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Forming the Productivity Commission

The Industry Commission, the former Bureau of Industry Economics and the Economic Planning Advisory Commission have amalgamated on an administrative basis to prepare for the formation of the Productivity Commission. Legislation formally establishing the new Commission is before Parliament.

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ABBREVIATIONS

ACT	Australian Capital Territory
ANZECC	Australian and New Zealand Environment and Conservation Council
CFC	chlorofluorocarbon
COAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EC	electrical conductivity unit
EIS	environmental impact statement
EPA	Environment Protection Authority
GHG	greenhouse gas
HPC	habitat preservation credit
ICESD	Intergovernmental Committee on Ecologically Sustainable Development
IGAE	Intergovernmental Agreement on the Environment
ILZ	intensive land use zone
ITAA	Income Tax Assessment Act
MDBC	Murray-Darling Basin Commission
NDSP	National Dryland Salinity Research, Development and Extension Program
NGO	nongovernment organisation
NLP	National Landcare Program
NSESD	National Strategy for Ecologically Sustainable Development
NO_X	oxides of nitrogen
NVI	Native Vegetation Initiative
OECD	Organisation for Economic Cooperation and Development
PRP	Pollution Reduction Program
RWC	Rural Water Corporation

SEL	Special Environmental Levy
TWE	tradeable water entitlement
UNCED	United Nations Conference on Environment and Development
VOC	volatile organic compound

GLOSSARY

beneficiary pays	Pricing principle where those who benefit from an action pay for the portion of the benefits they receive.
capillary rise	Process by which shallow groundwater is drawn to the soil surface — often this groundwater contains salts that contribute to salinity.
cost benefit analysis	A technique used to compare alternative courses of action by assigning dollar values to all relevant benefits and costs.
covenants	Legal instruments attached to titledeeds of ownership which limit an owner's right to use or trade his or her property.
Crown leases	Contracts where the government confers upon private individuals the right to exclusive possession of land belonging to the government for a definite period in return for rent.
discharge areas	Areas of catchments where groundwater emerges at low points in the landscape (groundwater being the water below the ground surface).
ecologically sustainable land management	Ecologically sustainable land management is essentially about long term viability of the land and its associated natural resources. This includes both economic viability and maintenance of the environment.
ex ante	Before the event.
ex post	After the event.
externalities	Externalities occur when one person's actions affect another person's wellbeing and the relevant costs and benefits are not reflected in market prices.
information extension	The active dissemination of data and material to improve understanding and awareness of an issue or situation.

integrated catchment management	Seeks to bring together the various parties and interests in a catchment through regional land and water management plans to achieve whole-catchment improvements.
marginal cost	The increase in total costs resulting from an increase in output of one unit.
market failure	A situation where, in principle, selective changes to the market mechanism lead to net gains to society.
nonpoint source pollution	Pollution which may be diffuse and for which it is difficult to identify and monitor the precise source.
optimisation models	Mathematical models that seek to maximise or minimise variables subject to constraints.
perverse incentives	An incentive that unintentionally induces behaviour that results in environmental degradation.
point source pollution	Pollution which can be traced to an easily identifiable, single source.
polluter pays	Pricing principle where the source directly responsible for pollution bears the cost of resulting environmental damage.
private cost/benefit	Costs (or benefits) borne by (or accruing to) the individuals involved in a production or consumption decision.
property rights	Rights that govern the use and ownership of a resource — most commonly associated with the use and ownership of land.
recharge areas	Areas of catchments where a significant proportion of water enters into the groundwater systems.
regulation	Institutional measures aimed at directly influencing the environmental performance of polluters by regulating processes or products used, by abandoning or limiting the discharge of certain pollutants, and/or by restricting activities to certain times, areas, etc.

social cost/benefit	Costs (or benefits) of a production or consumption decision borne by (or accruing to) individuals and communities not directly involved in such decisions.
socially optimal level	The 'best' situation or state of affairs. The optimal level of pollution is that level at which the marginal cost of abatement is equal to the marginal cost of the damage caused by the pollution, such that the additional cost of further abatement action would exceed the additional benefits secured by the reduction in damage.
user pays	Pricing principle based on charging for the full supply cost of a product/resource.

SUMMARY

There is considerable scope to extend the use of economic instruments to manage the environment.

The use of economic instruments in Australia to address environmental problems has progressed in recent years. However, there is scope for economic instruments to be used more extensively either on their own or in combination with other measures to improve the efficiency of environmental protection efforts.

Economic instruments have a number of advantages over regulation.

Economic instruments can range from relatively simple broad based charges and subsidies to more complex tradeable permits systems. They have a number of advantages over regulations, including that in many cases they entail least cost solutions to environmental problems, provide greater flexibility in responses and encourage ongoing innovation. Economic instruments therefore have considerable potential to complement other environmental protection measures.

In a number of cases, the preferred solution to address environmental problems will be a mix of measures.

Whilst economic instruments have a number of advantages, they are rarely used in isolation and are often supported by regulation. In a number of cases, a mix of complementary regulatory, suasive and economic measures will provide the preferred solution to environmental problems.

Economic instruments have been used by Commonwealth, State and local governments.

Commonwealth, State and local governments have used economic instruments to address a number of problems associated with air, water and land degradation. Examples include Commonwealth Government tax concessions

for improved land and water management, the Victorian load based licensing scheme for a variety of pollutants, the New South Wales Hunter River Salinity Trading Scheme and rate concessions for conservation of native vegetation administered by a number of local governments.

Two case studies on native vegetation retention and dryland salinity were undertaken.

Two case studies carried out by the Commission on native vegetation retention and dryland salinity show a limited use of economic instruments to address these issues, and there is scope for further extending their use. Options canvassed include expanding the use of management agreements and conservation covenants to protect native vegetation and exploring the possibility of extending the salt credits scheme, which is currently operating in irrigation areas, to dryland areas.

There is also scope to extend the use of economic instruments to address a broad range of other environmental problems.

The use of economic instruments may also be extended to address a broad range of environmental problems in Australia, including those associated with the atmosphere, inland waters and coastal environments. Examples of instruments could include tradeable emissions permits schemes to abate greenhouse gas emissions and excessive nutrient levels in waterways, and fees and levies to reduce the adverse impacts of recreation and tourism on coastal environments.

Government, industry and community all have a role in progressing the use of economic instruments in

Progressing the use of economic instruments to address environmental problems in Australia will require action from government, industry and community. Governments have a role in coordinating and

addressing environmental problems.

implementing environmental policy, providing information and developing mechanisms to ensure community and industry involvement in decision making processes. Industry and community involvement provides local knowledge at low cost, ownership of solutions and may provide valuable leverage to government funds. Effective implementation of incentive based mechanisms requires devolving responsibility and authority to the lowest practical level.

Further research is required in a number of areas.

The report identifies several areas for further research. There is a need for better data and information about specific environmental problems in order to understand any external effects involved and to address problems relating to information failure. There is also a need to develop effective performance indicators to monitor and evaluate instruments used to address specific environmental problems, and to investigate more closely opportunities for economic instruments to be included in strategies to address these problems.

1 INTRODUCTION

While considerable progress has been made in recent years to better manage the Australian environment, significant environmental problems still exist. For example, there is widespread concern about the degradation of farm land. Nutrient and salt levels in water, waste water disposal, rising groundwater and associated salinisation and pollution of coastal waters are of concern. In urban areas, stormwater and sewage and other waste disposal continue to have an adverse impact on the environment (SEAC 1996).

Continuing community concern about environmental protection and the conservation of natural resources has presented some challenges for policy formulation. Environmental assets and natural resources are valuable in their own right, and major sectors of the economy rely on use of these resources. The extent to which the environment should be protected depends on the relative values placed by Australians on environmental preservation compared with use of environmental assets and natural resources.

Environmental protection and economic performance are interdependent, and protection of the environment can make good economic sense. Furthermore, delivering environmental objectives more effectively and using resources more efficiently is good for both the economy and the environment. Attention should be paid not only to the extent to which the environment is protected, but to how such protection is provided. Failure to pay attention to both these issues may mean Australia's productivity performance is undermined and/or the environment is not adequately protected (IC 1990).

Responses to environmental problems

There is a range of measures available to address environmental problems, including direct regulation, suasive measures and economic instruments. In the past, governments have relied heavily on direct regulation to achieve environmental objectives. While this approach has been effective in some cases, regulations tend to be inflexible and can provide limited incentive for technological innovation in addressing environmental problems. In more recent years, increasing attention has been focussed on economic instruments to complement other approaches to addressing environmental problems because of their potential to achieve environmental outcomes in more cost effective ways.

A number of international and national policies promote the use of economic instruments to address environmental problems. Despite this, progress to date in the use of economic instruments has been less than might be expected. The Industry Commission in its *Stocktake of Progress in Microeconomic Reform* suggested that, to date, governments in Australia have used economic instruments sparingly, and there is scope for them to be used more extensively (IC 1996a). The Commission recommended that 'to improve the efficiency of environmental protection measures, where feasible, governments should replace prescriptive environmental regulation with outcome-oriented regulation or use economic instruments' (IC 1996a, p.143).

The National Commission of Audit also perceived a lack of progress in pursuing more cost effective ways of achieving environmental objectives such as improved valuation and pricing of resources and other incentive mechanisms (NCA 1996). It has recommended that 'Commonwealth and State agencies should pursue greater use of economic instruments, such as appropriate valuation and pricing of resources and increased cost recovery, through purchaser/provider agreements' (NCA 1996, p.77).

1.1 Policy framework

International context

In 1987 the General Assembly of the United Nations adopted a report from the World Commission on Environment and Development (the Brundtland Report or *Our Common Future*), which emphasised the need for environmental and economic policies to be mutually reinforcing (WCED 1987). This report had an important effect on environmental policies in Australia and inspired the development of the National Strategy for Ecologically Sustainable Development (NSESD). The Brundtland Report fostered the concept of sustainable development and paved the way for the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992.

Economic issues, including the use of economic instruments, were important from the outset in the preparation for the UNCED, which saw the signing of the *Rio Declaration* and *Agenda 21*. Principle 16 of the *Rio Declaration* promotes the internalisation of environmental costs and the use of economic instruments. *Agenda 21* also stresses the use of economic measures to complement more traditional regulatory approaches to environmental management.

In 1991, the Council of the Organisation for Economic Cooperation and Development (OECD) adopted a recommendation which proposed a greater and more consistent use of economic instruments by:

- improving the allocation and efficient use of natural and environmental resources by means of economic instruments to better reflect the social costs of using these resources; and
- seeking further agreement at international level on using economic instruments with respect to solving regional or global problems and to ensuring sustainable development (OECD 1994a).

National context

A number of national policies call for improved mechanisms for achieving environmental objectives. Guiding principles for the NSESD include:

- that decision making processes should integrate both long and short term economic, environmental, social and equity considerations; and
- that cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms (Commonwealth of Australia 1992a).

The NSESD highlighted two key objectives for pricing and taxation:

- to develop, improve and enhance the effective use of pricing and economic instruments as a means for achieving better management of Australia's natural resources; and
- to ensure that adequate attention is given to social and environmental costs when assessing the use of pricing, taxation and other economic instruments (Commonwealth of Australia 1992a).

The Intergovernmental Agreement on the Environment (IGAE) provided the basis for a cooperative approach to the environment by all governments in Australia (Commonwealth of Australia 1992b). The IGAE sets out the following principles in relation to improved valuation, pricing and incentive mechanisms:

- environmental factors should be included in the valuation of assets and services;
- polluters should bear the costs of containment, avoidance or abatement;
- the users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and disposal of wastes; and

- 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.

In a recent statement on *Investing in Our Natural Heritage*, the Minister for the Environment indicated the Commonwealth Government's commitment to identifying those areas where economic instruments can be used to provide lower cost and more flexible solutions to environmental problems (Commonwealth of Australia 1996).

1.2 Objectives of the study

Given the current stage of development of the use of economic instruments in environmental management, it is timely to review the progress made to date and examine the potential to further extend the use of economic instruments.

With this in mind, the particular objectives of this study are to:

- review the application of economic instruments to key environmental problems in Australia to date;
- discuss the use of economic instruments to address the issues of native vegetation retention and dryland salinity as two case studies. (A full range of issues from the exclusion of environmental values to provision for intergenerational equity associated with vegetation retention and dryland salinity will be analysed in detail in the Commission's inquiry into Ecologically Sustainable Land Management which is currently under way.);
- examine areas where the use of economic instruments could be extended; and
- discuss the role of stakeholders in extending the use of economic instruments.

1.3 Structure of the report

The measures available to address environmental problems are discussed in the next chapter. The rationale for government involvement in addressing environmental problems, including the use of economic instruments, is briefly outlined, along with the main types of economic instruments. Issues to consider when selecting the most appropriate instruments to address environmental problems are then highlighted.

In chapter 3, economic instruments that are commonly being used in Australia are briefly discussed with the use of several examples. Factors limiting the use of economic instruments are also outlined.

In the form of case studies, the use of economic instruments to address the issues of native vegetation retention and dryland salinity is discussed in chapter 4. The two issues are briefly described, and action to date to address these issues is outlined. Lessons learnt from this experience are then identified and suggestions for further action, including the removal of perverse incentives, are made.

In chapter 5, suggestions are made for extending the use of economic instruments to address some of the key environmental problems in Australia. The roles of stakeholders in extending the use of economic instruments are discussed in chapter 6, along with some required policy changes. An agenda for the extension of economic instruments is also briefly discussed. In chapter 7, some concluding remarks and suggestions for further research are made.

2 INSTRUMENTS FOR ENVIRONMENTAL POLICY

This chapter describes the rationale for government intervention in addressing environmental problems, and the main instruments available to address such problems — regulation, suasive measures and economic instruments. Particular attention is given to the different economic instruments available. Issues to consider in the choice of instruments are also discussed.

2.1 Rationale for government intervention

There are limited resources available to meet continually growing demands. This means there are competing uses for scarce resources. The aim is to achieve the optimal use of resources — that is, the set of uses that results in the highest net benefit to society. The market place, left to operate without any interference from government, is in some cases unlikely to deliver the optimal use of resources due to the existence of market failures.

Market failures are situations where, in principle, selective interventions in the market lead to net gains to society. The existence of market failures is one of the main reasons for government intervention. In the context of the environment, the most common form of market failure that arises is due to externalities. Externalities result when economic activities lead to effects that are external to those who decide over these activities in the first place and may thus generate social costs (including the costs of environmental degradation) that are not fully translated into private costs. Externalities are generally caused by an absence of, or ill defined, property rights. For example, much of the problem of air pollution occurs because nobody can 'own' the air and so control its quality and level of usage.

Information failures are another form of market failure often associated with environmental problems. Information failures result when firms or individuals do not have full information concerning a particular problem or issue, and private investment in such information is below socially optimal levels. This may result in firms or individuals making suboptimal decisions regarding resource use and governments making suboptimal policy decisions relating to the environment.

Other reasons for government intervention to deal with environmental problems include the view that in some cases the current generation may be

myopic and degrade the environment today for financial gain at a cost to future generations. This provides a rationale for government intervention to preserve intergenerational equity and ensure that the current generation make decisions based on the full costs of any environmental degradation, where this includes the costs to future generations of action taken today. Also, some consider that there are 'public good' elements to the demand for environmental attributes, such as the demand for the continued existence of certain ecosystems, biodiversity and genetic diversity.

Government intervention to offset environmental market failures can take three main forms — direct regulation, suasive measures and economic instruments.

2.2 Main instruments for environmental policy

Traditionally, governments in Australia and overseas have relied on regulatory or 'command and control' approaches in dealing with environmental problems. While such approaches have generally been effective in meeting some environmental objectives, it has been realised in recent years that they can be expensive, inflexible and generally do not provide much incentive for technological innovation. Therefore, there is increasing focus on the use of economic instruments to complement other measures to address environmental problems.

Regulation

Direct regulations are 'institutional measures aimed at directly influencing the environmental performance of polluters by regulating processes or products used, by abandoning or limiting the discharge of certain pollutants, and/or by restricting activities to certain times, areas, etc' (OECD 1994a, p.15). They are implemented through directives from regulatory authorities.

The main feature of regulatory instruments is that they prescribe a specific level of pollution (or abatement) and/or the means of reducing environmental damage, and the polluter is left with no choice but to comply with the regulation or face penalties (OECD 1994a). As a result, regulation is often considered inflexible and may not provide incentives for ongoing innovation to reduce environmental degradation. Regulation is also often associated with high costs of administration and compliance. For all these reasons, the use of regulatory instruments in isolation from other measures is unlikely to be the least cost method of achieving environmental objectives in many cases.

Department of Finance (DoF 1994, p.10) lists the following examples of regulatory instruments:

- specification of process and/or equipment;
- specification of allowable discharge quantities;
- performance standards;
- direct liability;
- community 'right to know' legislation;
- environmental audits; and
- specification of administrative processes and Ministerial responsibility.

Most of the above regulatory instruments have been used in Australia to address various environmental problems. Examples range from specifications relating to the treatment and disposal of hazardous chemicals to legislation allowing environmental protection authorities to order environmental audits to be carried out on the operations of suspected polluters.

Suasive measures

The aim of suasive measures is to change perceptions and priorities within a firm's decision framework by internalising environmental awareness and responsibility into individual decision making. Suasive measures to address environmental problems can take the form of education, provision of information and training as well as forms of 'moral suasion' such as social pressure and negotiation (OECD 1994a).

Suasive measures are becoming increasingly important to address environmental problems in Australia. For example, one of the main objectives of the National Dryland Salinity Research, Development and Extension Program is to educate and inform farmers and regional communities about the extent of Australia's dryland salinity problem and how it can best be addressed.

As well as being measures to address environmental problems in their own right, suasive instruments also have a great deal of potential to support economic and regulatory instruments and assist in their successful implementation. By altering attitudes using suasive measures, it is more likely that regulations or economic instruments aimed at altering behaviour will be accepted.

Economic instruments

Economic instruments affect the relative 'prices' (costs and benefits) of alternative actions open to firms. Through this, they aim 'to influence decision-making and behaviour in such a way that alternatives are chosen that lead to an environmentally more desirable situation than in the absence of the instrument' (OECD 1994a, p.17).

Economic instruments include a range of price or quantity related measures which alter the attractiveness of different options available to individuals or firms in decision making processes. The main examples are charges and taxes, subsidies, tax concessions, performance bonds, deposit refund systems and tradeable permits schemes. These instruments ensure producers and consumers 'bear some or all of the costs that their choices impose on others in the community through environmental damage and the use of natural resources' (DoF 1994, p.6).

With most economic instruments the 'polluter pays' principle applies, so that the source directly responsible for pollution bears the cost of resulting environmental damage. In cases where it is not possible or not appropriate to apply the polluter pays principle, the 'beneficiary pays' principle, in which those who benefit from an action pay for the portion of the benefits they receive, can be applied. However, with some instruments, such as subsidies to encourage environmentally friendly behaviour, consumers or the community indirectly pay the polluter to undertake environmentally friendly activities or constrain damaging behaviour.

2.3 Closer look at economic instruments

Economic instruments are often referred to as market based instruments, as they work by using market signals, such as prices, to provide an incentive to decision makers to integrate environmental concerns into their everyday decisions.

An advantage of using market based instruments, over regulation, is that they can increase the flexibility of the response of decision makers to the need to reduce environmental damage. That is, economic instruments do not dictate a particular technology but allow polluters to choose the method that is best in their particular circumstances for meeting a given environmental outcome. By doing so, economic instruments will allow firms to achieve environmental objectives in the most cost effective manner. Economic instruments also make the costs of meeting environmental standards transparent.

As well as providing incentives for economic efficiency, another advantage that economic instruments tend to have over regulation is that they provide incentives for ongoing innovation. That is, there are continuing incentives to seek out and adopt less polluting (or environmentally degrading) technology to address environmental problems because by doing so a firm can lower its costs.

Traditionally, in considering economic instruments, emphasis has been on assigning prices to environmental and other resources within existing markets through charges and taxes. Such measures represent price instruments. However, increasing attention has been focused recently on the potential gains from the creation of specific markets for environmental services. For example, tradeable emissions permits create a market in the right to emit pollutants by restricting the overall level of emissions and allocating emissions permits between polluters. An efficient allocation of emissions permits is then determined through the market mechanism. Such mechanisms represent a 'quantity' control.

Economic instruments may be classified in a variety of ways. This report distinguishes five categories:

- charges and taxes;
- subsidies and tax concessions;
- financial enforcement incentives;
- deposit refund systems; and
- property rights and market creation.

The first four represent price based instruments, whereas the last category identifies quantity based instruments (see table 2.1).

Charges and taxes

Charges and taxes are a price instrument. They may be considered as a price to be paid for pollution. By reflecting the extent of environmental damage caused by different activities, charges and taxes can be used to make polluters pay the costs of such damage. Where enforceable, they ensure that producers and consumers take account, at least in some part, of the costs of environmental damage in their decisions. Whilst it is most efficient to apply the charge or tax to the source of environmental damage, in some cases this may be difficult. In such cases it may be preferable to tax a cost effective surrogate if one can be found.

