntary approaches			
Co management	Right holders draw up operating systems	Challenger Scallop	Peer agreements reduce externalities
Codes of practice	Agreed behaviour which limits externalities	HSNO, Agchem	Industry develop, adopt, codes which limit or preclude externalities
Accredited environmental management systems	Industry develops systems - externally audited prior to accreditation	Marine Stewardship Council, ISO 14001	Industry develop, adopt, systems with environmental policy which aims to limit or preclude externalities
Conservation easements	Negotiated agreements restricting a parties behaviour	QEII Trust, Ducks Unlimited	Negotiated agreement to not take certain actions eg create externalities
Legal Remedies			
Tort law	Liability for pollution damages	RMA is a 'strict liability' law	Potential damages claims provide incentive to avoid creating externalities
Education Information supply			
Publications, guides, kits, etc	numerous	Numerous, e.g., biodiversity protection	Informed people change behaviour, not create externalities
Informal regulation e.g., environmental reporting	Toxics Release Inventory and corporate environmental reporting	???	Information release plus community pressure, modifies firm behaviour

(Source: modified from Hughey et al 2000)

Appendix 2. Publications from this Work

Note that the following list includes publications reporting on all the research objectives from SEC 1999/05.

Hughey, K., Cullen, R., Kerr, G.N., Memon, A., Robb, C. Instruments for Internalising the Environmental Externalities in Commercial Fisheries. Agribusiness and Economics Research Unit, Research Report No. 242. Lincoln University. 2000.

Kerr, G.N., Cullen, R., Hughey, K.F.D., Memon, A. (2000). Criteria for Selecting Policy Instruments to Internalise Environmental Externalities from Commercial Fisheries Management in New Zealand. Paper to IAIA'00 Back to the Future: Where Will Impact Assessment Be in 10 Years and How Do We Get There?" 19-23 June 2000 Hong Kong Convention and Exhibition Centre, Hong Kong.

Memon, A., Hughey, K.F.D., Cullen, R., Kerr, G.N. (2000). Processes and Methods to manage fisheries externalities in New Zealand's Exclusive Economic Zone. ISRM Conference, Washington, June, 2000.

Cullen, R., Kerr, G.N., Hughey, K.F.D., Memon, A. (2000). Selection of mechanisms to achieve internalisation of fishing externalities. Paper to NZ Agricultural and Resource Economics Society conference, 30/6-1/7 2000, Blenheim.

Hughey, K., Cullen, R., Memon, A., Kerr, G., & Wyatt, N. (2000). Developing a Decision Support System to manage fisheries externalities in New Zealand's Exclusive Economic Zone. Paper to International Institute of Fisheries Economics and Trade 10th biennial conference – Microbehaviour and Macroresults, University of Oregon – 10-14 July 2000.

RESEARCH REPORTS

- 230 **New Zealand Agricultural Policy Reform and Impacts on the Farm Sector.** Gouin, Daniel-M; Jean, N & Fairweather, J 1994
- 231 **New Zealand's International Trade Performance: Pre and Post Deregulation: 1970-1985 and 1985-1993.** Lattimore, R & McKeown, P 1995
- 232 **Understanding Why Farmers Change Their Farming Practices: The Role of Orienting Principles in Technology Transfer.** Morris, C; Loveridge, A & Fairweather J R 1995
- 233 **The Decision Making of Organic and Conventional Agricultural Producers.** Fairweather, John R & Hugh Campbell 1996
- 234 **Family Farming without State Intervention.** Rudolf Helbling 1996
- 235 **Regional Income & Employment Impacts of Farming & Forestry in the Mackenzie/Waitaki Basin.** G V Butcher 1997
- 236 **Investigating Community: Imperatives for but Constraints Against Land Use Change in the Mackenzie/Waitaki Basin.** Morris, Carolyn, John R Fairweather & Simon R Swaffield, 1997
- 237 **A Comparison of the Structure and Practice of Dairy Farming in New Zealand and Japan.** Kazuaki Araki, 1998
- 238 **The Development of Organic Horticultural Exports in New Zealand.** Campbell, Hugh & Fairweather, John 1998
- 239 **A New Zealand Trade Share Database, 1966-96.** Cagatay, S & Lattimore, R 1998
- 240 **A Review of Economic Reforms in Bangladesh and New Zealand, and Their Impact on Agriculture.** Jahangir Alam, 1999
- 241 **Public Perceptions of Natural and Modified Landscapes of the Coromandel Peninsula, New Zealand.** Fairweather, John R & Swaffield, Simon R 1999
- 242 **Instruments for Internalising the Environmental Externalities in Commercial Fisheries.** Hughey, K F D., Cullen, R., Kerr, G N and Memon P A 2000
- 243 **New Zealand Farmer and Grower Intentions to Use Genetic Engineering Technology and Organic Production Methods.** Cook, Andrew J., Fairweather, John R & Campbell, Hugh R 2000
- 244 **Success Factors in New Land-based Industries.** Mayell, Peter J & Fairweather, John R 2000
- 245 **Smallholders in Canterbury: Characteristics, Motivations, Land Use and Intentions to Move.** Fairweather, John R & Robertson, Nicola J 2000
- 246 **A Comparison of the Employment Generated by Forestry and Agriculture in New Zealand.** Fairweather, John R., Mayell, Peter J and Swaffield, Simon R 2000
- 247 **Forestry and Agriculture on the New Zealand East Coast: Socio-economic Characteristics Associated with Land Use Change.** Fairweather John R., Mayell, Peter J and Swaffield, Simon R 2000
- 248 **Community Perception of Forest Sector Development on the New Zealand East Coast: Likely and Acceptable Employment Activities. Infrastructure and Landscape Change.** Simon R Swaffield and Fairweather, John R 2000
- 249 **Gisborne/East Coast Field Research on Attitudes to Land Use Change: An Analysis of Impediments to Forest Sector Development.** Craig J Tomlinson, John R Fairweather and Swaffield, Simon R 2000

DISCUSSION PAPERS

- 139 **Classifying NZ's Export Markets: A Behavioural Approach.** Thomson, G & Lattimore, R 1994
- 140 **Dumping Protectionism & Free Trade.** Sheppard, R L & Atkins, C 1994
- 141 **Papers Presented at the 1st Annual Conference of the NZ Agricultural Economics Society.** Blenheim 1994
- 142 **Papers Presented at the 2nd Annual Conference of the NZ Agricultural Economics Society.** Blenheim 1995
- 143 **The Implications of Government Reform in New Zealand for the Canadian Agri-Food Sector.** Storey, Gary G 1996
- 144 **Papers Presented at the 3rd Annual Conference of the NZ Agricultural Economics Society.** Blenheim 1996
- 145 **Papers Presented at the 4th Annual Conference of the NZ Agricultural Economics Society.** Blenheim 1997
- 146 **Papers Presented at the 5th Annual Conference of the NZ Agricultural Economics Society.** Blenheim 1998
- 147 **Papers Presented at the 6th Annual Conference of the NZ Agricultural Economics Society.** Blenheim 2000