Table 2.1 Main characteristics of selected economic instruments

Type and definition	*Advantages*	*Difficulties/disadvantages*	*Relevance*
Emissions and effluent charges or taxes charges based on the quantity and quality of pollutants discharged	— low transaction costs for firms or individuals	— setting the charge at the right level — monitoring requirement	discharges from point sources
Product charges levies on products which are harmful to the environment when used or disposed of	— reduces the use of products that are harmful to the environment	— setting the charge at the right level — monitoring requirements	where it is not feasible to monitor pollution from individual sources
Clean up or restoration levies a levy to raise funds for environmental clean up	— levy funds are linked to environmental purposes	— determining the relevant group to levy	to fund clean up costs caused by past (but not ongoing) activities
Subsidies payment by government to those undertaking environmentally friendly activities	— encourages action to overcome environmental problems	— externalities are not internalised by polluter — may reward poor environmental performers — may pay those who would undertake action even without a subsidy	where other economic instruments do not work or are too 'expensive'
Performance bonds financial security lodged with government against environmental damage	— minimises the risks and potential costs of polluters defaulting on liability — encourages restoration and clean up where necessary	— setting a realistic level of security	where it is necessary to minimise the risk that environmental damage will not be rectified
Legislated deposit refund systems a refundable deposit which is paid on products which can cause pollution if discarded	— reduces the volume of waste and/or the release of toxic substances into the environment	— transaction costs may be high — significance of benefits (relative to changes in costs) not always clear	most effective if applied to products which have an existing distribution system, eg household milk containers
Tradeable permits a transferable right to discharge a prescribed	— allocation of resources to the highest valued use — reduced	— establishing an efficient market — setting overall level and initial allocation of	where environmental impact is independent of pollution source, eg for air pollution within

level of pollutants or use a certain amount of a resource	information needs for regulators — more certainty regarding pollution or resource use levels	permits — transaction costs	a defined area
Environmental liability making polluters legally liable for environmental damage	— potential polluters are forced to either adopt environmentally friendly practices or pay potential damage (through higher premiums)	— choosing the level of increase in premiums, etc. that will cover liability and risk — enforcement of liability	where environmental outcomes are linked to the availability of finance, insurance, etc.

Source: IC (1993)

Whilst on a practical level charges and taxes operate in a similar manner, there is a distinction between the two. According to the OECD, charges 'are associated with return flows of goods or services whereas taxes are not' (OECD 1994a, p.18). That is, 'charges are payments for which a good or service is rendered in return … and taxes are payments on the basis of, for example, the level of pollution for which no direct return in terms of goods or services is given' (OECD 1994a, p.46). However, in practice this distinction is difficult to make and maintain, and the terms charges and taxes are often used interchangeably.

Charges and taxes can result in the achievement of environmental objectives in an economically efficient manner, as those who are able to reduce environmental damage at a lower cost than the rate of tax or charge will do so, while those who can not will pay the tax or charge instead.

Charges and taxes may have an incentive impact and a revenue raising impact (OECD 1994a). The incentive impact depends on the cost and price changes brought about by the charge, and encourages polluters to introduce new technologies and cleaner production processes, and to continually find least cost ways to reduce pollution and thus avoid payment (The Treasury 1990).

Where charges and taxes are too low to have an incentive impact, they mainly serve to raise revenue. In such cases, the revenues are generally intended for collective treatment of the environmental problem, research on new abatement technologies or subsidising new investment by polluters in such technologies (OECD 1994a).

In the past, charges and taxes have been heavily used for fiscal policy purposes. However, recently they are being considered for their potential to change environmental behaviour.

Whilst there are incentive and revenue raising benefits associated with charges and taxes they also tend to have a number of drawbacks. The main drawbacks include:

- the administrative difficulty of determining an appropriate level of charge or rate of tax which will achieve the desired environmental outcome as well as ensuring an efficient allocation of resources;
- the need to continually monitor the effectiveness of charges and taxes to determine if they are meeting the desired environmental outcome. As economic conditions change, so do levels of production and, hence, pollution levels, and thus it is likely to be necessary to adjust environmental charges and taxes in order to maintain a particular environmental outcome; and

- the practical problem of overcoming concerns that they will become revenue raising devices for the government, and that the revenues will not be used to address environmental problems (IC 1993, p.85).

Charges and taxes to discourage environmentally damaging activities can be categorised into the following three broad groups:

- user charges;
- product charges or taxes; and
- other charges.

User charges

User charges are payments for use of environmental services. They generally take two main forms: emissions and effluent charges; and charges for the use of natural areas and amenities.

Emissions and effluent charges are based on (a proxy for) the quantity and/or quality of pollutants discharged into the environment. Examples include payments for the costs of public collection and/or treatment of effluent. Charges may be uniform or they may differ according to the amount of effluent collected or treated (OECD 1994a).

In the past, services for the collection and treatment of emissions and effluent have been funded out of general revenues. This has meant that individual users of these services have had no indication of the cost incurred by their usage and there has been no incentive to alter their use of such services. Charging for the use of environmental services can provide incentives to reduce demand for waste collection and treatment services by reflecting a truer cost of those services.

Emissions or effluent charges are most relevant to discharges from point sources — where the polluter can be identified. However, they are not an efficient means of controlling pollution in cases where the pollution source is not readily identifiable (nonpoint sources).

Examples of emissions or effluent charges that have been applied in Australia and overseas include:

- air and water effluent charges;
- aircraft noise charges; and
- charges for public collection and treatment of waste.

User charges for natural areas and amenities are payments for the recreational and educational use of areas such as national parks, recreation areas and conservation reserves. Revenues from such charges are generally applied to

the management of the areas for recreational and educational uses, and also to scientific research in the areas.

Product charges or taxes

Product charges or taxes are levelled on products that could have a harmful effect on the environment — either in the manufacturing or consumption phase. They can be based on a product, such as the use of petroleum, or on a product characteristic, such as the carbon content in petroleum (OECD 1994a).

Product charges or taxes differ from emissions charges in that they are directly related to the use of harmful products rather than the discharge of pollutants. Product charges are usually applied when emission charges are not feasible — for instance in cases where it may be physically or financially impossible to identify all of the polluters and the amount of pollution for which each is responsible. For example, in addressing land and water degradation, a general tax on fertilisers may be more feasible and cheaper to administer than a system of charges based on the level of individual farm runoffs (IC 1993).

In most cases, product charges aim to reduce environmental damage by providing an incentive for the product to be used more sparingly and for alternative (less harmful) products to be substituted. In these cases, the charges are levied in accordance with the potential of the product to damage the environment. However, some product charges may have revenue raising as their main goal, in which case it is unlikely that the charge will reflect the environmental damage.

One form of product charge which has as its sole purpose to provide an incentive to reduce polluting activities is tax differentiation. Tax differentiation results in more favourable prices for 'environmentally friendly' products and vice versa. This instrument usually operates in a budget neutral manner.

Other charges

A variety of other environmental charges exist, such as administrative charges and clean up or restoration levies. Administrative charges include control and authorisation fees and payments for administrative purposes. For example, they may be used in registering certain chemicals, or in implementing and enforcing regulations (OECD 1994a).

Clean up or restoration levies may be imposed where the costs of environmental clean up or restoration can not be recouped from those

responsible for causing environmental damage. One advantage of such a levy is that it is transparent, and consequently may be more acceptable to the public than a general increase in taxation or municipal rates. However, a flat rate levy imposed per household, for example to pay for cleaning up a local lake or dam, may not be equitable as households are not charged in accordance with their respective 'willingness to pay' or with the benefits received (IC 1993).

Subsidies and tax concessions

Subsidies and tax concessions are instruments which can provide an incentive to modify behaviour. A subsidy is a payment by government (directly or through another body) to those who undertake certain activities the government wishes to promote. A tax concession, on the other hand, reduces the amount of tax owed to the government by those undertaking such activities. In both cases, government revenue is reduced and there is a financial gain to firms who undertake the relevant activities. Ideally, the size of a subsidy or tax concession should not exceed the overall benefits derived from the action or activity for which the subsidy or concession is given.

Whilst providing an incentive to change behaviour, and in many cases giving polluters the flexibility to do this in the manner they choose, subsidies and tax concessions do not cause the polluter to internalise the costs to the environment of their polluting activities. Therefore, these instruments may not satisfy the polluter pays principle.

Subsidies and tax concessions may also have the undesirable effect of rewarding those who have been poor environmental performers prior to their introduction. Such payments may also be inefficient where they are made to those who would undertake action even in the absence of a financial incentive. Furthermore, subsidies and tax concessions represent a net payment by the government, and may also distort the tax system.

Despite the arguments against subsidies and tax concessions, there may be situations where a firm is unable to capture sufficient benefits from undertaking a certain activity and the desired behaviour is unlikely to occur without the provision of an external financial incentive. In these cases, and where effective polluter pays measures can not be devised, the use of subsidies and tax concessions may be desirable. For example, in the case of land degradation it is very difficult to apply charges to environmental impacts which are spatially separated from their causes, or to ensure adherence to regulations aimed at reducing environmental impacts. Therefore, a combination of a tax concession for expenditure on reducing environmental

damage and provision of information and technical assistance has been used to address many land degradation problems (The Treasury 1990).

Financial enforcement incentives

Financial enforcement incentives penalise noncompliance with a certain environmental standard or regulation. Whilst they may provide an economic rationale for compliance by influencing the relative costs of alternatives, financial enforcement incentives are not strictly economic instruments unless the penalty for noncompliance varies with the resulting amount of environmental damage. Therefore, fixed level penalties are not considered economic instruments, but regulatory instruments.

There are two main types of financial enforcement incentives: performance bonds and noncompliance fees.

Performance bonds are ex ante payments made to authorities for potential environmental damage, where the amount of payment generally varies with the level of potential damage. There are various ways in which such finance may be provided. One is the provision of upfront capital funding where the money is held in trust, and is refunded once compliance with certain regulations has been achieved. However, this may place severe constraints on the cash flow position of enterprises. A firm may reduce strains on working capital by taking out a loan with a financing body in a manner similar to other general cases of risk insurance. The main requirement for a performance bond is that government has a guarantee against the risk of default of conditions prescribed for environmental safeguards (James 1997). Environmental performance bonds 'are best suited to situations where there is one source of potential environmental damage and that damage can be reasonably estimated' (Young et al. 1996, p.31).

Noncompliance fees are levied ex post on polluters when they do not comply with certain regulations. To constitute an economic instrument, such fees would need to be linked to the rates by which prescribed limits are exceeded — fixed penalties, such as fines for noncompliance, are not classed as economic instruments. According to James (1997), there are no examples of the use of varying noncompliance fees in Australia. Such fees may represent an anomaly in rational approaches to environmental management, because if a threshold, or 'safe standard', of environmental degradation can be defined, the basis for exceeding the standard may be difficult to justify (James 1997).

Deposit refund systems

Deposit refund systems generally encourage recycling or reuse of goods. A surcharge is initially included in the price of a product which can cause environmental damage when discarded. The surcharge is refunded when the product, or a residual, is returned to a collection system. Deposit refund systems are commonly used for items such as beverage containers, automobile batteries, tyres, aluminium cans, steel products and lubricating oil.

The benefits of deposit refund systems are reductions in the volume of waste, in the release of toxic substances into the environment and in resource (input material) use (IC 1993). However, whilst most deposit refund systems are successful in achieving these benefits there are some drawbacks. It may be that the benefits are achieved at high costs compared with alternative measures — some of the costs include additional handling, transport and storage costs incurred by wholesalers, retailers and specialist container collection agents. Such costs may also put products subject to deposit refund systems at a competitive disadvantage relative to substitute products. Furthermore, the significance of the benefits is not always clear.

There are two main types of deposit refund systems — those which aim to enhance reuse, and those which provide an incentive for recycling. With either type, to operate on a commercial basis the products need to have sufficient value as reusable or recyclable products. Deposit refund systems which can not be sustained on financial grounds, but which are considered to be desirable on broader economic grounds which take account of environmental damage, require legislation for their implementation (IC 1993).

Property rights and market creation

Environmental problems often stem from the fact that there are no clearly defined property rights for environmental resources, such as clean air and water, ecosystems and undamaged natural areas. As a result, environmental resources may be overused (The Treasury 1990).

To overcome this, it is possible in some cases to assign private property rights. Assigning property rights creates a market for the resource whereby beneficiaries pay an amount equivalent to the benefit they receive from the proper management or use of the resource. The owner of the resource will manage the property or use the resource in the most cost effective way in order to maximise benefits. Assigning property rights can potentially reduce the need for direct government involvement in protecting environmental resources.

A number of characteristics of property rights need to be present for them to work effectively. Property rights should be:

- well defined (divisible and exclusive);
- freely transferable — to ensure efficient allocation and to permit adjustment;
- enforceable; and
- secure over the long term — but subject to the possible need to adjust entitlements in the light of changed circumstances or new information (The Treasury 1990, p.5).

The use of property rights as a tool for addressing environmental problems may not be feasible where there exist environmental benefits for which payment can not be extracted. For example, many people value native vegetation and old growth forests for the sake of their existence and not for any particular recreational use, but it may be difficult for a private owner to extract payment for such values.

Two types of market creation — tradeable permits schemes and environmental liability — are discussed below.

Tradeable permits

Tradeable permits are a particular example of creating a market for an environmental resource or a byproduct by allocating private property rights. These instruments work first by establishing some multisource limit on environmental degradation, such as a limit on total pollution/emissions of substances or the level of use of a resource. This limit is allocated amongst participants, who are then free to trade their permits. Firms for which the marginal cost of abatement is relatively high will buy permits from those who can reduce environmentally damaging behaviour relatively more cheaply, as long as the price of the permit is below the marginal cost of abatement for the high cost firms. Low cost firms will agree to sell their permits to high cost firms as long as the price they receive for the permits is greater than the cost to them of abatement.

Depending on the nature of the environmental problem, trade may take place on a large scale, such as nationally, or within a localised region. As well as limiting trade to specified locations, permits may also have other conditions attached, such as a time limit within which trade must occur.

Tradeable permits systems have other benefits apart from being economically efficient. One benefit is that they can reduce the overall costs of compliance and the information needs of regulators. Another is that, as tradeable permits set a ceiling on the allowable level of emissions or environmental degradation,

there is more certainty regarding the quantity and quality of degradation than is the case with some other instruments such as charges, which allow any level of degradation provided the charges are paid.

Despite these advantages, a number of conditions must be met for the efficient use of tradeable permits systems. An important condition is that it is necessary to be able to define an appropriate indicator which reflects the extent of environmental damage and to monitor this indicator economically. If it is not feasible to directly monitor environmental degradation, it may be possible to use a proxy whose level varies reasonably closely with the type of degradation in question. For example, the use of fossil fuels may be a proxy for carbon dioxide emissions (The Treasury 1990).

Environmental liability

Environmental liability involves making polluters legally liable for the environmental damage they cause. This may lead to the creation of a market in which risks for penalties relating to environmental damage are transferred to banks and insurance companies (OECD 1994a). For example, the financial sector will take into account the probable cost and likelihood of environmental damage from a business when assessing and renewing loan applications and charging insurance premiums. In some countries, such as the United States, institutions who finance the activities of companies which result in environmental degradation may themselves be liable for some or all of the associated damage costs. Either way, the need for capital and insurance, and the benefits of lower interest rates and premiums in some cases, provide strong incentives for businesses to take necessary steps to reduce environmental risks.

2.4 Issues in the choice of instruments

The underlying theory of regulation, suasive measures and economic instruments may appear simple. However, a number of considerations must be taken into account in their design and implementation. Some can be described as preconditions for the successful application of instruments to address environmental problems. Others are criteria which should be considered in selecting the most appropriate instrument(s) to address a particular environmental problem.

Preconditions for successful application

There are several factors which will assist in successfully applying policy instruments to address environmental problems. The following preconditions should be met for an environmental policy or measure to be successful:

- evidence that a significant environmental problem exists, or is likely to arise, which otherwise would not be adequately addressed;
- strong public and/or industry support for action to address the problem;
- availability of appropriate expertise to help design, implement and monitor the use of the instrument;
- capacity to establish an effective and efficient administrative and legal framework to implement the instrument;
- measures in place for reviewing, adapting and refining approaches to changing circumstances; and
- clear goals against which effectiveness can be evaluated (C. Binning pers. comm.; DoF 1994; The Treasury 1990).

Criteria for selecting instruments

A number of criteria need to be considered in selecting the best instrument(s) to address an environmental problem: effectiveness and dependability; efficiency; equity; flexibility; incentives; acceptability; informational requirements; and other considerations. A single instrument will rarely meet all the criteria. However, the criteria do provide a useful means of developing an effective mix of instruments to address a particular environmental problem. In some cases a mixture of regulatory, suasive and economic instruments may provide the most preferred solution.

The nature of the environmental problem will also determine the emphasis on the various criteria. For example, if the costs of policy failure are high then dependability may be the most important criteria, whereas if there is scope for tradeoffs to occur then efficiency and equity may be more important (C. Binning pers. comm.).

Effectiveness and dependability

Effectiveness refers to how well an instrument achieves its objective(s). Different instruments may be appropriate for different environmental problems. For example, within economic instruments, user charges may be appropriate for discharges which can be traced to a point source, whereas product charges may be more appropriate where it is not feasible to monitor pollution from individual sources.

Economic instruments are not necessarily the most appropriate instruments for all environmental problems. It is possible that in some cases the desired environmental outcome may be better achieved through regulatory mechanisms. For example, if it is required to quickly eliminate the use of a toxic substance, regulations are likely to be more effective than economic instruments. If, on the other hand, it is only required to phase out the use of such a substance, economic instruments could work well, as may suasive measures.

The degree of certainty with which an instrument will achieve a stated goal or standard, or its dependability, is also an important consideration. In other words, some instruments may be highly reliable and achieve their intended goal continually, whereas other instruments may be less reliable.

Efficiency

Efficiency relates to the relative net cost associated with the use of instruments — that is, one instrument is more efficient than another if it achieves a desired outcome at a lower net cost. The net cost of an instrument is determined by comparing the costs and benefits of its implementation. Costs may be associated with administration, monitoring and compliance/enforcement. Benefits include the degree to which the environmental goal is achieved as well as indirect benefits associated with the achievement of the goal, although the latter may be hard to measure. It is possible for the administrative and compliance costs of certain instruments to be high enough as to make alternative approaches preferable.

Equity

The distribution of costs and benefits generated by the instrument across regions or firms and/or households within the economy should be considered in selecting an instrument for an environmental problem. For example, it may be useful to consider the relative importance to the economy of those affected, the relative impact on different sectors within the economy and the effect on individual firms/households. It may also be important to ensure that the use of an economic instrument does not result in unequal market power.

Flexibility

It is desirable that the chosen instruments or measures allow for flexibility. There are two main aspects of flexibility that need to be considered: the ability of an instrument to keep doing its job in the face of changing circumstances, such as changing prices, conditions and public policy; and the degree to which individual firms may 'choose their own responses within the context of the overall (environmental) goal' (The Treasury 1990).

With respect to the latter aspect, economic instruments do not prescribe specific levels of abatement for individual firms or technology for achieving reductions in environmental degradation, whereas regulatory instruments generally prescribe at least one of the two. Therefore, economic instruments generally allow more flexibility in responding to environmental goals than do regulatory instruments.

Incentives

It is preferable that instruments provide ongoing incentives to reduce pollution through the adoption of new and cleaner technologies or continual improvements in the performance of existing technologies.

Economic instruments often provide these incentives whereas regulation generally does not. Suasive measures also have the potential to provide these incentives.

Acceptability

Implementation of instruments to address environmental problems is more likely to be successful the more acceptable they are politically and to community and industry. Lack of support may constrain the introduction of such instruments.

Informational requirements

It is desirable that any information required for the effective implementation and administration of, and compliance with, an instrument are readily available, or else not too costly to obtain or develop. For example, the informational requirements for some economic instruments may be so costly that regulation may be a more feasible alternative in certain circumstances.

Other considerations

It should also be borne in mind that, with respect to any revenue raising or tax instruments, such instruments should be consistent with broad tax policy objectives.

Department of Finance (DoF 1994) also suggests that the effects of economic instruments on international competitiveness in directly or indirectly affected industries should be considered. However, this argument is sometimes used as an excuse to not introduce appropriate environmental policies, and should be taken into consideration with the long term costs and benefits of reducing environmental degradation.

3 CURRENT USE OF ECONOMIC INSTRUMENTS

In this chapter, the economic instruments that are commonly being used in Australia to address environmental problems are briefly discussed with the use of several examples. (A more detailed discussion of the use of economic instruments in two case studies is given in chapter 4.) Some of the factors that are, in general, limiting the use of economic instruments are also presented.

3.1 Use of economic instruments

Chapter 2 classifies the range of economic instruments available for addressing environmental problems into five categories. Each of these types of economic instruments are presently being used by governments in Australia, although some of these categories are more heavily represented than others. Box 3.1 lists examples of some of the major economic instruments operating in Australia by category. These are discussed in detail in the following subsections.

Charges and taxes

Schemes involving charges and taxes now form core components of most States' environmental protection packages. As part of their 'environmental tool kits', they assist States to meet their environmental objectives. Examples of major economic instruments of this type operating in Australia are discussed below.

Emissions and effluent charges

Emissions and effluent charges had rarely been applied in Australia until recently. However, they are becoming a major part of packages of economic instruments being considered by some States to achieve environmental outcomes.

The pioneering application of an effluent charge in Australia is the system of fees introduced in South Australia to support the *Marine Environment Protection Act 1990*. A system of fees now operates under the *Environment Protection (Fees and Levy) Regulations 1994*. Emissions are measured for every point source discharge to any tidal water of South Australia. The fee is

linked to the toxicity of the pollutant and the sensitivity of the environment as well as the volume of discharge.

Box 3.1 Some examples of major economic instruments in use in Australia

Charges and taxes

- A system of effluent charges in South Australia to support the *Marine Environment Protection Act 1990*
- Load based licensing schemes in Victoria and Western Australia covering air, water and land pollutants
- Trade Waste Program operated by the Sydney Water Corporation
- The product tax operating on ozone depleting substances

Subsidies and tax concessions

- Tax concessions for improved land and water management under sections 75B and 75D of the *Income Tax Assessment Act 1936*
- Local government rate concessions to encourage sustainable land management
- Subsidies and grants from various sources for tree planting and vegetation protection

Financial enforcement incentives

- Queensland Environmental Policy for Mining (performance bonds)

Deposit refund systems

- South Australian beverage container deposit scheme

Property rights and market creation

- Hunter River Salinity Trading Scheme
- Murray-Darling Basin Commission Salinity and Drainage Strategy
- South Creek Bubble Licence Scheme to reduce phosphorus levels in the Hawkesbury-Nepean river system

Other economic instruments

- Victorian Accredited Licensee Scheme
- Murray-Darling Basin Commission cost-sharing framework for on-ground works

The system of charges has been sufficiently successful to be embraced by the South Australian *Environment Protection Act 1993*. The *Environment Protection Act* has as one of its objectives 'to allocate the costs of environmental protection and restoration equitably and in a manner that encourages responsible use of, and reduced harm to, the environment, with dischargers bearing an appropriate share of the costs that arise from their

activities, products, substances and services' (James 1997, p.26). Environmental objectives are met through compliance conditions and monitoring requirements. The South Australian Government has approved licence fee increases which are expected to see the average annual licence fee rise from $486 in 1993 to about $780 in 1999 (James 1997). The charging system is therefore expected to become an incentive based effluent management system rather than one designed, as it presently is, to cover administrative costs.

A load based licensing system operates in Victoria which covers discharges of waste to air, water and land as well as noise emissions. Until 1991 the fee structure for licences was designed to raise general revenue to cover costs associated with implementing activities under the *Environment Protection Act 1970*. A major restructure of the fee system took place in 1991. Fees for individual licences are now calculated as a function of the volume and nature of emissions. The load based licensing system presently covers around 1200 licences — primarily covering the operators of industrial premises, landfills and waste treatment plants. This is a reduction of nearly 5000 licences from the number being applied in the late 1970s. If the activity associated with the licences posed a reduced threat to the environment, the Environment Protection Authority (EPA) tended to cancel such licences. The drop in licence numbers therefore represents an improvement in the environmental performance of a number of firms.

The Department of Environment Protection in Western Australia has introduced a tiered licensing system, under which three types of licences for emissions to air, land and water are available — regulated licences, monitored licences and best practice licences. The system allows firms who are required to be licensed substantial choice in the type of licence held, and therefore the basis of fees paid. Firms who do not accurately monitor discharges are required to hold regulated licences. Holders of regulated licences pay the highest fees, with load based fees calculated on the amount of waste licensed to be discharged. Firms that accurately monitor some discharges are able to hold partially monitored licences, and pay lower fees based on a combination of waste emissions identified in the licence and actual emissions monitored. Firms that accurately monitor all discharges are able to hold monitored licences, and pay even lower fees based on actual emissions. Best practice licences are based on the concepts of best practice environmental management, audited self management, an approved environmental management system and an approved continuous improvement plan. Firms that qualify for a best practice licence are not required to pay load based fees. Ascertaining the effectiveness of this new tiered licensing system will take some time. Some premises will not be affected until October 1, 1998.

However, the scheme provides economic incentives for improved environmental performance that were absent in the previous fee system. A full review of the system is planned for 1999.

By late 1997 the EPA in New South Wales is expected to introduce a load based licensing scheme covering air, water and land pollutants. The basis for calculating fees will be similar to that of the South Australian scheme described above, with fees determined using index values that reflect initial loads and subsequent environmental impacts. Industries initially to be covered by the scheme include cement works, coal and other mines, electricity generation, livestock processing and sewage treatment plants. As the scheme is yet to be introduced, only minimal reductions in pollution discharge associated with anticipatory effects of future fees are likely to have been occurring. However, as the base levels of fees upon implementation of the scheme are likely to gradually increase to their full value over a five year period, the incentive to reduce discharges will increase and there are likely to be significant reductions in emissions among the 18 categories of pollutants covered by the scheme.

User charges for the treatment and/or disposal of waste

User charges are widely applied throughout Australia by State and local governments for the treatment and disposal of household and industrial waste water. However it has been suggested that the principles of 'user pays' and polluter pays have been applied on a rather ad hoc basis by water authorities in different parts of Australia. Only some water authorities have succeeded in implementing user pays pricing policies that have had a demonstrable effect on demand for water services. These include the Hunter Water Corporation, the Water Authority of Western Australia and ACT Electricity and Water (James 1997).

There are several examples of effective industrial user charges that relate to the disposal of waste through the sewerage system. The Trade Waste Program of the Sydney Water Corporation (which involves applying charges against industries that discharge wastes into the sewerage system), has been successful in achieving a positive environmental outcome. A significant incentive for polluters to reduce the quantities of waste discharged has been created by a 15 per cent increase in charges per year since 1991. Monitoring indicates that discharges of certain pollutants have declined since the introduction of the program (James 1997).

Melbourne Water in Victoria and the Hunter Water Corporation in New South Wales have also implemented charges for waste disposal. There is some

evidence that firms are modifying their discharges to take account of the costs of disposing of trade waste (James 1997).

User charges for natural areas and amenity

User charges (or fees) are applied by all levels of government for access to natural areas such as national parks. Fees may be applied on a user pays basis for access to national parks, recreation areas and conservation reserves. Most fees are set at a level which allows maintenance of facilities rather than to ration resource use or maintain flora or fauna.

Product charges and taxes

In Australia, charges and taxes have been imposed on a range of products that cause pollution. One example is the scheduled 2 cents differential tax between unleaded and leaded petrol introduced in August 1993. Due to indexation it is now operating at 2.175 cents per litre. As an economic incentive, the differential tax has been judged effective in encouraging a switch from leaded to unleaded petrol where this has been technically possible (James 1997).

An example of a product charge aimed at reducing the use of a product is the system of charges on ozone depleting substances applied by the Commonwealth and the States as part of the Ozone Protection Strategy. The Commonwealth initiated the strategy in response to the Montreal Protocol on Substances that Deplete the Ozone Layer. As part of the strategy, governments applied charges to products that used ozone depleting chemicals. However the fees have been designed only to raise revenue to cover the costs of administration of the *Ozone Protection (Licence Fees - Imports) Act 1995* and *Ozone Protection (Licence Fees - Manufacture) Act 1995* and industry and public awareness programs (James 1997).

Environment levies

Environment levies are generally used to finance environmental improvement programs and projects. In late 1980s, serious problems of water pollution arose in the Sydney, Illawarra and Blue Mountains areas as a result of inadequate methods of sewage disposal. In response to these problems, the Sydney Water Board introduced in 1989 a Special Environmental Levy (SEL) of $80 per household per year to finance a range of initiatives to clean up the ocean, beaches and polluted waterways. The SEL has now been replaced by a user pays system of pricing.

Environmental levies are also now being imposed by local councils. Funds raised are used to support environmental improvement programs. Brisbane City Council has an environmental levy of $30 per year per household that is

used to purchase bushland remnants. Approximately 1400 hectares of bushland have been purchased at a total cost of around $40 million. Cooloola Shire has an environmental levy of $10 per household per year. Examples of other councils that impose environmental levies and special environmental charges include Eurobodalla Shire Council in New South Wales, and Caloundra, Logan, Johnstone, Toowoomba and Albert Shire Councils in Queensland.

Subsidies and tax concessions

A range of subsidies and tax concessions have been implemented in Australia to encourage actions with positive environmental outcomes. These include concessional taxes, tax concessions, subsidies, grants and rate concessions.

Concessional taxes can be used to promote the use of a product considered more environmentally friendly than alternatives. An example was the exemption from sales tax of products made entirely of recycled paper introduced by the Commonwealth in 1992. This aimed to encourage reuse of paper, conserve timber supplies and reduce waste disposal and litter. Although the tax exemption was abandoned in 1995 because it created a number of market distortions including encouraging the use of imported recycled paper products, a Commonwealth EPA review concluded that the scheme had resulted in significant environmental benefits (James 1997).

A range of subsidies and tax concessions have been used by various levels of government to encourage landholders to address land degradation and encourage sustainable land management practices. These include tax deductions and rebates, subsidies and grants for tree planting and protection of vegetation, and rate concessions.

Sections 75B and 75D of the *Income Tax Assessment Act 1936* are related to improved land and water management. Under section 75B, capital expenditure for the purpose of conserving or conveying water is able to be depreciated over three years. While the objective of section 75B is to encourage landholders to increase their capacity to withstand drought, eligible works are also likely to provide some resource management benefits. Under section 75D, full deductibility is allowed in the year of expenditure for capital expenditure to control land degradation on land used for primary production. Relevant eligible works include pest and weed control, fencing off degraded areas and areas identified in an approved management plan, and tree and shrub establishment. One indication of the effectiveness of the scheme in providing incentives for land care activity comes from a survey conducted by the Australian Bureau of Agricultural and Resource Economics (Mues, Moon and

Grivas 1996). It found that for a majority of farmers with land care expenditures, the availability of sections 75B and 75D was of at least some importance in their decision to make such expenditures.

Donations of cash to approved environmental organisations are fully tax deductible. Donations of land with conservation value are also eligible deductions if the land has been owned for less than 12 months or if the land is of national cultural heritage significance and accepted by the National Trust. However, it has been suggested the effectiveness of this provision is limited by the fact that deductions are not available for land that has been owned for more than 12 months (Young et al. 1996).

Commonwealth programs such as Landcare and One Billion Trees provide a range of grants for the management of native vegetation. Grants and subsidies are also available in a number of States from a variety of sources to fund activities related to management of native vegetation.

Rate concessions of various kinds are widely used by local governments to encourage adoption of environmental protection measures by landholders. The most common form of concession is rate rebates. One example is the rate rebate offered by the Melton Shire Council in Victoria. The rate rebate is given to nonurban properties larger than two hectares in the council area for completed works designed to discourage land degradation. Such work may be for the control of noxious weeds, animal pests or soil erosion. See James (1997) and ALGA (1996) for a more detailed discussion of the use of economic instruments by local governments. Subsidies and tax concessions for the management of native vegetation are discussed in more detail in chapter 4.

Financial enforcement incentives

Performance bonds are being used in Queensland and New South Wales as an inducement for mining companies to rehabilitate mined areas. Bonds can be lodged as an up front capital payment, a loan with a financing body or payment of a risk premium to a bank, insurance company or other financial institution. In Queensland, the core objectives of the performance bond system are: achievement of acceptable post-disturbance land use capability; stable post-disturbance landform; and preservation of down stream water quality. The system appears to have been successful, partly due to the fact that monitoring compliance is undertaken by an external body and the system has been accepted by industry.

In South Australia, bonds are a component of a fee based licensing system aimed at reducing the amount of effluent discharged into marine waters

(James 1997). In New South Wales bonds may be prescribed by the Environment Protection Authority in Pollution Reduction Programs (PRPs) negotiated with industry (James 1997). PRPs are an agreed program of works or emission targets to improve environmental performance set to agreed time frames, and are attached as a condition to pollution control licences (NSW EPA 1996).

Deposit refund systems

Deposit refund schemes on recyclable containers were once commonly used in Australia. The advent of disposable containers made many such schemes redundant. However, some manufacturers do make modest payments for recycled cans and bottles that has resulted in improved collection services. The only State that has specific legislation to support a deposit refund scheme is South Australia.

Beverage container deposits in South Australia are now legislated under the *Environment Protection Act 1993*. The Act applies to containers for some soft drinks and alcoholic beverages. The deposit refunds range from 5 cents for beer bottles to 20 cents for refillable glass containers for soft drinks and mineral waters. The operation of the system has led to some positive environmental outcomes. Recent figures collected by the Beverage Container Unit on return rates for South Australia indicate that return rates are 70 per cent for plastic containers, 82 per cent for aluminium containers and 83 per cent for glass containers. These rates are well above return rates from other States and above national targets recommended by the Industry Commission in its report on recycling (IC 1991a).

Property rights and market creation

To date, property rights and market creation mechanisms have not been used greatly in Australia. However, more attention is being focused on them as their potential to reduce pollution and environmental degradation efficiently is being realised. In recent years, tradeable permit schemes have been implemented to address problems of salinity and phosphorus levels in rivers. A market is also being created in the area of environmental liability, as financial institutions are starting to take such liability into account when assessing risks associated with the capital they lend.

Tradeable permits

Several different tradeable permits schemes currently operate in Australia. The Salinity and Drainage Strategy, managed by the Murray-Darling Basin

Commission (MDBC), includes a salt credits trading scheme to reduce the level of salinity in the Murray-Darling river system. This scheme operates between the irrigation districts of New South Wales, Victoria and South Australia. The scheme appears to be achieving its target reductions in river salinity. See chapter 4 for details of the scheme.

The Hunter River Salinity Trading Scheme is another example of a tradeable salt discharge scheme, operating along the Hunter River in New South Wales. This scheme involves 11 coal mines and two large power stations who amongst them are licensed to discharge a total predetermined level of saline water into the river or its tributaries. Within the total level of discharge, each firm is allocated discharge 'credits' which they are free to trade with other credit holders. As well as limiting pollution to a predetermined level, this scheme has given the local community confidence that new mines will not increase overall pollution levels, and thus new mine developments have since gone ahead with increased community support.

Also in New South Wales there is in place a quasi-tradeable permit scheme to reduce phosphorus levels in the Hawkesbury-Nepean River. The main source of phosphorus in the river is sewage effluent for which the Sydney Water Corporation is responsible. The EPA developed the South Creek Bubble Licence Scheme involving three Sydney Water sewage plants. Under this scheme, the EPA sets an aggregate load limit of phosphorus levels for the bubble as a whole and allows Sydney Water Corporation to determine the load allocation between the plants. This implies that the plants are able to 'trade' phosphorus discharges between themselves so as to meet the overall required reductions in emission levels at least cost. The scheme has been operating since July 1996.

Environmental liability

Chapter 2 outlined how liability for environmental damage can create a market where the risks of liability are transferred to either banks or insurance companies. In Victoria, lending institutions who finance firms whose activities involve a high degree of pollution are subject to limited liability for cleaning up any environmental spills. Essentially, this means that financial institutions acting as controller, managing controller or mortgagee in possession of a development are liable for making the development site safe and ensuring that any further operations do not cause pollution. As a result, companies that are good environmental performers are more likely to obtain finance at a somewhat lower cost than their poorly performing competitors.

Other economic instruments

Other economic instruments that have been used to address environmental problems in Australia include modified licensing systems and a cost-sharing framework for on-ground works.

The Victorian EPA operates a modified licensing and works approval system known as the Accredited Licensee Scheme. Under the scheme, businesses that demonstrate a commitment and capability for environmental protection receive a number of benefits relating to licensing and works approval. These benefits include a 25 per cent reduction in licensing fees, no additional approval requirements for most new works and the ability of firms to manage their own environmental performance within broad performance criteria so that they have the flexibility to achieve environmental goals in the most cost effective manner. A recent survey conducted by the Victorian EPA of businesses involved with the accredited license scheme shows overwhelming support for the scheme.

The MDBC has developed a cost-sharing framework for on-ground works implemented as part of catchment management plans which address environmental problems in the Murray-Darling Basin. This framework provides a financial incentive to landholders to participate in catchment management plans by making them pay only for their share of the benefits of the works. Cost benefit analyses are first used to decide on the works to be adopted, and then cost shares for the works are determined between those who will benefit from them by using polluter pays and beneficiary pays principles. The framework is also discussed in chapter 4.

3.2 Factors limiting the use of economic instruments

The fact that many of the economic instruments highlighted above have been introduced recently suggests that the various governments in Australia are making an increasingly greater use of them. However, a number of factors impede the general application of economic instruments, as discussed below.

Conceptual problems

One of the major barriers to successful implementation of economic instruments is the inherent difficulty of changing the status quo. This resistance often derives from misconceptions that implementing market based instruments will result in little environmental gain, weaker regulatory controls, and legitimise pollution by providing a license to pollute (Izmir 1994). These misconceptions highlight the need for an effective information dissemination, educational and consultative process of how economic instruments operate and their benefits over other instruments. It also hints at the wider problem of raising the awareness of environmental problems and their impacts on the environment and the wider economy.

Information and valuation problems

Information deficiencies can impair the effectiveness of existing schemes involving economic instruments, restrict the potential for existing schemes to expand and limit the application of economic instruments into new areas. A lack of information on the nature of the environmental problem can limit the potential to implement economic instruments.

The spatial and temporal complexity of some environmental problems can also limit the potential to apply economic instruments, since economic instruments (particularly taxes and charges) require an understanding of the costs and benefits of particular actions. Even if adequate information is available, the optimal policy mix may vary between regions or through time. The solution to this problem lies in implementing economic instruments at the appropriate scale. Instruments to address regional problems should be designed and implemented at a regional level (C. Binning pers. comm.).

Valuation problems occur when trying to assess the magnitude of environmental problems. For many environmental issues, valuation problems of intergenerational risk and irreversibility pose difficulties for policy makers. Intergenerational risk problems arise when the future consequences of environmental problems, and therefore the costs imposed on future generations, are unclear. The irreversibility of some environmental problems poses similar difficulties. Valuation problems mean that making decisions relating to tradeoffs between environmental and community interests can be difficult. This is exacerbated by spatial differences in the nature of many environment problems and can act as a barrier to the implementation of economic instruments (IC 1996b).

Resource problems

Another barrier is the need for diversity in skills and expertise to design and implement measures. For example, environmental, legal and communication skills and technical and operational expertise may be needed, as well as economic skills, to design and implement economic instruments. Within traditional command and control type organisations, some of these skills can be scarce. Indeed, personnel resource constraints can act as a factor affecting the ability of some environment protection agencies to develop and implement economic instruments.

Other problems

A number of other problems can impede the application of economic instruments. Cross border difficulties may arise in trying to expand economic instrument schemes between different areas. This may occur when different State or local governments in different areas are unable to reach agreement about what environmental protection measures are implemented, or when other impediments exist. For example, it has been suggested that a number of impediments to interstate water transfers exist, including legislation prohibiting the transfer of water from some States, differences between States with respect to reliability, deliverability and water quality, and uncertainty about the environmental outcomes of transfers (Cleary 1997). The States are at different stages of development of water transfers and have different water pricing regimes. As a result, interstate trade in water would be distorted (Eigenraam and Stoneham 1997). Tradeable discharge schemes operating across state boundaries could incur similar difficulties and suboptimal outcomes (although perhaps better than the status quo).

4 TWO CASE STUDIES: NATIVE VEGETATION RETENTION AND DRYLAND SALINITY

This chapter uses a case study approach to discuss the use of economic instruments to address two important environmental issues — native vegetation retention and dryland salinity. These case studies were undertaken to provide some background information on vegetation retention and dryland salinity to the ICESD Working Group for Review of the NSESD.

Understanding the causes of impacts associated with vegetation retention and dryland salinity, and formulating the responses required to address them, would involve analysis of a wide range of issues. These issues include property rights, information problems, external effects, the exclusion of environmental values, provision for intergenerational equity, and the role of appropriate instruments and institutions. The focus of this chapter is on the scope to use economic instruments to better encourage better management of vegetation and dryland salinity. Some of the other issues highlighted above will be analysed in the Commission's inquiry into Ecologically Sustainable Land Management which is currently under way.

Vegetation retention and dryland salinity have some common links. First, the clearance of vegetation can lead to a number of land degradation problems, one of which is dryland salinity. Second, both of these environmental issues are associated with market failure. Third, there is regional variation in the characteristics of vegetation retention and dryland salinity.

4.1 Case study 1: Native vegetation retention

In addition to natural causes, a number of underlying factors have contributed to the degradation of Australia's native vegetation, including agricultural and urban expansion and incomplete specification of property rights. A poor understanding of the value of native vegetation and the consequences of vegetation clearance have also contributed to the problem. Perverse incentives for landholders to clear vegetation, such as tax concessions for clearing and leases with conditions requiring land to be cleared, have also contributed to the clearance of large areas of Australia's native vegetation over time (SEAC 1996) (see box 4.1).

Box 4.1 Native vegetation retention: A brief description of the problem

In a recent assessment of land cover disturbance in Australia, it was estimated that 52 per cent of Australia's forests and woodlands in the intensive land use zone (ILZ) had been cleared or thinned. The ILZ comprises 39 per cent of the Australian continent and contains more than 90 per cent of its population. Twenty four per cent of the extensive land use zone was assessed as being substantially or significantly disturbed. In total, 35 per cent of the continent is significantly disturbed (Graetz, Wilson and Campbell 1995, p.6). In all States except Tasmania and the Northern Territory, more than half the ILZ has been cleared or thinned. The extent of clearing is pervasive, with satellite images revealing there is little native vegetation left in Australia's agricultural areas (Graetz, Wilson and Campbell 1995).

Contrary to common belief, as much land has been cleared in the last 50 years as in the previous 150 years (DEST 1995, p.6). Extensive clearing occurred in the 1960s and 1970s, and significant clearing is still occurring. The National Greenhouse Gas Inventory Committee estimated that between 1983 and 1993 an average of 500,000 hectares of land were cleared per year for agricultural purposes (DEST 1995, p.17). However, there is considerable uncertainty about the extent of agricultural land being cleared (ICESD 1997).

Clearing of native vegetation can have a number of impacts. These impacts include biodiversity loss and land degradation problems such as erosion, rising groundwater, dryland salinity, soil acidification and soil structural decline. In some areas, removal and modification of native vegetation is threatening the viability of natural and agricultural ecosystems (DLWC 1995). Recent research also suggests that 'regional rainfall and atmospheric energy patterns have been changing in certain areas which have been extensively cleared' (DEST 1995, p.13).

A number of private and social costs can be incurred as a result of these impacts, including:

- production losses due to land degradation and loss of shelter for stock and crops;
- offsite costs such as declining water quality, and damage to roads and buildings as a result of rising watertables and salinity;
- social and economic losses associated with loss of biological diversity, including possible loss of genetic resources for pharmaceuticals and scientific research;
- lost opportunities to derive revenue from harvesting native vegetation products such as timber, flowers and oils; and
- costs associated with loss of cultural, aesthetic and landscape values.

Action to date

Australia's native vegetation is managed within an institutional framework which includes a range of Commonwealth, State and local government strategies and policies.

Delivery of the Natural Heritage Trust aims to contribute significantly to the conservation of native vegetation. The Trust provides an integrated package of measures to address both off-reserve conservation, through the Native Vegetation Initiative (NVI), and on-reserve conservation, through the National System of Reserves. The NVI will build upon the work of existing vegetation programs such as One Billion Trees, National Corridors of Green, Urban Forests and Grasslands Ecology (Commonwealth of Australia 1997). Other Commonwealth strategies relevant to the conservation of native vegetation are the National Strategy for Ecologically Sustainable Development, the National Strategy for the Conservation of Australia's Biological Diversity, the Draft National Strategy for Rangeland Management, the Murray-Darling Basin Natural Resources Management Strategy and the National Landcare Program.

The States have also implemented a range of programs and strategies to encourage retention of native vegetation. These include legislation to control land clearing, regional vegetation management plans which provide a framework for the protection of native vegetation in a region, community based conservation programs and conservation management agreements for protection of native vegetation.

Strategies at the local government level aimed at retaining native vegetation include planning frameworks which consider the effect of urban development proposals on nature conservation, tree clearing ordinances that require landholders to obtain permission to remove trees and rate concession programs which encourage landholders to conserve native vegetation by offering incentives such as rate rebates.

Within this institutional framework, a range of policy instruments have been used to manage Australia's native vegetation, including regulations, suasive measures and economic instruments. As the focus of this study is on economic instruments, regulatory and suasive measures will be discussed briefly, while economic instruments will be discussed in more detail.

Regulation

The main regulatory mechanisms used to date to manage native vegetation have been legislation to control land clearance and zoning by local government. Most States now have legislation to protect native vegetation on private land, although legislation varies in design and application. Land clearance has not been banned in any State, but New South Wales, South Australia, Victoria and Western Australia have stringent controls over land clearing. Queensland has also introduced tighter controls on leasehold land, although there are no clearing controls on freehold land. In the Northern Territory, controls on land clearing exist on pastoral land and Crown leases. Tasmania does not have specific legislation regulating clearing of native vegetation.

Regulatory measures can play an important role in protecting native vegetation by setting minimum standards and setting in place regional processes for determining the conservation values of particular areas of native vegetation. However, there are some problems associated with using regulations in isolation. For example:

- outright prohibition of land clearance is not widely accepted by rural communities;
- ongoing management by landholders of land set aside for conservation is not encouraged;
- landholders who have been refused permission to clear land are unlikely to cooperate with regulation without realistic expectation of enforcement; and
- enforcement is usually a significant problem due to lack of resources in regulatory agencies, the size and often remoteness of areas administered and problems with proving whether landholders are complying with regulations (Farrier 1995).

As discussed in chapter 2, regulations can impose inflexible restrictions on the use of resources, which may result in inefficient resource use. The information required for regulators to overcome this problem can be significant. Regulatory measures therefore need to be complemented by more flexible approaches to conservation such as suasive measures and economic incentives.

Suasive measures

Community support is integral to the successful implementation of conservation policies. Fostering a conservation ethic on private land is therefore an important part of any effort to conserve native vegetation. A

range of motivational and voluntary instruments have been used to foster such an ethic, including participation in community groups, awards, education and voluntary agreements.

Participation in community groups is one mechanism used to encourage the development of a conservation ethic in the community. Perhaps the most prominent program using such an approach to date is Landcare. The objectives of the Landcare program are achieved by a variety of means, including educational and voluntary measures, and financial incentives which will be discussed later.

Development of a conservation ethic can also be encouraged through award programs which recognise achievements in conservation of Australia's natural resources, including native vegetation. Example include the National Landcare Awards, Banksia Awards and South Australian Ibis Awards.

Education of land managers on native vegetation conservation issues has proceeded though a variety of programs. Examples include Landcare, Save the Bush and the integration of native vegetation management considerations into catchment and property planning in a number of States. State of the environment reports, and other related reports and media coverage, as well as school and community workshops also play a role.

Management of native vegetation remnants can be encouraged by voluntary management agreements between government or nongovernment organisations (NGOs) and landholders. There is a spectrum of management agreements which vary in duration, the level of incentives provided and whether current or future landholders are bound by the agreement. At one end of the spectrum are voluntary agreements which provide information and support to landholders entering into such agreements but do not specify the terms and conditions under which the landholders agree to manage their land, nor do they provide financial incentives. These agreements can provide an important starting point in negotiations to conserve native vegetation. Examples of such agreements include Land for Wildlife in Victoria and Wildlife Refuges in New South Wales. Other agreements alter property rights by specifying management terms and conditions and can provide incentives such as rate rebates, payment for fencing or access to other land for grazing. Such agreements will be discussed in more detail later.

While regulatory and suasive measures can play an important role in ensuring that the optimal extent and distribution of land clearance occurs, economic instruments can also play a significant role.

Economic instruments

A number of examples of the application of economic instruments to encourage retention of native vegetation in Australia exist. Some of these examples are summarised in table 4.1.

Table 4.1 Summary of economic instruments applied by various jurisdictions to encourage retention of native vegetation

Category	*Instrument*	*Jurisdiction*
Charges and taxes	Environmental levy	Local government
	Catchment levy	Local government
	User fees	State Governments
Subsidies and tax concessions	Tax concessions	Commonwealth Government
	Grants/subsidies	Commonwealth, State and local government
	Rate concessions	Local government
	Exemption from environmental levies	Local government
	Bonus development rights	Local government
Financial enforcement incentives	Performance bonds	State Governments
Property rights and market creation	Conservation covenants (with or without financial incentives)	State Governments
	Management agreements (with or without financial incentives)	State Governments
	User rights for leasehold land	State Governments
Other economic instruments	Murray-Darling Basin Commission cost-sharing framework for on-ground works	Commonwealth Government

Charges and taxes

Levies have been the main charge used in Australia to manage native vegetation. Some local governments impose an environmental levy on rate payers to fund conservation projects, such as the Brisbane City Council's environmental levy which raises funds to purchase remnant bushland. Catchment levies are paid by landholders in some catchments to fund works which provide environmental benefits. Murray Council in New South Wales applies a levy to farmers which funds tree planting, among other things.

User fees are charged for access to many natural areas such as National Parks and reserves. However, such fees are usually set at a level which allows maintenance of facilities and are not usually directed at maintenance of flora or fauna (Young et al. 1996).

Subsidies and tax concessions

A range of subsidies and tax concessions have been used by various levels of government to encourage the retention of native vegetation. These include tax deductions and rebates, subsidies for tree planting and fencing, grants and rate concessions.

Commonwealth Government

Tax concessions have been allowed for works which aim to conserve vegetation. Section 75D of the *Income Tax Assessment Act 1936* (ITAA) provides primary producers and other businesses using rural land with a 100 per cent tax deduction in the year of expenditure for capital expenditure primarily for the purpose of combating or controlling land degradation. Relevant eligible works include pest and weed control, fencing out degraded areas and areas identified in an approved management plan, and tree and shrub establishment. Landholders are also able to claim a 20 per cent tax rebate on expenditure for prevention of land degradation under the ITAA (Young et al. 1996).

Donations of cash to approved NGOs are fully tax deductible. Donations of land with conservation value are also eligible deductions if the land has been owned for less than 12 months or if the land is of national cultural heritage significance and accepted by the National Trust (Young et al. 1996).

Programs such as Landcare, Save the Bush and One Billion Trees have provided a range of grants for the management of native vegetation. Save the Bush has operated a general grants scheme and provides special grants to State and Territory Governments to assist in developing and implementing remnant native vegetation strategies. One of the main strategies of the One Billion Trees program is provision of grants to community groups, local authorities and landholders to implement revegetation projects (HRSCERA 1992). The NVI draws on the strengths of Landcare to work cooperatively with communities, industries and governments to encourage sustainable management of native vegetation. Under the NVI, funding will be given to community based projects that integrate management of native vegetation with extensive revegetation.

State Governments

In a number of States, grants and subsidies are available from a variety of sources to fund activities related to management of native vegetation. For example, in the Australian Capital Territory, South Australia and Western Australia subsidies for fencing to protect native vegetation are available under ACT Decade of Landcare, Drought Landcare funds and the Remnant Vegetation Protection Program respectively. In New South Wales, South Australia and Victoria subsidies and grants for native vegetation management are available to landholders who enter management agreements. Grants and subsidies for management of native vegetation implemented by the States are summarised in table 4.2.

Local government

Some local governments provide incentives for the conservation of native vegetation, the most common of which is rate rebates. Legislation enabling councils to use this power varies between the States. The City of Greater Bendigo in Victoria has a rate rebate scheme to encourage revegetation of groundwater recharge areas on farm land. The scheme augments funds available from the Department of Natural Resources and Environment for dryland salinity control within the Lodden and Campaspe Salinity Management Plans. Rate rebates are also being considered within a number of other catchment management plans.

In Queensland, a number of local governments offer rate rebates or grants to landholders who enter conservation agreements for the protection of areas identified as having conservation value. The rebate may vary according to the area of land covered by a conservation agreement or the conservation value of the land. Some councils offer rate rebates to landholders who voluntarily rezone their property to conservation zones. Other incentives may also be available, such as exemption from environmental levies for protecting native vegetation on private land, or bonus development rights, where approval is given to develop the land where the significant habitat of the land parcel is covered by a management agreement. Free tree programs are also operated by some councils. See ALGA (1996) for a detailed discussion of rate rebates schemes operated by local governments.

Table 4.2 Grants and subsidies for management of native vegetation implemented by the States and Territories

State/Territory	*Grant/subsidy*	*Source of funds*
Australian Capital Territory	Funds for community groups for protection, assessment and maintenance of native vegetation for land care purposes	Community Vegetation Management Program
	Funds for vegetation management activities	ACT Decade of Landcare
New South Wales	Funds for landholders entering voluntary conservation agreements	NSW National Parks and Wildlife Service
	Funds for native vegetation management	Salt Action program
Queensland	Incentives and rate rebates for landholders entering Nature Refuges	Local governments
South Australia	Fencing remnant vegetation	Drought Landcare initiatives
	Rural tree grant	State Governments
	Grants for landholders who have entered Heritage Agreements	Native Vegetation Council
Victoria	Grants for revegetation and protection of remnant vegetation	Land Protection Incentives Scheme; State Salinity Program
	Funding for development of regional vegetation management plans	Save the Bush; MDBC Natural Resources Management Strategy; Tree Victoria
Western Australia	Fencing subsidy	Remnant Vegetation Protection Program
	Funding for remnant vegetation projects not funded from other sources	Gordon Reid Foundation for Conservation

Financial enforcement incentives

The main financial enforcement incentive used in the management of native vegetation is performance bonds, which have been introduced in Queensland and New South Wales to encourage mining companies to rehabilitate mined areas (James 1997). Performance bonds are used to cover in advance the cost

of rehabilitation, including revegetation, where commercial operators disturb the land or natural habitats.

In Queensland, reductions in the size of the bond for proven compliance with performance standards act as an inducement for mine operators to comply with the conditions of the scheme and improve their environmental management practices (James 1997).

Property rights and market creation

While no markets currently exist for land clearance, a range of mechanisms which place restrictions on property and user rights have been used to encourage landholders to retain native vegetation. These include user rights for leasehold land as well as conservation covenants and management agreements. While there are legal differences between the latter two mechanisms, they describe similar contractual arrangements.

Management agreements and conservation covenants contain elements of regulatory and suasive measures as well as economic instruments. While agreements and covenants are usually entered voluntarily, the terms and conditions under which a landholder manages their land can be specified in the agreement, thus altering property rights. Financial incentives can also be provided as part of an agreement. Agreements and covenants can be legally binding, and in this sense are similar to regulations. Suasive elements of agreements can include advice and information provided to landholders who enter agreements.

All State Governments have provisions for landholders to enter management agreements to protect native vegetation, although agreements differ between States. These differences are mainly defined by whether the agreement is contractually binding, whether it binds subsequent landholders, whether financial incentives are paid and whether the agreement is perpetual or for a fixed term. Contractually binding management agreements have not been as widely applied in Australia as voluntary management agreements. Voluntary agreements which offer financial incentives are not common because of the costs of funding such agreements (Young et al. 1996). Property right mechanisms for the retention of native vegetation implemented by State Governments are summarised in table 4.3.

Table 4.3 Property right mechanisms for the retention of native vegetation implemented by the States and Territories

State/Territory	*Mechanism*	*Binding*	*Financial incentives*
Australian Capital Territory	Property management agreements [a]	Y	N
New South Wales	Conservation agreements	Y	Y
Northern Territory	Management agreements	Y	Y
Queensland	Conservation agreements	Negotiable	Y [b]
South Australia	Heritage agreements	Y	Y
Tasmania	Management agreements, conservation covenants	Y	Y
Victoria	Management agreements	Y	Y
Western Australia	Management agreements [c]	Y [d]	Y

a An agreement must be negotiated between government and lessees of rural leasehold land. It is proposed that financial incentives will become available.
b Rate concessions from local government may be available.
c Landholders receiving financial incentives under the Remnant Vegetation Protection Scheme are required to enter a 30 year agreement to maintain remnants.
d A memorandum of understanding is signed which is registered with the Valuer General.

In Victoria, conservation covenants can also be voluntarily negotiated by landholders with Trust for Nature (Victoria), an independent body established under the *Victorian Conservation Trust Act 1972* to encourage and assist in the preservation of areas of ecological significance on privately owned land. The covenants are registered on the land title and bind all future landholders to observe the conservation management conditions of the covenant. A conservation management plan and monitoring program for each covenant are provided by the Trust. The Trust also administers a revolving fund to purchase, covenant and resell land of high conservation value (ANZECC Working Group on Nature Conservation on Private Land 1996).

A future strategy of Trust for Nature (Victoria) are Habitat Management Agreements. This will provide a series of nonbinding agreements which allows landholders to enter a conservation agreement at a level they are comfortable with and progress through a series of agreements which have increasing commitment and responsibility for conservation management until, ultimately, a covenant is negotiated.

In addition to the schemes presently in operation and summarised in table 4.3, a number of other property right mechanisms are currently being developed by State Governments. As mentioned earlier, the New South Wales Minister

for Land and Water Conservation has recently announced that existing controls on land clearing will largely be replaced by regional vegetation management plans which 'contain specifics on what clearing is allowed in the region, identifying which areas are ecologically sensitive as well as best practices for clearing' (NSW Minister for Land and Water Conservation 1997). Landholders who wish to undertake clearing not prescribed in a regional plan will be able to prepare a property agreement for vegetation management on their property. Landholders who enter into property agreements or place covenants over sensitive vegetation areas will be eligible for financial incentives for fencing or revegetation. It is envisaged that these agreements will bind landholders to abide by the terms of the agreements.

The Australian Capital Territory Government will shortly release a Nature Conservation Strategy which specifically addresses conservation of remnant vegetation on rural lands and explores concepts such as conservation covenants. Western Australia is also currently developing a nature conservation covenanting initiative.

Other economic instruments

Funds are available through the Murray-Darling Basin Commission's (MDBC) Integrated Catchment Management program to develop and implement plans which address natural resource problems in the Basin. A framework of cost-sharing for on-ground works facilitates development of a plan where works are to be one of the actions implemented. Funding for revegetation or protection of native vegetation can be obtained if these are among the actions to be implemented. The MDBC cost-sharing framework is discussed in more detail in section 4.2.

Lessons learnt and scope for further action

In this section, the outcomes of economic instruments used to encourage retention of native vegetation are discussed. Suggestions for further action required to progress the use of economic instruments in encouraging the retention of native vegetation are also made.

Charges and taxes

Environmental and catchment levies are simple instruments. When implementing a levy, it is important to consider who the beneficiaries of projects funded by the levy will be in determining whether the levy should be targeted at all rate payers or landholders or targeted more specifically at the project beneficiaries.

User fees for access to natural areas are usually set to cover maintenance of amenities and are insufficient to fund nature conservation. Entry fees to National Parks and nature reserves that do not reflect the full cost of providing tourism services can act as a disincentive for private providers to supply nature conservation amenities. Young et al. (1996) argue that entry fees should therefore reflect the full cost of providing visitor facilities and infrastructure. However, consideration should be given to administrative arrangements when designing user fees to ensure collection costs are minimised and a net contribution to management costs is made (The Treasury 1997).

User fees for access to natural areas can help preserve these resources by rationing their use, and therefore reducing congestion and resource degradation. Fees could also be varied in peak use periods to control visitation. While imposing higher user fees can have equity impacts on low income earners, they may assist in enhancing equity in the community (compared to general government revenue) by requiring those that use the resource more frequently to pay for their extra benefit and requiring overseas visitors to contribute (The Treasury 1997). Equity concerns could be addressed by granting concessions for low income earners. For more popular or sensitive sites, other mechanisms such as tradeable permits could also complement access fees to limit the number of visitors to an area in a way that would not depend on income.

Subsidies and tax concessions

Under the current land care tax provisions, benefits obtained are dependent on the individual farmer's marginal tax rate, even though the external benefits of retaining native vegetation are unlikely to be affected by the marginal tax rate.

In a survey of land care tax provisions, Mues, Moon and Grivas (1996) found that while one of the most common land care expenditures was for tree planting, expenditure per farmer was small and 50 per cent of farmers surveyed placed little or no importance on section 75D when deciding whether or not to establish trees and shrubs.

The current land care tax deductions only apply to capital expenditure for conservation. Without provision to cover maintenance costs, there is little incentive for landholders to ensure conservation is ongoing. Deductions for expenses incurred in maintaining capital works for conservation have been suggested as one solution (Thomson 1986).

Another criticism of tax based mechanisms is that the lag between expenditure and receiving tax benefits may have impacts on cash flow and thus act as an impediment to expenditure for conservation purposes (Douglas 1991). Tax

concessions also provide little scope to target particular problems or areas or vary the level of support according to the anticipated social benefits of the project. Furthermore, tax based mechanisms for encouraging conservation add further complexity to the tax law, with consequent increases in administration and compliance costs.

The main argument in favour of the current tax arrangements is that the infrastructure for administering the tax system is already in place and the concession can therefore be delivered relatively cheaply (Peterson 1995).

Young et al. (1996) suggest the list of eligible land care expenditure be expanded to include costs of habitat rehabilitation and tree planting off-farm, and that vegetation clearance costs using farmers' own equipment and labour be depreciated in a manner similar to other capital expenditures and not written off in the year of expenditure.

Donations of land to approved environmental organisations for conservation purposes are impeded by current tax arrangements, whereby such donations are only tax deductible if the land has been owned for a period of less than a year or is of national *cultural* heritage significance. Young et al. (1996) suggested extending the tax deductibility of land donated for conservation purposes to land of *natural* heritage significance, irrespective of purchase date, would remove this impediment. However, consideration needs to be given to valuation difficulties which may arise if this extension was granted. According to Young et al. (1996), the 20 per cent rebate which is available for the cost of approved work on heritage buildings and structures could also be extended to include approved work on the rehabilitation or protection of areas of natural significance.

In contrast to tax concessions, government grants and subsidies offer more scope to target particular problems and vary the level of support according to the anticipated social benefits of the project. Grants and subsidies can therefore be awarded more competitively according to the specific merits of the landholders and/or habitat. Mues and Collins (1993) argue that groups and non-landholders can also receive assistance, and assistance can be provided irrespective of the landholder's income. Government expenditure on grants and subsidies is also more transparent, and is more easily adjusted than tax based measures, since tax concessions could become open ended. However, administrative costs may be higher for grants and subsidies than tax concessions due to the need to set up administrative systems. The relative benefits of better targeting need to be weighed up against the administrative costs of grants and subsidies when determining whether such measures are likely to lead to an efficient outcome.

The main impediment to the greater use of local government rate concessions is the associated loss of revenue. This generally is not a problem where rebates are part of a land rezoning package, as any losses are offset by an increase in the number of landholders. In other areas, particularly with small populations and large holdings, loss of revenue may be a significant barrier to implementation of rate rebate schemes. It may be necessary to review local government funding arrangements to overcome this impediment.

Consideration should also be given in the design of rate concessions to the most appropriate basis on which concessions should be made. Concessions based on the area of land protected may not be appropriate when there is a range of conservation values in a local government area, as this may provide an incentive to protect areas of low conservation value if areas of high conservation value have a higher capacity to earn agricultural or other income. It may be more appropriate to base the concession on the conservation value of the land protected. Another option is for local governments to identify areas of conservation value and offer concessions for protection of those areas.

There are opportunities to make access to economic incentives such as grants and subsidies conditional on landholders entering a management agreement to provide ongoing management and protection of native vegetation. This is similar to what has been proposed in the regional vegetation management plans recently announced in New South Wales. Landholders who wish to access financial incentives for fencing or revegetation available under the scheme will be required to develop a property agreement for management of native vegetation on their property or place covenants over sensitive vegetation areas.

Financial enforcement incentives

Performance bonds have been used in mine site rehabilitation, and can take two forms — those involving an up front or progressive payment and those involving financial guarantees. In case of periodic contributions to a reserve account, there is a risk that the mine may close prematurely or the mining company may fail before sufficient funds have been accumulated in a reserve to carry out the required rehabilitation. Furthermore, specification of a particular type of performance bond such as an up front fee may act as a barrier to entry to some companies. This could be overcome by allowing companies flexibility in the kind of performance bond used (Barnes, Cox and Roarty 1991).

Determination of the appropriate size of the performance bond can also be a problem. Drawing up a rehabilitation plan before mining begins should assist

in estimation of the likely costs of rehabilitation. The Industry Commission suggested that using the most probable value of rehabilitation costs is inadequate because it ignores the possibility of catastrophic outcomes (IC 1991b). Barnes, Cox and Roarty (1991) suggest such catastrophic outcomes should be treated as a separate issue and that insurance could be taken out against such outcomes.

Performance bonds may also play a role in ensuring that optimal decisions regarding the clearance of native vegetation are made in other areas where retention of native vegetation is competing with other land uses. For example, performance bonds may have the potential to be used in tourism or urban developments, logging of public forests by private contractors and public lands leased for agricultural use.

Property rights and market creation

Management agreements and conservation covenants have been in place in several States for a number of years. Uptake of these measures has, however, been slow, indicating that impediments exist. Complex capital gains tax considerations could be triggered by creation of a conservation covenant. A capital gains tax exemption was suggested as a possible solution to this problem (Young et al. 1996).

The binding nature of agreements entered in perpetuity can limit acceptance by landholders, although such agreements do secure conservation objectives without the need for renegotiation. Fixed term agreements may be more attractive to landholders, but do need to be renegotiated and can give the landholder an opportunity to hold an environmental asset 'to ransom'. A requirement for the landholder to pay back money received when a new agreement can not be negotiated can circumvent this problem (Young et al. 1996). As discussed earlier, Trust for Nature (Victoria) is considering implementing a series of management agreements of increasing commitment and responsibility called Habitat Management Agreements. This may be a useful model for other States to use to address landholder reluctance to enter binding agreements.

One problem that may be associated with management agreements is ongoing management of vegetation. While agreements which offer financial incentives but do not alter property rights may be very successful in achieving landholder participation, appropriate management can not be enforced as future land use has not been restricted (Binning and Young 1997).

In some States, plans for management of vegetation have not been included in management agreements. While processes such as clearing or grazing are controlled, the issue of managing the vegetation on an ongoing basis is not

addressed (Binning and Young 1997). Inclusion of plans for management in agreements would overcome this problem.

Management by public agencies of areas protected under management agreements or payment of compensation to landholders entering agreements can result in a lack of stewardship of the protected area by the landholder. Landholders may not manage the area covered by the agreement on an ongoing basis due to perceptions that they no longer 'own' the area or it is not their responsibility (Binning and Young 1997).

Another problem that could be associated with management agreements is that if landholders were relied on to nominate areas for conservation, factors other than the conservation value of the land, such as agricultural productivity, are likely to influence their decision. This could be overcome by adopting a strategic approach to areas to be conserved such as that proposed by Young (1995). Such a scheme would use a tender system and land for inclusion in the scheme would be selected according to biological value, the price offered in the tender and the nature of land already in the public reserve system. This could provide a useful means to build conservation zones around key areas and habitat corridors between areas of biological significance. Although the transaction costs of such a scheme may be greater than one which relied upon landholders to nominate areas for conservation, the benefits from improved targeting of areas for conservation may outweigh these costs.

While management agreements have the advantage of being flexible, cooperative, nonintrusive (where voluntary) and easily targeted, an obvious limitation is their potentially high administrative cost.

A number of property right instruments have been proposed which may warrant further investigation as possible means to encourage optimal clearance of native vegetation. These include environmental contracts, transferable development rights and habitat preservation credits.

Binning and Young (1997) describe a range of potential models for management agreements, including:

- General Agreements to further promote voluntary conservation on private land;
- Transition Agreements to speed the transition resulting from legislative and policy change; and
- Stewardship Agreements in protected areas to assist in meeting the objectives of the National Reserve System.

A system of environmental contracts with landholders is proposed by Hodge (1991). Environmental contracts are similar to management agreements

but more flexible in prohibiting changes which detract from the environmental value of the land and in identifying potential benefits for whose provision the landholder would receive benefits.

A system of transferable rights to cleared land has also been proposed by Hodge (1982), whereby landholders occupying the most productive land would be prepared to bid for the right to clear land, ensuring less valuable land is taken out of production. When poor land had already been cleared, the landholder would have an incentive to revegetate and sell his allocation of rights to those on more productive land. Transferable development rights have been used in the United States, and operate in conjunction with zoning restrictions so that landholders who own high value habitat are able to trade development rights with landholders in zones of lower conservation value (Young et al. 1996).

A market for habitat preservation credits (HPCs) has been suggested by Merrifield (1996) as a means of making habitat a valuable, competing land use. HPCs are formally established by a management agreement to maintain existing or new habitat. Landholders would be required to buy a HPC for each hectare they wanted to alter so that it no longer met the definition of habitat. The right conferred by HPCs can only be exercised once. Environmental groups could purchase HPCs to increase the total area of preserved habitat.

Care would need to be taken when designing a system of tradeable permits to cleared land to ensure that rights to clear areas of high conservation value are not traded for rights to clear areas of low conservation value, resulting in suboptimal land clearance. It may be appropriate to target areas of high conservation value with measures that allow a greater degree of targeting such as tradeable permits and conservation covenants, and areas of lower conservation value with more broad based measures such as tax concessions and subsidies.

Removal of perverse incentives

A number of policies provide incentives that unintentionally result in clearance of native vegetation in some situations. These include tax concessions, land tax, drought and land tenure policies. Governments should be aware of the possible perverse incentives of new policies, and should try to remove existing perverse incentives. It is generally more appropriate to remove the underlying cause of the perverse incentive, rather than attempt to correct the perverse incentive by adding further distortions which may have other unintended consequences. However, care is needed when removing perverse incentives as opposition from those affected by the removal of the

incentive can be created. There may be a case for transitional arrangements to maintain equity, gain acceptance of the need to remove perverse incentives and maintain a positive community attitude (Young et al. 1996).

Tax concessions

While tax concessions for clearing land have been abolished, the costs of clearing land using landholders own equipment and labour can still be claimed as a tax deductable operating expense. This may result in suboptimal decisions relating to clearance of native vegetation by reducing the private costs of land clearance.

It has also been suggested that the availability of tax concessions for expenditure to address land degradation may increase the future supply of degraded land by lowering the private costs of rehabilitation (Edwards, Dumsday and Chisholm 1996). Thus, landholders may be encouraged to clear native vegetation because the private costs of revegetation and addressing land degradation resulting from clearing are lowered by the availability of tax concessions.

Furthermore, the use of low nominal values for livestock inventories, while lowering graziers' tax liabilities in normal years, can result in large tax liabilities when stock numbers are reduced at the onset of a drought. This provides a disincentive to reduce stock numbers, even though it may be economically and environmentally sensible to do so. Retention of stock may cause degradation of land and vegetation through overgrazing. Moving toward market based valuations of livestock inventories is one possible means of overcoming this problem (Edwards, Dumsday and Chisholm 1996).

Land tax

Annual land taxes imposed by the States are assessed in some States on the unimproved value of the land. Land that has been cleared and developed is therefore assessed at the same rate as land that retains original vegetation cover (Young et al. 1996). According to Rosen (1995), most States also provide land tax exemptions for land used for primary production, but this exemption may no longer apply if land is taken out of production for conservation purposes. Furthermore, while land tax and stamp duty exemptions on the purchase of property are sometimes available for charitable organisations, such exemptions for land acquired for conservation purposes by nonprofit organisations can be more difficult to achieve. These factors reduce the effectiveness of conservation initiatives aimed at retention of native vegetation.

Drought policy

In the past, protection of natural resources has not been a specific objective in drought policy, with drought assistance measures aimed at retaining certain resources such as livestock and providing income support. Assistance measures in the form of fodder subsidies and low interest loans can encourage practices such as high stocking rates, which may lead to degradation of native vegetation, by reducing the private costs of feeding stock during droughts (Freebairn 1983). However, changes made in 1992 to drought policy at State and Commonwealth levels aim to encourage farmers to adopt more self reliant approaches to managing for climatic variability and to maintain and protect agricultural and environmental resources during periods of extreme climatic stress (Crean 1992). This should reduce threats to native vegetation during drought to some extent. However, it has been suggested that bringing drought under the 'exceptional circumstances' provision of the Rural Adjustment Scheme (which makes interest rate subsidies of up to 100 per cent available when exceptional circumstances are declared) encourages higher risk approaches to stocking and borrowing (Edwards, Dumsday and Chisholm 1996). This may have adverse impacts on native vegetation.

Land tenure

Although leasehold tenure provides opportunities for government to exert control over land management, there are also potential problems associated with leasehold land which can have negative implications for native vegetation. These include uncertainty of lease renewal and lack of full compensation for improvements upon lease termination (Edwards, Dumsday and Chisholm 1996). These problems can work against land management practices which conserve native vegetation. The South Australian Government has attempted to remove the perverse incentives provided by lease arrangements by introducing 42 year leases which have provisions for an extension of 14 years to take place every 14 years. The extension is granted subject to the leaseholder demonstrating ecologically sustainable land management. Lease conditions can be changed at each extension by the Government on the basis of a review and monitoring of the vegetation on the property (Young et al. 1996).

4.2 Case study 2: Dryland salinity

Dryland salinity appears as either salt scalds or saline seepage — both are the result of changes in land use, namely the removal of vegetation (see box 4.2). Salt scalds result from excessive loss of vegetative cover and erosion of

topsoil leading to exposure of saline subsoils which are relatively impermeable to water. Scalds are caused or made worse by harmful land management practices, such as overgrazing, which expose the soil surface (LWRRDC 1995 and Poulter and Chaffer 1991).

Saline seepage is caused by the removal of deep rooted native vegetation and its replacement with shallow rooted annual pastures and crops which use less water. This land practice results in increased infiltration of water to the groundwater causing the watertable to rise. When the watertable reaches a certain height, capillary rise and evaporation draws the groundwater to the surface bringing with it dissolved salts (LWRRDC 1995 and Poulter and Chaffer 1991).

As dryland salinity involves complex hydrogeological processes that affect soil and groundwater movements it may be many years after vegetation has been removed before any evidence of salinity becomes apparent (Watson, Morrisey and Hall 1997).

Salt scalds are generally a localised, on-farm problem, and policies to address them should be directed towards encouraging on-farm solutions. In these cases, if farmers have adequate information regarding the problem of salt scalds, the economically efficient solution is to let individual landholders make their own decisions about land use based on accurate values of the costs and benefits involved. However, it is likely that there is a lack of information available to landholders on the effects of land management practices to control scalding. Government funded research, development and information extension activities, can help address this information deficiency.

Although generally an on-farm problem, like many environmental problems salt scalds may have offsite effects, such as sedimentation in areas removed from the problem as a result of erosion of the exposed salty soils. Offsite effects are particularly likely to occur when the problem reaches a severe stage. However, these externalities are likely to be relatively minor compared to the onsite costs and it is likely to be the case that with adequate information landholders will make the private decision to tackle the problem before it gets to the stage where offsite effects are a significant problem. Nevertheless, where externalities do exist, there is a case for government intervention so long as it involves a net economic benefit.

Box 4.2 Dryland salinity: A brief description of the problem

Dryland salinity occurs predominantly in Western Australia, New South Wales and Victoria, and to a lesser extent in South Australia and Queensland. Estimates of the extent of dryland salinity in Australia are poor, but improving. In 1982, the

Working Party on Dryland Salting in Australia estimated that there were 4.2 million hectares of land affected by induced salting. Of this, 3.8 million hectares were affected by salt scalds and 426 000 hectares were identified as being affected by seepage salting. By 1988, the area estimated to be affected by seepage salting in Australia had grown to 639 000 hectares, and to 1.2 million hectares by 1992. The increase in these estimates is likely to be due in most part to more intensive surveys and improvements in recognising the occurrence of salinity. A further 1.6 million hectares of land are currently considered to be at risk of seepage salting (LWRRDC 1995).

Loss of agricultural production is one of the main effects of dryland salinity. However, financial estimates of these losses vary considerably. The MDBC has estimated that about $250 million per year is lost in agricultural production as a result of dryland salinity. Other consequences include soil erosion, damage to buildings and roads from rising saline groundwater levels and harmful effects arising from increased salt released into rivers and streams, such as reduced water quality and a greater incidence of rusting of metal pipes and machinery. The full cost of dryland salinity is not known, but is conceivably in the billions of dollars (LWRRDC 1995).

The problem of saline seepage is, on the other hand, a complex, nonpoint source problem. Although research, development and information extension with respect to saline seepage may address the market failure relating to information deficiency it will not address the market failure of the externalities associated with land use. This occurs when land clearance in 'recharge areas' causes salt to appear in 'discharge areas' further away. Therefore, addressing the problem of saline seepage may require different policies.

Dryland salinity problems arising from saline seepage vary between regions as a result of different landscape characteristics, such as land slope, the degree of clearing, soil type and the type of agriculture. As a result, the way salinity affects each area and possible methods of dealing with the problem may differ. Therefore, local or catchment solutions are likely to be the best means of dealing with the problem (Poulter and Chaffer 1991).

Action to date

Action to date has generally been aimed at the more serious problem of saline seepage as opposed to salt scalds, and has mainly involved the use of suasive measures such as research and development, information extension and education. The development of these suasive measures has generally occurred

at the Commonwealth and State Government levels and their implementation has involved all levels of government. Regulations have been used in some States, mainly to reduce land clearing. Whilst suasive and regulatory measures have been applied, there has been little use of economic instruments to address dryland salinity. Where economic instruments have been used they have generally been in the form of subsidies/grants, tax concessions or rate rebates designed to reduce land clearing and encourage revegetation.

Suasive measures

Suasive measures have formed a substantial and important part of Commonwealth, State and local government strategies to address dryland salinity in Australia. Currently, most suasive measures at catchment, State and Commonwealth levels are conducted as part of the National Dryland Salinity Research, Development and Extension Program (NDSP) or provide information to this program. The NDSP was established to bring together Commonwealth, State and local bodies to coordinate dryland salinity research, development and information extension efforts. These bodies include the Land and Water Resources Research and Development Corporation, MDBC, National Landcare Program (NLP), Commonwealth Scientific and Industrial Research Organisation, the State Governments of New South Wales, Queensland, South Australia, Victoria and Western Australia and some local groups. Most States affected by dryland salinity also have their own strategies for addressing the problem which substantially involve suasive measures.

The goal of the NDSP is to generate integrated techniques and approaches for the optimal management of dryland salinity in Australia. To avoid previous problems of fragmentation and lack of coordination of research and development effort, the NDSP is concentrating its efforts in five 'focus catchments' — one in each of the participating States selected by the relevant State Government. A comprehensive picture is being drawn of the salinity problem and management in these catchments. This knowledge and the approaches developed will be applied to other catchments around Australia. Project work is being undertaken in three subprograms. The mapping and monitoring subprogram aims to refine cost effective methods for determining the current extent of the dryland salinity problem and identifying land at risk of salinisation. The aim of the social and economic assessment subprogram is to identify and quantify the full range of effects of dryland salinity, including nonmarket valued benefits and costs, identify social, economic and environmental impediments to the adoption of new policies and programs and develop strategies to overcome these impediments. Projects in the soil/water/plant interactions subprogram involve investigating native perennial grasses for productive sustainable pastures, evaluating different

measurement and modelling techniques for comparing before and after engineering solutions such as drainage, and integrated catchment scale modelling.

Regulation

The primary responsibility for implementing environmental regulation lies with the States. The Commonwealth's role is limited to addressing issues of national importance. Regulations relating to land clearing have been implemented by most States affected by dryland salinity. The notable exception is Queensland, where the main problem is salt scalds from overgrazing and not saline seepage from tree clearing.

The ability of local governments to implement regulation is limited — most of their efforts come from their control over land zoning and approving development.

Economic instruments

At the national level, initiatives such as One Billion Trees, Save the Bush and the NLP have provided incentives for vegetation retention and revegetation, mainly in the form of grants. These are not specifically aimed at managing dryland salinity but a number of land degradation problems. Commonwealth Government tax concessions are available to individuals who implement works to control land degradation.

A number of States also have grants schemes for revegetation activities, or provide incentives for tree planting by providing free trees. Most States utilise management and conservation agreements to conserve native vegetation.

Some local governments provide economic incentives in the form of environmental levies and rate rebates, for individuals who undertake activities such as fencing remnant vegetation or planting trees.

Due to the nonpoint source nature of the problem of dryland salinity and the difficulties and expense of trying to monitor salinity flows, tradeable permits schemes have not been developed specifically to address the problem of dryland salinity. However, a tradeable salt credits scheme is part of the MDBC's Salinity and Drainage Strategy designed to reduce river salinity in the Murray-Darling river system, which mainly involves salinity caused by irrigation. This Strategy is the result of an agreement between the governments of New South Wales, Victoria, South Australia and the Commonwealth, and is managed by the MDBC (DWR 1992).

The Salinity and Drainage Strategy could be described as keeping a 'salinity bank account' for each of the three States as it involves maintaining a ledger

of salinity credits and debits for each State. States undertaking activities which cause an increase in salinity receive a debit, whereas salinity improvements lead to the granting of credits (DWR 1992). So far, the States are on track to achieving the desired reductions in salinity. See box 4.3 for details of the scheme.

Box 4.3 Salinity and Drainage Strategy

The Salinity and Drainage Strategy, managed by the MDBC, aims to improve salinity levels in the Murray-Darling river system and allow vital drainage and land management schemes to be carried out within the Murray-Darling Basin. The scheme involves keeping a ledger of salinity credits and debits for each of the participating States — New South Wales, Victoria and South Australia.

Salinity impacts are measured at Morgan in South Australia. Changes of 0.1 EC (Electrical Conductivity units) or higher attract a debit and are registered in the salinity bank account. It is intended that a salinity improvement of over 110 EC will be achieved — over 80 EC credits through a series of groundwater interception schemes, and over 30 EC credits from changes to the operation of Menindee Lakes and Lake Victoria. New South Wales and Victoria will gain 15 salinity credits each for contributing towards the costs of construction and subsequent maintenance of the groundwater interception schemes. In turn these will offset debits arising from river salinity increases caused by proposed drainage works and increased water usage. This arrangement will partially negate salinity improvements at Morgan leaving a net benefit of 80 EC — approximately 10 per cent of the total level of salinity in the river at that point.

To date, the States are on track to achieving the desired reductions in salinity. They have been granted proportional salinity credits from their total bonus allocation of 15 according to their contribution to date to the level of reduction in salinity.

Source: DWR (1992)

To date the Salinity and Drainage Strategy has only been implemented in irrigation areas, and consequently the main form of salinity it addresses is irrigation salinity, although dryland salinity can also have an impact on river salinity. However, it is intended in the future to extend the salt credits scheme to encompass dryland areas.

In addition to the application of the above economic instruments, economic principles have been adopted in some areas of dryland salinity management. A variety of economic methods, such as cost benefit analysis, optimisation models, regression analysis and simulation models, has been used to assess different management options for dealing with the problem. However, there

exist several deficiencies and constraints connected with these methods, which are outlined in Webb and Price (1994). They relate mainly to:

- lack of data on costs, impacts, rates of salinisation and hydrogeological processes;
- lack of information on factors influencing adoption of management options and client economic information needs;
- poor linkages between strategies to address related environmental problems;
- insufficient emphasis on conflict resolution and tradeoffs; and
- lack of monitoring of programs and policy.

Some of the above, particularly the data and information deficiencies, are being addressed through the NDSP.

Polluter pays and beneficiary pays principles have been used by the MDBC in developing a cost-sharing framework for on-ground works to address a variety of land degradation problems including dryland salinity. The cost-sharing framework determines cost shares between those who will benefit from chosen management options as part of integrated catchment management plans.

The MDBC's cost-sharing framework was developed to improve the uptake and effectiveness of on-ground works to address land degradation problems, including dryland salinity. The framework is linked to the implementation of integrated catchment management plans. If a community preparing an integrated catchment management plan has decided that on-ground works are to be a priority action in the plan, the cost-sharing framework can be used to assess the benefits and costs of the various types of works being considered, and to then identify the levels of public and private benefits on which to base cost-sharing negotiations. In the Goulburn-Broken Dryland Salinity Management Plan, which between 1990 to 1994 established 1224 hectares of trees, 3504 hectares of perennial pastures and reclaimed 402 hectares of salted land, landholders contributed between 25 per cent and 75 per cent of the establishment costs with governments providing the balance, mainly through the MDBC (MDBC 1996a).

The principle used in allocating costs to stakeholders is generally the beneficiary pays principle, whereby anyone who receives a benefit from implementation of on-ground works should contribute to the cost of those works. This is because the externalities associated with many land degradation problems, such as dryland salinity, and the problems with identifying polluters make it difficult or impossible to apply the polluter pays principle. However, where the polluter pays principle can be applied it should be used. For

example, in the Goulburn-Broken catchment polluter pays principles were applied to irrigation salinity problems but historical problems, where the cause and effect are temporally separated, were managed with user pays principles (MDBC 1996b).

However, a number of other issues related to the MDBC's cost-sharing arrangements may need to be explored further, for example the provision of assistance for individual farmers for on-ground works.

Lessons learnt and scope for further action

There still exists a lack of information concerning dryland salinity. For example, data are required on:

- the extent and potential magnitude of the problems of salt scalds and saline seepage at a disaggregated regional level;
- the precise effects of vegetation clearance, revegetation and farm management practices in different areas on watertable levels and the appearance of salt scalds;
- the time lags between vegetation clearance and the appearance of dryland salinity;
- the specific costs and benefits of dryland salinity and those of abatement; and
- technology to measure and monitor salt discharges from point sources.

The lack of information concerning dryland salinity has three effects. First, it means that landholders are not making optimal private decisions regarding their land management practices. This is particularly relevant to the localised problem of salt scalds, where it could be argued that if landholders have adequate information the economically efficient solution is to let individuals make their own decisions about land use.

Secondly, where externalities exist, lack of information may distort the estimations of the costs and benefits of government intervention to address the externality. Thirdly, where it is deemed necessary for government to intervene, lack of information may distort comparisons between economic instruments and other measures such as regulation and may constrain the use of some economic instruments. For example, currently no output based economic instruments are being used as a result of the current inability to cost effectively measure and monitor salt discharges. The existence of these two types of information related problems provides a strong case for government intervention in the form of public research, development and information extension activities with respect to dryland salinity need to continue.

Furthermore, dryland salinity is a national problem requiring commitment from all levels of government.

Where economic instruments are being considered to address the saline seepage externality problem, either output based or input based economic instruments may be used. Output based economic instruments focus on outputs, which in the case of saline seepage is the salt produced. These measures involve determining the socially optimal level of salt discharge and allowing individual polluters to meet that level in the most cost effective way. As mentioned above, current levels of technology and information do not permit cost effective use of output based measures at present. However, if it is desired to address the problem of dryland salinity efficiently then such measures need to be pursued. Theoretically, the most efficient output based instrument would be a tradeable salt permit scheme for dryland salinity, as this would allow polluters who can reduce their discharge more efficiently to do so ahead of those for whom it is more difficult and/or more expensive. Therefore, the initiative of the MDBC to review the irrigation area salt credits scheme (under the Salinity and Drainage Strategy) and consider the possibility of extending the scheme to dryland areas is a step in the right direction. How such a scheme would operate is an area requiring considerable further work.

Until output based measures are a viable option, input based economic instruments and those focusing on ameliorative methods could be pursued. Input based instruments focus on the cause of the problem. Current examples include penalties for land clearing and tax concessions, rate rebates and subsidies for tree planting. These instruments may help contain the current problem from worsening as well as reducing the potential for future salinity problems to arise. However, in general these instruments are not directly aimed at addressing dryland salinity. As a result they are unlikely to be as effective as instruments that focus on the problem and involve distinguishing between activities on recharge areas and those on discharge areas. More general shortcomings of some of these instruments were discussed in the previous section. There is scope for a system of transferable rights for tree clearing (see section 4.1) to be introduced to reduce the occurrence of dryland salinity in the future. Such a scheme would also address other land degradation problems arising from land clearance.

Practical methods used to ameliorate the existing problem include engineering works, such as groundwater pumping, and improved land management practices, such as reduced cropping, which are mainly encouraged through provision of information and cost-sharing frameworks. There is potential for penalty instruments, such as charges, or reward instruments, such as subsidies,

to be used to complement these measures and improve the uptake of ameliorative methods.

Whether it is more appropriate to use measures focusing on the cause of the problem or measures to encourage ameliorative methods, or a mixture of both, will vary case by case. For example, a recent study by Greiner and Hall (1997) into dryland salinity in the Liverpool Plains Catchment in New South Wales concluded that the main changes would be to stop cropping on the Liverpool Range and to plant increasing areas of lucerne and saltbush, with some trees, on the dryland plains. The study stated it would not be cost effective to plant trees on the Liverpool Range to reduce groundwater accessions due to the scale of planting required and the opportunity cost of reducing grazing on the Range. Therefore, it appears necessary that analyses of the dryland salinity problem and appropriate responses take place at local or catchment levels. However, it is also necessary to be aware that externalities may extend beyond catchment boundaries and may not be fully incorporated in catchment level measures. In these cases there may be a need for measures which are applied at a broader scale than at the catchment level.

5 EXTENDING THE USE OF ECONOMIC INSTRUMENTS

In this chapter, the application of economic instruments to address some of the key environmental problems facing Australia is summarised, and opportunities to extend the use of economic instruments discussed.

Five aspects of the environment are considered, consistent with the approach taken in *Australia – State of the Environment 1996* (SEAC 1996). These are the atmosphere, inland waters, the coastal environment and the sea, land resources and biodiversity. Within each of these areas, a selection of key environmental problems is discussed, based on the potential for economic instruments to be either introduced, expanded or modified to help address the particular environmental problem. However, the absence of discussion of an environmental problem does not indicate that economic instruments have no role in addressing the problem either now or some time in the future.

5.1 Atmosphere

Four of the key environmental problems in Australia associated with the atmosphere are summarised in table 5.1, and discussed below. The first two problems extend beyond Australia and are 'global' in coverage while the other two are more 'local' in nature.

Enhanced greenhouse effect and stratospheric ozone loss

At a global level, the enhanced greenhouse effect and stratospheric ozone loss stand out as two key atmospheric problems. The enhanced greenhouse effect is caused by an increase in emissions of naturally occurring greenhouse gases (GHGs) from human activities such as the burning of fossil fuels. This is predicted to lead to global warming (a warming at the earth's surface) as a result of a change in the radiation of the atmosphere. Stratospheric ozone loss is the depletion of the ozone layer primarily believed to be caused by the release of chlorofluorocarbons (CFCs) into the atmosphere. The two problems will be discussed in turn.

Table 5.1 Environmental problems associated with the atmosphere

Problem	*Description*	*Responses involving economic instruments*
Enhanced greenhouse effect	The increase in emissions of naturally occurring greenhouse gases, from human activities such as the burning of fossil fuels, which leads to global warming.	None used.
Stratospheric ozone loss	Depletion of the ozone layer primarily believed to be caused by the presence of CFCs.	Product charge.
Photochemical smog	Air pollution caused by chemical reactions among various substances and pollutants in the atmosphere in the presence of sunlight.	None used.
Excessive airborne lead levels	Airborne lead levels in Australia's urban areas arising primarily from leaded fuel used in motor vehicles.	Differential tax on unleaded and leaded petrol.

Sources: James (1997) and SEAC (1996)

Given current uncertainty over the economic and ecological implications of the enhanced greenhouse effect, industrialised countries including Australia have adopted an initial goal of returning their GHG emissions to 1990 levels by the year 2000. Australia's current greenhouse policy response is embodied in two major strategies: the *National Greenhouse Response Strategy* and *Greenhouse 21C*. Measures contained in these strategies emphasise 'no regrets' abatement action. No regrets measures are defined as those that, in addition to addressing the enhanced greenhouse effect, result in net benefits to industries or firms (or at least no net costs). A more intuitive interpretation of no regrets measures could be that they are actions which would still be considered worthwhile even in the absence of concerns about the potential adverse impact of global warming.

It is likely that the current greenhouse response measures and actions based on no regrets policies will be insufficient for Australia to meet the existing international targets implied in the United Nations Framework Convention on Climate Change, or any strengthened commitments (ICESD 1997).

There are several groups of instruments available to policy makers to address greenhouse concerns, including environmental taxes, subsidies and tradeable

emissions permits. These instruments may be applied to all GHGs or to one or more, such as carbon dioxide which is the most abundant of GHGs. Two measures that have received attention in recent years are carbon taxes and tradeable emissions permits.

A carbon tax is a levy on the carbon content of fuels which, when burned, release carbon dioxide. Such a tax would encourage energy producers to improve energy efficiency or substitute towards less polluting fuels.

A tradeable emissions permits scheme for GHGs would mean that polluters wishing to emit these gases would need to either possess the required number of emissions permits or achieve the necessary pollution abatement. The total number of permits on issue would reflect the desired overall level of GHG emissions for a given period. Both national and global tradeable permits regimes have been suggested for controlling GHG emissions.

A tradeable emissions permits scheme is considered to be more desirable than a carbon tax for a number of reasons. Tradeable permits schemes are potentially more cost effective than carbon taxes because the emissions abatement effort could be extended to include participants other than the energy producing and consuming sectors. Tradeable permits schemes may also allow nonpolluters to participate and purchase permits in order to reduce the total level of emissions. Furthermore, carbon taxes would need to be revised over time in response to changes in technology, incomes and public attitudes and preferences, and any error in estimating tax rates could have significant economic and environmental ramifications. Finally, given the international pressure in meeting GHG emissions reductions, the transparency of compliance associated with a tradeable permits scheme is a desirable attribute (IC 1997a).

There has been significant action to address stratospheric ozone loss in Australia. Under the Ozone Protection Strategy, approved by the Australian and New Zealand Environment and Conservation Council in 1989, the Commonwealth Government has introduced stringent regulation (in the form of licences, substance quotas and end use bans on equipment) to phase out the use of ozone depleting substances, and a product charge on products that use ozone depleting substances. So far, the approach appears to have been successful in phasing out the use of CFCs and is on target to phase out hydrochlorofluorocarbons. No further initiatives are expected to be needed.

Urban air quality concerns: photochemical smog and excessive airborne lead levels

When emissions of oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) react in the presence of sunlight they produce what is commonly known as photochemical smog — a low lying, perceptible area of polluted air. Motor vehicles are the main source of NO_x in urban airsheds and are responsible for around half the VOCs emitted (SEAC 1996). To date, smog levels in Australian cities have only occasionally exceeded National Health and Medical Research Council guidelines (SEAC 1996). However, if stricter guidelines were applied, as is happening in some parts of the world such as the United States and Japan, considerably more breaches would occur.

Motor vehicles are also the primary source of airborne lead in urban airsheds (NSW EPA 1994a). Air quality in urban areas with respect to lead levels has improved in recent years, primarily because of the introduction of stricter lead emissions standards on new vehicles and the simultaneous introduction of unleaded petrol (SEAC 1996).

As the population of Australia's urban areas increases and city limits extend, motor vehicle usage, and consequently total emissions of NO_x, VOCs and airborne lead, are likely to increase. Urban planning which better matches population centres to work opportunities (to reduce travel distances) and initiatives to increase patronage of public transport will go some way to limiting growth in motor vehicle emissions, as may technical advances and increased use of cleaner fuels (BTCE 1996). However, there is potential for these activities to be complemented by the use of economic instruments to limit emissions growth.

Differential taxes on motor vehicles, based on the rate of emission of pollutants, could be used to influence consumer preference towards vehicles that are more environmentally friendly. Road use charges could be used as a variable pricing mechanism based on how often and when the road network is used (NSW EPA 1994b). Such a system would most likely operate using electronic sensing technologies to track road use and target the vehicles and users that cause congestion. However, implementation would require substantial investment in a network of road based sensors and on–board recording devices.

A tradeable emissions permits scheme for NO_x and VOCs could be applied to vehicle manufacturers to achieve emissions reductions. Such a scheme would essentially involve vehicle manufacturers having to reduce the weighted average of emissions rates across all vehicle models they sell, rather than reducing emissions rates of all vehicles at a uniform rate. This would allow manufacturers flexibility in achieving vehicle emissions reductions. As well

as trading emissions reductions between their own vehicle models, there is scope for such a scheme to allow manufacturers to trade required reductions in emissions rates with other manufacturers.

A 'cash for clunkers' scheme also has potential to reduce vehicle emissions. Such a scheme involves organisations purchasing and retiring vehicles with high emissions rates, for which they receive emissions credits. Credits can then be sold to polluting firms or used to meet their own emissions reduction requirements. A study undertaken by the Bureau of Transport and Communications Economics (BTCE 1996) of the cost effectiveness of a cash for clunkers scheme, involving the purchase of vehicles by government to reduce GHG emissions in the transport sector, rates such a scheme as a relatively cheap way to reduce emission compared to other measures considered.

5.2 Inland Waters

Inland waters include all water inland of estuaries, both in surface features like streams, lakes, wetlands and reservoirs, and in the subsurface as groundwater. Monitoring indicates that in some areas, inland waters and surrounding habitats are being adversely affected both directly by discharge of pollutants into waterways and indirectly from land based activities such as tree clearing and cropping which can result in increased salinity levels on land and in waterways (SEAC 1996). Three of the more significant environmental problems affecting Australia's inland waters, and current responses involving economic instruments to address these problems, are outlined in table 5.2, and discussed below. The first two relate to problems of water quality, while the third is a problem of overuse of water.

Salinity of inland waterways

Salinity occurs naturally in many of Australia's inland waters. However, various activities are causing additional salt to enter waterways, adversely affecting the environmental health of waterways and limiting options for the productive use of water from these sources. These activities include: vegetation clearance and farming practices, resulting in dryland salinity which may be carried into waterways; irrigation, which causes watertables to rise and mobilise salts in subsoils which may then flow into waterways; and saline water discharges from point sources such as mines and electricity generating power stations. Responses to the problem of excessive salinity of inland waterways in Australia need to address all three main sources of the problem.

Table 5.2 Environmental problems associated with inland waters

Problem	*Description*	*Responses involving economic instruments*
Water quality problem - salinity of inland waterways	Salinisation of land has increased the salinity of streams and rivers, reducing their suitability for human or domestic stock use. Salinity of waterways also occurs through discharges from coal mines and power stations etc.	Hunter River Salinity Trading Scheme; MDBC's Salinity and Drainage Strategy salt credits trading scheme.
Water quality problem - nutrient enrichment	Excess nutrients (especially phosphorus and nitrogen) arise from eroded soils, fertiliser use, septic tanks, discharges from sewage treatment plants and animal wastes. Problems include algal blooms, loss of biodiversity and increasing risks to human and animal health from toxins.	Bubble license scheme in the Hawkesbury-Nepean river system.
Overuse of inland water (excluding groundwater)	Increase in the demand for water use has placed considerable pressure on waterways and their surrounding environments, particularly in the Murray-Darling Basin and parts of the eastern seaboard.	Water pricing; tradeable water entitlements.

Sources: SEAC (1996), James (1997) and NSW EPA (1995)

Measures to date to address the problem of dryland salinity are discussed in chapter 4. However, these measures have not had a significant impact on dryland salinity and thus on the contribution to water salinity from this source. Therefore, there is scope for extending the use of economic instruments to address dryland salinity.

As dryland salinity is generally a nonpoint source problem for which it is hard to measure individual contributions to increased salinity levels, it is not possible to implement economic instruments focusing on salt outputs at this stage given current levels of information and technology. Therefore, measures focusing on inputs to dryland salinity, such as subsidies for revegetation and taxes and tradeable permits for vegetation clearance, and incentives to undertake ameliorative action, such as cost-sharing for on-ground works, may help reduce dryland salinity and thus salinity levels in waters.

The main economic instrument that has been applied to date to address salinity from irrigation is a tradeable salt permits scheme for irrigation areas in the Murray-Darling Basin, discussed in chapter 4. This scheme involves trade in salinity credits which takes place between the States of New South Wales, Victoria and South Australia, and initially aims to reduce salinity levels in the Murray-Darling river system by 10 per cent. The scheme appears to be on target to achieving this reduction, and there is scope for it to be expanded to include dryland areas in the future — see chapter 4 for details.

Whilst salt trading schemes are an efficient economic instrument to achieve salinity reductions, they may not always be cost effective, particularly at more disaggregated levels than between states. Therefore, as inefficient irrigation practices are a major cause of irrigation salinity, measures aimed at improving the efficiency of water use are important to reducing salinity in waterways. Also important is full cost pricing of water — whilst water prices are artificially low due to government subsidisation, the use of water will be above the socially optimal level. These issues are discussed in the subsection below on 'Overuse of inland water'.

For direct discharges of salinity into waterways from point sources such as mines and electricity generating power stations, output based measures are appropriate. Options include charges and taxes on salt output, subsidies for activities to reduce salty discharges and tradeable salt permits systems. The main economic measure that has been used to date to control discharges from point sources is the Hunter River Salinity Trading Scheme, discussed in chapter 3. This scheme involves trading in salinity credits between 11 coal mines and two power stations along the Hunter River in New South Wales. There is potential to extend this scheme to include other point sources, as well as nonpoint sources. Further work towards this end is desirable.

Whilst including other point sources should be fairly straightforward, involving nonpoint sources in a tradeable permits scheme is more difficult. However, a potential system could see point sources obtaining extra discharge credits by investing in works that will contribute to a reduction in salinity from nonpoint sources. Credits earned by point sources in this way could then be used to offset requirements for load reductions from their own operations. Point sources could also be allowed to earn credits by contributing to a financial fund that implements best management practices for nonpoint sources which are required to improve their environmental performance. The potential for the Hunter River Salinity Trading Scheme to be expanded in these ways has been recognised by the New South Wales Environment Protection Authority (NSW EPA 1994c).

Nutrient enrichment of inland waters

Excessive nutrient levels in water bodies can degrade the health of the water environment by killing flora and fauna species and producing algal blooms. These effects may result in loss of biodiversity and create health risks for humans and animals. Two of the main types of nutrients responsible for such effects are phosphorus and nitrogen. The main source of these nutrients in waterways is discharges from sewage treatment plants. Other sources of excessive nutrient levels are eroded soils, fertilisers, septic tanks and animal wastes (SEAC 1996).

Discharges from sewage treatment plants are a point source problem and so present an opportunity for the application of tradeable permits systems. The South Creek Bubble Licence Scheme involving three sewage treatment plants on the Hawkesbury-Nepean river system in New South Wales (discussed in chapter 3) is an example of a quasi-tradeable permits scheme. This scheme focuses on discharges of phosphorus into the river system. There is potential to extend this scheme to other point and nonpoint sources of phosphorus, in a similar manner to the Hunter River Salinity Trading Scheme discussed in the previous subsection.

'Trading' opportunities which involve other point and nonpoint sources have recently been introduced in Victoria. In late 1996, an 'off-set' scheme was introduced in Central Gippsland which allows firms that need to undertake environment protection action to propose an alternate action. For example, firms can off-set requirements to reduce their own nutrient discharges by financing more cost effective programs to reduce nutrient loads from other catchment sources. This could be achieved by investing in activities such as revegetation or rehabilitation of wetlands.

There is potential for tradeable permits or off-set schemes to be applied to a range of nutrient discharges and in regions and states where they currently do not exist. Where tradeable permits systems are not cost effective, an alternative instrument for point sources of nutrient discharge is a tax or charge on contributions to increased nutrient levels in waterways.

Nonpoint sources of nutrient discharge, where it is not feasible to include them in a tradeable permits or off-sets scheme, may need to be addressed by measures aimed at the source of the nutrient itself, such as fertilisers and animal waste. For example, a possible instrument is a charge or tax on fertilisers which differs according to the potential of the fertiliser to increase water nutrient levels. Where it is not possible to monitor or measure such inputs or sources, subsidies for undertaking action to reduce the problem may be required.

The effects of nutrient enrichment of waterways are exacerbated by diversion of water from Australia's major river systems, primarily for agricultural uses. Therefore, effective management of water use is an important part of addressing the nutrient problem.

Overuse of inland water

Increased demand for water in Australia is placing increasing pressure on the environment of inland waters and contributing to land degradation. Excessive use of water for irrigation can result in land and water salinity from rising watertables, adversely affecting agricultural production. Reduced stream and river flows from water diversion may also reduce water quality and result in loss of biodiversity in aquatic environments (SEAC 1996).

Use of water for irrigation accounts for around 70 per cent of water use in Australia — urban and industrial use accounts for 21 per cent and rural water supply for nine per cent. Much irrigation water is used inefficiently for marginal economic benefit (SEAC 1996). Full cost pricing of water and tradeable water entitlements (TWEs) are two measures that would provide incentives for more efficient water use.

Water for irrigation purposes is currently subsidised by governments through the provision and maintenance of infrastructure. Therefore, water prices do not fully reflect either the direct costs of water storage and distribution or the indirect environmental costs associated with diversion of water and problems of land degradation from irrigation. Full cost pricing of water would ensure that the amount of water used for irrigation coincides with the socially optimal level of water use, and may encourage irrigators to adopt water saving technologies.

TWEs are an economic instrument which may be used to control the use of water. They will potentially lead to the distribution of water to its most productive or highest value uses. TWEs have only begun to emerge since the mid 1980s (Simmons, Poulter and Hall 1991). In 1994, trading arrangements for water were included as part of the water reform process for Australia agreed to by the Council of Australian Governments (NCC 1996). Also part of the reform process were requirements for allocations of water to be given to the environment. Assigning water allocations to the environment is an important element in creating TWE schemes in order to maintain the health of waterways.

The Victorian Rural Water Corporation (RWC) manages a TWE scheme in Victoria's irrigation area. Two types of entitlements are available for trade — temporary transfers, which are only permitted within seasons, and permanent

transfers of 15 years duration. The RWC reports that the TWE scheme has resulted in a movement of water use from mixed farming to dairy farming and from less profitable to more profitable farmers (James 1997). There is scope for markets in TWEs to operate in other states where they currently do not exist. Schemes could provide a range of entitlements differentiated by, for example, the quality of water and/or the time of year and duration of the entitlement.

As well as schemes operating within states, there is also potential for interstate trading in water. A trial in interstate water trade is currently operating in the horticultural Mallee border regions of New South Wales, South Australia and Victoria. The trial is testing solutions to a number of impediments to efficient interstate water trade such as differences in state water pricing policies and standards and requirements of water licences (Parish 1997). Once the trial has been completed and adjustments made to the scheme as necessary, there is potential for the scheme to be expanded to other areas.

Potential also exists for a TWE scheme to operate between different industries or sectors. For example, the Victorian Government has stated that substantial savings could be made (from the deferral of large investment in the building of dams) if water could be transferred from irrigation districts in Victoria to meet growth in demand in metropolitan Melbourne (IC 1992). Therefore, intersectoral trading schemes may provide benefits exceeding those that can be gained from TWEs within an irrigation sector alone.

5.3 Coastal environment and the sea

Australia's coastal environment and the sea extends from river mouths at the border of marine and fresh water ecosystems to the boundary of the 200 nautical mile Exclusive Economic Zone. It includes mangroves and salt marshes, beaches, near shore waters and reefs. On the whole, Australia's marine and estuarine environments are in good condition (SEAC 1996). However, in areas close to major urban centres or considerable human activity, the environment can be significantly affected. Some of the more significant environmental problems facing the coastal environment and the sea and the economic instruments used in response to these problems are listed in table 5.3. Each of these environmental problems and additional instruments that could be utilised to help address these problems are discussed below.

Table 5.3 Environmental problems associated with the coastal environment and the sea

Problem	*Description*	*Responses involving economic instruments*
Coastal development	Habitat and hydrology modification, land reclamation, stormwater and other discharges and recreation as a result of coastal development exert pressure on the coastal environment.	Application of performance bonds for some mining sites; local council differential rates to fund maintenance of coastal areas.
Exposure of coastal waters to contaminants	Nutrients, sediments, chemicals, metals, pathogens and litter can lead to algal blooms, habitat degradation, poisoning of marine species, can accumulate in fish and other organisms, and can cause disease in humans.	The South Creek Bubble Licence; load based licensing systems.
Impact of recreation and tourism	Impacts on estuaries, coral reefs, fish and fisheries, beaches, near shore waters.	Great Barrier Reef users fee; Environmental Management Charge (Great Barrier Reef Marine Park).
Impact of fishing	Threats to marine species as a result of overfishing.	Individual transferable quotas in fisheries; levies on revenue from fishing catches to fund fisheries research.

Sources: SEAC (1996) and James (1997)

Coastal development

Pressures exerted on the coastal environment by development occur as a result of habitat and hydrology modification, land reclamation, stormwater and other discharges and recreation. Degradation of the coastal environment reduces the capacity of coastal ecosystems to function effectively. Adverse impacts also stem from industrial and urban pollution sources and sediments and nutrients derived from river catchments (RAC 1993).

In the past, the environmental and economic benefits of coastal environments were often discounted in favour of economic gains from development. A poor understanding of the impacts of developments, and the absence of an approval

system that properly assessed the ecological sensitivities of an area, created environmental problems (RAC 1993). To address this problem, the Commonwealth and most State Governments now require environmental impact statements (EISs), which identify the impacts of development proposals on the environment, to be undertaken. Regulations to govern access to and use of resources such as mineral deposits and fisheries and for land use zoning are also applied (RAC 1993).

There is scope for economic instruments to be used to complement regulatory mechanisms to manage coastal development. Economic instruments that can be used include performance bonds, user charges, load based licensing schemes, effluent charges and local government rating schemes and environmental levies.

Performance bonds for coastal developments would operate in much the same way as in other applications of this instrument. Developers would be subject to the loss of a financial bond if they fail to meet or breach previously agreed environmental conditions. The use of performance bonds could be extended to any situation in the coastal zone where compliance to specific conditions is necessary (ABARE 1993). Performance bonds could also be used to enforce EISs for coastal developments. Developers would make a commitment to meeting certain environmental standards in their development and pay a performance bond. Environmental standards would then be monitored and the costs of remediating any breaches imposed. This would encourage EISs to be more realistic and effectively enforce self regulation by industry (C. Binning pers. comm.). Performance bonds could also be used to enforce EISs in a wide range of other situations.

Development of coastal subdivisions has occurred in some cases without adequate infrastructure such as drainage and sewerage systems and waste management facilities. This has caused a number of problems including damage arising from pollution in various forms and dumping of wastes. In addition to provision of adequate infrastructure, a range of economic instruments including user charges, load based licensing schemes and effluent charges have the potential to help minimise pollution and the volume of wastes to be disposed.

User charges for waste disposal, deposit refund schemes and kerbside recycling rebates can encourage waste minimisation and recycling. Where pollution arises from point sources, load based licensing schemes and effluent charges based on the quantity and quality of pollutants have the potential to reduce pollution arising from coastal development. Applications of these instruments are described in chapter 3. Measures to reduce the impacts of

pollutants such as nutrients, sediments and contaminants on the coastal environment are discussed further in the next subsection.

An example of a rating system applied by a local council to maintain coastal areas is that operated by the Manly Municipal Council. A special differential rate on commercial business is applied to help fund, among other things, the cleaning of the beach (RAC 1993). Environmental levies are also applied by local governments to raise funds for environmental projects. The use of these instruments could be extended to help address the environmental impacts resulting from development.

Exposure of coastal waters to contaminants

One of the more serious large scale threats to Australia's near shore marine environment is posed by excessive amounts of contaminants such as nutrients, sediments, chemicals, heavy metals and litter. Contaminants can lead to algal blooms, habitat degradation and poisoning of marine species, and can accumulate in fish and other organisms. The main sources of contaminants include agricultural runoff, sewage effluent discharges and urban stormwater (SEAC 1996).

Sewage effluent discharges and agricultural runoff are major sources of nutrients and sediments in coastal waters. Measures to address the problems of nutrient enrichment of inland waters can also reduce their flow into coastal waters — see section 5.2 for a discussion of these measures. Sedimentation is a similar problem and can be addressed using similar measures. Suasive measures such as education can also play an important role.

Sewage outfalls in urban cities also carry significant quantities of industrial discharges. Trade waste charges based on polluter pays principles provide incentives for industry to reduce discharges to the sewerage system, and should be applied where possible to reduce the impact of trade waste discharges on coastal (and inland) waters. As mentioned in the previous subsection, load based licensing schemes and effluent charges based on the quantity and quality of pollutants also have potential to reduce pollution arising from coastal development. Applications of these instruments are described in more detail in chapter 3.

Urban stormwater is now recognised as a major pollutant of the coastal environment. Stormwater carries a range of contaminants, including sediments, nutrients, heavy metals, oils and surfactants, and litter. Improved stormwater management needs to focus on both stormwater quantity and quality. A range of engineering and suasive measures can help to improve stormwater quantity and quality. Economic instruments such as tradeable

permits and user pays pricing can complement these measures. Tradeable permits to discharge stormwater are one means by which local councils could regulate the quantity of stormwater discharges from new developments. Developers could trade the right to discharge stormwater so that the overall discharge from the catchment can be limited. User pays pricing principles could also be applied to the treatment of stormwater (CEPA 1993).

Impact of recreation and tourism

Recreation and tourism can place substantial pressures on the coastal environment. Large, often seasonal, influxes of tourists can have significant environmental consequences, including beach and dune erosion, trampling of reefs and vegetation, loss of habitat to facilities and declines in wildlife and fish stocks.

A range of suasive measures have been used to control the impacts of tourism on the coastal environment. These include education of local government planners and tourists, codes of conduct for tourism operators and accreditation for ecotour operators. While regulations are also likely to be necessary to control tourism impacts, care must be taken that they are used appropriately. According to Plimmer (1992), for example, ecological constraints should be taken into account when deciding the number of tourists allowed to visit some ecologically sensitive areas.

A range of economic instruments also have the potential to complement these measures to address environmental problems associated with tourism and recreation. These include charges and taxes, tradeable permits, deposit refund schemes and financial enforcement incentives.

Effluent charges based on the quantity and/or quality of discharges to the environment from tourism facilities such as hotels could be utilised more extensively throughout coastal areas. User charges could also be applied more extensively to reflect the full costs of provision and management of facilities such as national parks (see chapter 4), car parking, sewerage and water systems and beach maintenance. Taxes on tourism related goods and services also have the potential to ensure that tourists contribute to the costs of environment protection when applied to complementary goods and services.

Deposit refund systems could be utilised more extensively to manage waste generated from tourism. There is also potential to apply performance bonds more widely, particularly for tourism developments that pose environmental risks if development guidelines are breached.

Impact of fishing

Fishing in estuarine, near shore and off shore areas can exert pressure on Australia's fish stocks. Impacts include excessive catches of species, alteration of food chains, changing species composition and alteration of the genetic composition of fish stocks (SEAC 1996).

The underlying objective of fisheries management is to conserve fisheries resources to ensure their long term sustainability. Controls on fishing activity constitute the main response, with a range of management strategies being applied by the Commonwealth and State Governments.

Tradeable resource use rights have been implemented in a number of fisheries. They include transferable quotas in the Southern Bluefin Tuna Fishery, abalone fisheries in New South Wales, South Australia and Tasmania, the Australian pearl industry and the South East Fishery (James 1997). Most of these schemes are working effectively in meeting their objectives, however noncompliance can be a problem. For example, quotas in the South East Fishery are confined to Commonwealth waters, but in many cases the fish populations extend across Commonwealth-State boundaries. This creates incentives for fishers to report some catches made in Commonwealth waters as being from state waters. There is scope for refinement of this quota scheme to make the quota rights more clearly defined, secure and enforceable (Rose 1997). Transferable quotas could be applied to other Australian fisheries where species are being overexploited.

5.4 Land resources

There are two main components of land resources — vegetation and soil. Australia has a relatively large primary industry and use of land resources is an important part of Australia's economic prosperity. As a result of a variety of natural, human induced and economic pressures Australia's land resources have suffered, particularly in recent years, from a number of environmental problems. Some of the main problems are listed in table 5.4, along with the current measures used to address them. The first two relate to problems of vegetation and the following four to soil degradation. In a number of cases there is a link between the two groups of problems as degradation of vegetation often leads to one or more problems of soil degradation.

Table 5.4 Environmental problems associated with landresources

Problem	*Description*	*Responses involving economic instruments*

Clearance of native vegetation	Excessive clearance has consequences for biodiversity, land degradation and GHGs.	Levies; grants; tax and rate concessions; management agreements; performance bonds.
Forest habitat conservation	Pressures of human activities on forest resources have impacts on flora and fauna, soil compaction and erosion, stream siltation and water quality.	None used.
Salinity	A result of changes in land use, vegetation clearance and inefficient irrigation practices. Impacts include reduced agricultural productivity, infrastructure damage, reduced water quality and soil erosion.	Cost benefit analysis; cost-sharing for on-ground works; MDBC's Salinity and Drainage Strategy salt credits trading scheme; instruments to encourage vegetation retention and revegetation.
Soil erosion	Accelerated by clearing, cultivation and grazing. Impacts include reduced agricultural productivity, deposition of sedimentation and associated reductions in water quality.	Instruments to encourage vegetation retention and revegetation.
Soil acidification	Decreases in soil pH are exaggerated by excessive use of fertilisers, removal of alkaline plants and introduction of legumes. Impacts include reduced plant growth.	None used.
Soil structural decline	A result of farm practices such as excessive cultivation, stubble burning, overgrazing, compaction from animals and machinery. Effects include erosion, reduced plant growth, increased management costs.	None used.

Source: SEAC (1996)

Vegetation clearance and forest habitat conservation

Clearance of native vegetation and forests has a number of impacts. These include loss of habitat and biodiversity, and land degradation problems such as salinity and erosion. Removal of native vegetation also reduces nature's ability to absorb greenhouse gas emissions, and may have an impact on climatic patterns. Two of the main factors contributing to the degradation of

Australia's native vegetation and forests are certain land use practices and to some extent urban expansion. A poor understanding of the value of native vegetation and the consequences of vegetation clearance have also contributed to the problem.

The two issues of native vegetation clearance and forest habitat conservation are linked by the need to maintain existing vegetation (either native trees, shrubs and grasses or native forests) and the need to encourage the establishment of new vegetation (either native vegetation or plantation forests for timber in order to conserve forest habitat).

Responses to the problem of native vegetation clearance and the need to conserve forest habitat have mainly involved regulatory and suasive instruments. These include: clearing controls in most states; national forestry Codes of Practice, Comprehensive, Adequate and Representative reserve systems and Regional Forest Agreements all aimed at meeting forest conservation goals; and Landcare, One Billion Trees and Save the Bush which have provided information and education services to the public on land resource degradation and related issues.

Some economic instruments have been applied to the problem of reducing vegetation clearance and encouraging revegetation. These have mainly been subsidies and tax concessions at the national level, and levies, subsidies, rate concessions, performance bonds and management agreements (sometimes linked to incentives) at the State and local government levels. There is potential for the use of these instruments to be extended and improved. There is also potential for the introduction of tradeable permits schemes for clearing vegetation and forest habitats — see chapter 4 for details.

Soil degradation

The major types of soil degradation in Australia include salinity, soil erosion, soil acidification and soil structural decline. There are two main causes of most forms of soil degradation, both of which relate to changes in land use. One cause is land clearance. The other is certain farming and irrigation practices undertaken by landholders.

To date, most problems of soil degradation have been addressed through government funded research, development and information extension activities. There has been limited use of economic instruments to address soil degradation problems. Where they have been applied they have mainly been used in the area of salinity, and in particular irrigation salinity. However, there is further scope for the use of economic instruments in addressing soil degradation problems.

Where soil degradation problems are related to land clearing, policies and instruments to address vegetation clearance and encourage revegetation, discussed in chapter 4, are likely to help with prevention and rehabilitation. Where problems are related to land management practices, it is likely that these practices are a result of lack of information about their impact on land degradation. Therefore, there is a case for government to continue funding research, development and information extension activities.

As well as the issue of information failure there is the issue of whether soil degradation problems resulting from farming and irrigation practices are onsite (private) problems or cause offsite impacts and thus involve externalities. Where they are onsite problems, the full costs and benefits relating to the problem are captured by the individual landholder, and thus there is no case for further government intervention. However, if the problem causes external impacts there is a role for government intervention to internalise such impacts, and thus a potential role for economic instruments. Where possible it is desirable to apply property rights mechanisms such as tradeable permits systems, although it is likely that in many cases the most appropriate economic instruments for addressing issues of farming and irrigation practices will be taxes and subsidies.

Salinity

There are several forms of salinity. Dryland salinity and irrigation salinity are the two most common forms. The problem of dryland salinity is discussed in detail in chapter 4. In brief, the existence of offsite impacts suggests there is scope for the use of economic instruments to address the problem, particularly in the form of a tradeable salt credit scheme for dryland areas (see chapter 4).

Irrigation salinity occurs as a result of inefficient irrigation practices which cause watertables to rise, bringing salts to the surface. In terms of economic instruments, irrigation salinity has been addressed through the implementation of a tradeable salt credits scheme in the irrigation areas of New South Wales, Victoria and South Australia (see chapter 4 for more details of this scheme). Such a scheme appears to be the most efficient way to reduce this form of salinity. Full cost pricing of water and TWEs may help improve the efficiency of water use in irrigation areas.

Soil erosion

Soil erosion occurs when particles of soil are carried by water or wind and deposited elsewhere. Soil erosion is accelerated by land clearing, as well as grazing and cultivation. Soil erosion is a problem in Australia because rates of soil formation are low and are exceeded by rates of erosion. Soil erosion

results in nutrient loss and reduced land productivity, and can also reduce the water storage capacity of soil. Furthermore, deposition of sediment by water may cause damage to roads, the filling of dams and reduced water quality, and wind erosion can produce dust storms as well as salt scalds from exposed saline subsoils.

Solutions to both forms of soil erosion involve maintaining or improving vegetative cover and encouraging the adoption of improved farming practices such as reduced tillage, strip cropping, reduced cropping frequency and the use of contour banks. In the case of erosion by water it is also important to discourage farming on sloped land. Windbreaks to reduce wind speed may decrease the severity of wind erosion problems.

Erosion is often a private problem, and the cause and effect occur on the same land area. Where this is the case, and landholders have adequate information, there is no rationale for government intervention. However, offsite effects such as dust storms and siltation of waterways sometimes exist. Therefore, there may be a case for government implementation of economic instruments, such as taxes or subsidies, to internalise these external costs. Cost-sharing for engineering and on-ground works also may be a useful instrument in encouraging the implementation of works to address existing erosion problems.

Soil acidification

Soil acidification occurs when soil becomes more acidic through the addition of hydrogen ions to the soil. This occurs naturally over time, so that older soils are generally more acidic than younger soils. Large areas of land in Australia are naturally acidic. However, soil acidity may be aggravated by a variety of farming practices, such as: the introduction of subterranean clover and legumes into Australian pastures; the removal of certain alkaline plants; and the excessive use of acidifying fertilisers, usually nitrogen fertilisers, or elemental sulfur. The main cost associated with soil acidification is reduced agricultural productivity.

Solutions to existing problems of soil acidity include introduction of perennial pastures and the addition of lime to neutralise existing surface salinity and prevent future subsurface acidity.

Generally, soil acidification is a private problem. However, there are instances when external impacts may occur, for example where acidification has progressed to the stage where soil erosion occurs and this imposes costs on the wider community. In such cases government intervention to address soil acidification may be warranted. However, it appears that long before such a stage is reached, the costs of reduced land productivity would have provided

landholders with the incentive to take measures to address the acidification problem.

Soil structural decline

Soil structural decline is the undesirable change or breakdown in the arrangement of soil particles and the inability of the soil to form aggregates or clods. Structural decline results in soils with high density, reduced air and water permeability and low organic matter content. The problem may result from specific farm practices such as excessive cultivation, stubble burning and overgrazing or compaction caused by animals and/or heavy machinery. The effects of soil structural decline include low seed germination rates and retarded plant growth, increased susceptibility of plants to disease, greater occurrences of wind and water erosion and wet boggy topsoils which make cultivation difficult. These effects all result in reduced agricultural production.

As with soil acidification, soil structural decline generally is confined to onsite areas and does not cause offsite impacts until the problem is well advanced. Consequently, landholders will bear virtually all of the costs of declining soil structure and gain the benefits of prevention and rehabilitation. However, there may be instances of external effects, such as those from erosion resulting from soil structural decline. Therefore, because treatment and rehabilitation may confer some benefits on the wider community, there is a case for public contribution towards the cost of prevention and rehabilitation, such as through subsidies.

5.5 Biodiversity

The term biodiversity refers to the variety of all living organisms. Three widely recognised levels of biodiversity exist — ecosystem diversity, species diversity and genetic diversity. Ecosystem diversity refers to the diversity of entire ecosystems such as coral reefs or rainforests. Species diversity refers to the variety of different species which live within an ecosystem. Genetic diversity refers to genetic differences within a species (Young et al. 1996).

The National Strategy for the Conservation of Biological Diversity, which underpins Australia's response to issues involving biodiversity, recognises that a range of measures are required to conserve Australia's biodiversity. These measures include the cooperation of a range of stakeholders including resource users and the community, improved knowledge and understanding of Australia's biological diversity, and integration of biodiversity conservation with natural resource management.

The Strategy also advocates the use of economic instruments for conserving biodiversity (as a general principle and, more specifically, to minimise land based discharge of pollutants); for fisheries management; to contribute to the protection of aquatic ecosystems; and to encourage land managers to improve conservation of native vegetation. It also recognises the potential for property rights to be altered to help encourage the protection of biodiversity (DEST 1996).

In many of these areas, economic instruments are already being utilised, albeit to varying degrees (see table 5.5). This is because the conservation of biodiversity is an indirect outcome of many of the applications of economic instruments discussed in this report. For example, water pricing reforms and the introduction of tradeable water entitlements aim to encourage more efficient use of water resources, which may help to maintain the biodiversity of aquatic ecosystems by reducing the environmental pressures on inland waters. Similarly, economic instruments aimed at reducing pollution of land, air and water are likely to have beneficial consequences for biodiversity.

Significant opportunities to extend the use of economic instruments to conserve biodiversity exist. The potential to extend the use of economic instruments to encourage retention of native vegetation is discussed in chapter 4. Many of the instruments discussed also have relevance for biodiversity conservation beyond native vegetation. Potential to extend the use of economic instruments to address other environment issues which have consequences for biodiversity are discussed elsewhere in chapter 5. This includes instruments to reduce pollution of land, air and water, tradeable quotas in fisheries, instruments to reduce the impacts of development and tourism in the coastal zone, and instruments to address land degradation issues and overuse of inland waters.

Table 5.5 Environmental problems associated with biodiversity

Problem	*Description*	*Responses involving economic instruments* [a]
Loss of biodiversity at three levels: ecosystem diversity, species diversity and genetic diversity.	Pressures on biodiversity arising from human activity are reducing biodiversity at all three levels.	Load based licensing charges for pollutants; individual transferable quotas in fisheries; water pricing reforms and transferable water entitlements; levies, grants, and tax and rate concessions for native vegetation retention; conservation covenants and management agreements; performance bonds.

a Many economic instruments are being applied in response to environmental problems other than biodiversity but have the potential to provide outcomes consistent with biodiversity conservation objectives.

Source: SEAC (1996)

The Biological Diversity Advisory Council considers that biodiversity conservation can be encouraged by emphasising biodiversity conservation in leases, licences and permits, particularly for the use of natural resources for commercial purposes, issued by governments (BDAC 1996). Biodiversity conservation could also be encouraged by creation of markets to provide agreements for the use of genetic resources. These are in effect payments for prospecting rights for the genetic resources of plants in a geographical area. Such arrangements help to strengthen incentives for the conservation and sustainable use of biological resources for particular geographic areas (OECD 1994b).

6 ROLE OF STAKEHOLDERS

In this chapter, the role of government, industry and community in extending the use of economic instruments is discussed. In this context, required policy changes and an agenda for government to facilitate the extension of economic instruments are also outlined.

6.1 Role of government

Broadly speaking, there are two types of environmental problems — those of a local or regional nature (that is, they occur only over a limited area or they vary across regions) and those that are more national or global in nature. As discussed in chapter 2, government intervention in environmental problems can be justified on the basis of a number of factors including market failures.

The roles of the Commonwealth, State and local governments in relation to the environment are formally set out in section 2 of the Intergovernmental Agreement on the Environment (IGAE). It recognises that State and local governments have significant responsibility for the practical implementation of environmental policies and measures, and makes provision for the Commonwealth Government to become involved in those issues where it has demonstrated responsibilities and interests.

Where government action is warranted, the question of which level of government should have responsibility for a particular environmental problem is an important one. The principle of subsidiarity, which states that responsibility should reside with the lowest practical level of government, is increasingly being used to determine the most appropriate level of government (IC 1997b). Effective implementation of incentive based mechanisms to address environmental problems may require devolving responsibility and authority to the lowest practical level.

Central governments

For environmental problems of a local or regional nature, one of the roles of central governments is to empower departments, local government organisations, nongovernment organisations and individuals to address environmental problems as appropriate. In seeking mechanisms that devolve responsibility, one option is for the Commonwealth Government to set regional environmental goals or objectives that are consistent with agreed

strategies and constraints. State Governments can then manage the relevant environmental problems within those constraints. Under such arrangements, responsibility and accountability for managing the problems can then be devolved by Commonwealth and State Governments to local governments, resource management agencies, community groups and industry (Young et al. 1996).

Management of natural resources within the Murray-Darling Basin is an example of such a model. The Murray-Darling Basin Commission (MDBC) sets the broad framework for managing resources within the basin. As detailed in chapter 4, committees comprising representatives from industry, the community, local government and State government agencies then develop and implement integrated catchment management plans for catchment sustainability in accordance with that framework. The States provide information and support to committees through research, development and extension. The MDBC has developed a cost-sharing framework to improve the uptake and effectiveness of on-ground works to address, for example, land degradation problems. The framework is used to determine cost shares between stakeholders who will benefit from chosen management options as part of integrated catchment management plans. Similar approaches may have potential in addressing a wide range of environmental problems.

Central governments also have a critical role in developing effective strategies for consultation and direct participation of industry and community in the decision making process at the local level. For solutions to environmental problems to be effective, structures that allow consultation and participation of industry, communities and government need to be developed, along with mechanisms that enable targets and strategies to be agreed by all parties affected (Young et al. 1996).

Despite the important contributions that industry and the community can make in addressing certain environmental problems, there are some contributions that need to come from government. These include providing a broad perspective and ensuring that decisions relating to environmental problems are not made without considering all the relevant implications of such decisions.

Governments also have a role in understanding the environment and identifying environmental problems in a proactive way, since there is no private interest in addressing these issues at an appropriate regional or national scale. By recognising problems earlier, they can be addressed in a more cost effective way.

With particular reference to economic instruments, central governments have a role in resourcing research and provision of information (where this is not

likely to be privately provided), monitoring and accountability and coordinating policy including inter regional, state and national plans and strategies.

For environmental problems of a national or global nature, central governments may also have a role in administering economic instruments to address those problems. An example would be administration of a carbon tax or tradeable emission permit scheme to reduce greenhouse gas emissions.

Furthermore, central governments have a role in facilitating the introduction of more efficient and effective economic instruments as improved information and technology becomes available. They also have a role in ensuring mechanisms are in place which allow instruments to be reviewed and refined as circumstances change.

Local governments

Local governments have the capacity to play an important role in addressing environmental problems of a local or regional nature, although to date this role has not been widely taken up. Local knowledge, the potential role in education and leadership, and council functions in infrastructure provision and regulation of development on private land also mean that the role of local governments is critical in addressing local or regional environmental problems.

Local governments have not played a greater role in addressing environmental problems for a number of reasons. These include the fact that local government boundaries do not usually reflect natural boundaries and a lack of financial resources. A review of funding arrangements for local governments (including consideration of the possibility of making local governments more accountable for environmental performance) may be an option in some cases to overcome this barrier. Investigation of the possibility of setting up regional committees to manage natural resources within individual catchments along the lines of Catchment Management Committees may also be worthwhile. Catchment Management Committees, with representation from industry, community, local government and State government agencies, have been established in New South Wales under the *Catchment Management Act 1989*.

Kelly and Farrier (1996) observe that, despite the critical role that local governments could play in implementing environmental policy, national environment policies such as the National Strategy for Biological Diversity and the National Strategy for Ecologically Sustainable Development pay little attention to local governments. In the Intergovernmental Agreement on the Environment there is little focus on the role local governments could play in

implementing environment policy. The Accord signed in 1995 between the Commonwealth and the Australian Local Government Association promises an enhanced role for local governments, but provides few details of how this is to be achieved. More attention should be given to mechanisms to engage local governments in implementing environmental policy. An example is the introduction of mechanisms to enable local governments to enter conservation covenants to protect fauna and flora where such mechanisms are not already in place.

Intergovernmental coordination

Intergovernmental coordination on environmental matters is presently conducted through a number of forums, including the Council of Australian Governments (COAG), the Australian and New Zealand Environment and Conservation Council, the Agriculture and Resource Management Council of Australia and New Zealand, the Intergovernmental Committee on Ecologically Sustainable Development (ICESD) and the National Environmental Protection Council. These bodies aim to support the implementation of policies involving various tiers of government by ensuring policies affecting environmental issues are broadly consistent between jurisdictions and facilitating greater cooperation between the various tiers of government in implementing these policies. Intergovernmental coordination of this type can lead to increased effectiveness and efficiency of the policies and programs implemented through reducing duplication of programs, better designed policies due to input from different levels of government and greater consistency between instruments used to address particular problems. These forums may have the potential to play a significant role in extending the use of economic instruments.

An inquiry into the environment powers of the Commonwealth is currently being undertaken by the Senate Environment, Recreation, Communications and the Arts References Committee. The terms of reference for this inquiry include investigation of the most appropriate balance of powers and responsibilities between Commonwealth, State and local governments and mechanisms to ensure consistency between all levels of government in environmental protection (SERCARC 1997). An ICESD Working Group is also reviewing Commonwealth-State roles and responsibilities for the environment (ICESD Working Group on the Review of Commonwealth-State Roles and Responsibilities for the Environment 1996). It would be worthwhile for both these reviews to examine potential means of improving intergovernmental coordination on environmental matters, particularly with respect to extending the use of economic instruments.

6.2 Role of industry and community groups

Industry and community involvement in developing solutions to environmental problems is crucial. Not only do they have local knowledge which can be provided at low cost, but ownership of solutions increases industry and community commitment and the probability of compliance. Community involvement can help to overcome the credibility gap which exists when decisions are made by governments in the face of uncertainty and limited information, and can also provide valuable leverage to government funds in terms of community input of time and resources (Young et al. 1996).

As mentioned previously, government has a role in setting up mechanisms which facilitate industry and community involvement in decision making processes. Industry and community then have a responsibility to participate. Through such mechanisms, opportunities exist to learn from industry experience with respect to economic instruments, including, for example, the experience of some firms with respect to the application of economic instruments in other countries.

However, if a decision making role is to be given to local governments, community or industry, and taxpayer funded resources are to be used to develop solutions to environmental problems, then accountability is critical to overcome any possible misuse of funds or to avoid capture by vested interest groups as well as possible conflict between private and public interests. These problems can be overcome by devolving responsibility to regional entities, ensuring a diversity of interests are represented in the decision making process, putting accountability mechanisms in place and ensuring transparency of decision making processes. Accountability could be achieved through setting goals and performance indicators against which performance could be measured, along with regular reporting requirements and periodic independent auditing. There is also potential to use cross compliance mechanisms to force agencies to collate the appropriate data to demonstrate, in a transparent manner, that they are meeting agreed environmental objectives (Young et al. 1996).

6.3 Required policy changes

The policy framework for extending the use of economic instruments appears to be adequate. Both the National Strategy for Ecologically Sustainable Development and IGAE explicitly state that economic instruments should be used more extensively. However, the Industry Commission (1996a) and the National Commission of Audit (1996) recently assessed that insufficient

progress has been made in using economic instruments to achieve environmental objectives.

According to the Industry Commission (1996a), the effectiveness of government initiatives to address environmental problems has been reduced by:

- poor coordination between governments;
- a lack of information about the nature and extent of environmental problems; and
- inappropriate policy responses, particularly overuse of inefficient regulations.

The Industry Commission (1996a) indicates that the implementation of the IGAE has been slow and that there are still substantial differences in the institutional and regulatory frameworks employed between jurisdictions. This has given rise to complex regulatory structures and overlaps and duplication of some regulatory functions, which can increase compliance costs and create uncertainty. The Commission suggests that implementation of the IGAE be accelerated, and recommends that all prescriptive regulations be reviewed to assess the scope for using outcome oriented measures, and that governments assess the feasibility of meeting environmental objectives by using economic instruments where possible. The Commission also points out that, for problems where inadequate information about the nature and extent of environmental problems exists, a staged response may be warranted to reduce the risk that responses may be inappropriate in the light of later information.

The National Commission of Audit (1996) found that to date the IGAE has not been effective in encouraging action on environmental issues from a national and bilateral perspective. It also found that the lines of responsibility between governments have become increasingly blurred with greater reliance by States on Commonwealth resources, despite the fact that the IGAE recognises that there are many environmental issues for which the States have primary responsibility.

The National Commission of Audit (1996) recommended that the implementation of the IGAE should be clarified and appropriate action be taken by governments with respect to:

- the roles and responsibilities of the Commonwealth and States;
- overlap, duplication and potential for cost shifting; and
- opportunities for purchaser/provider agreements.

A range of factors are likely to influence the successful implementation of environmental protection policies. These include:

- application of environmental policies which involve a range of complex issues, including intergenerational issues, environmental valuation difficulties and goals and objectives that can appear as competing;
- a lack of information about some of the environmental problems;
- failure of some environmental policies to define the implementation requirements adequately;
- constitutional limitations, legislative difficulties and division of responsibilities; and
- a lack of resources.

Actions which could be taken by governments to overcome these factors include:

- resourcing research and information gathering on environmental problems where such information is unlikely to be privately provided;
- properly defining implementation requirements of environmental policies, including the time frame for action, responsibility for policy implementation, priorities and prerequisites, resource and cost implications, and the existence of an appropriate organisational structure;
- ensuring that effective intergovernmental coordination mechanisms are in place; and
- reviewing resource constraints, particularly funding arrangements for local governments, and ensuring that the best use is being made of existing resources.

As improved information about particular environmental problems becomes available and policy makers gain further experience in designing and implementing economic instruments, the use of such instruments for addressing environmental problems can be expected to increase.

6.4 Agenda for the extension of economic instruments

The use of economic instruments to address key environmental problems could be extended by development of a specified plan of action which provides a platform for change and reform agreed to by all Australian governments. Such a plan could include specific issues to be considered, allocation of responsibility for specific actions and identify target dates for such actions. Plans for action could be developed at two levels — to progress the use of economic instruments and for specific environmental issues. Such plans should recognise that economic instruments are among a range of

measures available to manage environmental problems, and that in a number of cases a mix of instruments (economic, suasive and regulatory) will be the most effective response to environmental problems.

A plan for action for governments to review opportunities to implement economic instruments or modify existing economic instrument schemes could include development of a 'step by step' guide to designing and implementing economic instruments, and a process to inform government, industry and the community of the role economic instruments can play in addressing environmental problems.

The COAG water reform process is a good example of intergovernmental cooperation to address an environmental issue of national importance. The water reform process involved formation of a working group to develop and report to COAG on a strategic framework for the reform of the water industry, including the role of COAG and Ministerial Councils in the reform process and a timetable for implementation. The framework detailed action to be taken and issues and problems to be addressed, and identified target dates for specific actions. Institutional reform, consultation and public education arrangements were also included in the framework. The framework was subsequently endorsed by COAG. Such an approach may also be appropriate for a range of other key environmental issues.

7 CONCLUDING REMARKS

While there has been some progress in the use of economic instruments to address environmental problems in Australia, there is scope for their use to be extended. The Industry Commission (1996a) and the National Commission of Audit (1996) recently argued that insufficient progress has been made in using economic instruments to achieve environmental objectives.

While economic instruments may not always be the most appropriate instruments for addressing particular environmental problems, a number of factors suggest that such instruments can play an important role. They include the potential to achieve the required environmental outcomes at least cost, to provide greater flexibility in responses to reduce environmental damage and to stimulate innovation of more efficient pollution prevention and control technology.

However, economic instruments are not a panacea for environmental problems, and need to be tailored to specific situations. Economic instruments are one of a suite of tools available to manage environmental problems. Other tools include regulatory and suasive measures. In a number of cases, a mix of instruments (economic, suasive and regulatory) tailored to specific policy goals, will be the most effective response to environmental problems.

Economic instruments may be classified in a variety of ways. This report distinguishes five categories: charges and taxes; subsidies and tax concessions; financial enforcement incentives; deposit refund systems; and property rights and market creation.

Economic instruments have been implemented by all levels of government in recent years. Examples include tax concessions for improved land and water management administered by the Commonwealth, load based licensing schemes covering air, water and land pollutants operating in Victoria and Western Australia, performance bonds for mine site rehabilitation in Queensland and New South Wales, the South Australian beverage container deposit scheme, the salinity trading scheme operating in the Hunter River in New South Wales, and rate concessions and environmental levies administered by some local governments.

Case studies undertaken by the Commission indicate there has been limited use of economic instruments in addressing key environmental issues such as native vegetation retention and dryland salinity. Opportunities to extend the use of economic instruments to address these issues exist. Examples include

expanding the use of management agreements and covenants, and exploring the possibility of using property right mechanisms such as environmental contracts, transferable development rights and habitat preservation credits to protect native vegetation. The possibility of extending to dryland areas the salt credits scheme which is currently operating in irrigated areas of the Murray-Darling Basin, and examining the potential for penalty instruments, such as charges, or reward instruments, such as subsidies, to be used to complement provision of information and cost-sharing frameworks aimed at improving the uptake of ameliorative measures to address the problem of dryland salinity, are also worth further investigation.

There is also scope to extend the use of economic instruments to address a wide range of other environmental problems in Australia. Examples include tradeable permit schemes to reduce greenhouse gas emissions and discharges from sewage treatment plants, fees and levies to reduce the impacts of recreation and tourism on coastal environments, and creation of markets to provide agreements for the use of genetic resources to encourage the conservation of biodiversity.

Broadly speaking, environmental problems can be of a local or regional nature, or more national or global in nature. For environmental problems of a local or regional nature, one of the roles of central governments is to empower departments, local government organisations, nongovernment organisations and individuals to address environmental problems as appropriate. Central governments also have a critical role in developing effective strategies for consultation and direct participation of industry and community in the decision making process at the local level. For environmental problems of a national or global nature, central governments may also have a role in administering economic instruments to address those problems.

Government, industry and community all have a role in progressing the use of economic instruments. Governments have a role in coordinating and implementing environmental policy, as well as monitoring and accountability. Industry and community involvement can also play a crucial role. Local knowledge can be provided at low cost, and ownership of solutions increases the commitment and the likelihood of compliance.

This report has discussed opportunities to extend the use of economic instruments to address environmental problems. However, a number of areas need to be addressed to facilitate this process.

Need for better information

For economic instruments to operate efficiently, supporting information needs to be available. Information also needs to be comparable and consistent. Currently there is considerable scope for improving the availability of relevant information needed to design and implement effective economic instruments to address a range of environmental problems. In some cases, private investment in obtaining information may be below the socially desirable level because it is difficult for individuals to exclude others from the benefits of their own research and to cover the costs of such investment. In such situations, governments have a role in resourcing research and provision of information. Industry and community and industry can also play a valuable role in the provision of information.

Areas for further research

Issues worthy of further research and analysis include:

- in relation to key environmental problems, development of performance indicators against which progress on meeting environmental objectives using various tools including economic instruments can be measured; and
- examination of the use of economic instruments to address particular environmental problems. Examples include the possibility of designing and implementing tradeable permit schemes for land clearance and greenhouse gas emissions.

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