
PANEL SESSION 3

Environmental regulation

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Invited paper 7

Role of economic instruments in managing the environment

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7.1 Introduction

While progress has been made in recent years to better manage the Australian environment, significant problems remain. There is widespread concern about the degradation of our land, water and biological diversity. Community concern about environmental problems has presented some challenges for policy makers. Environmental assets and natural resources are valuable in their own right, and major sectors of the economy rely on the 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 environment protection 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).

There are various policy responses for environmental protection, including regulation, suasive measures and economic instruments. In the past, governments have relied heavily on regulation. While often effective, regulation tends to be inflexible and to provide limited incentives for innovation in managing environmental problems. More recently, there has been increasing interest in economic instruments to complement other approaches because of their potential to improve the cost effectiveness of environmental protection.

7.2 Rationale for government intervention

On their own, market forces sometimes fail to realise the socially optimal use of environmental resources due to the existence of market failures. The existence of market failures is one of the main reasons for government intervention in dealing with environmental issues.

In the context of the environment, the most common form of market failure is externalities. Externalities result when economic activities have consequences for the environment that are not translated into private costs. They are generally caused by an absence of, or ill defined, property rights.

Information failures are another form of market failure. When producers and consumers are not well informed about the environmental implications of their activities or how best to minimise them, the environmental impacts of their decisions are likely to be aggravated. Moreover, private provision of such information may be less than socially optimal.

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 makes 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.

7.3 Forms of intervention

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

Regulation

Generally prescribes a level of pollution (or abatement) and/or the means of reducing environmental damage, and the polluter is left with no choice but to comply or face a penalty (OECD 1994a). As a result, regulation is often inflexible and provides little incentive for innovation to reduce environmental degradation. Regulation can also have high costs of administration and compliance. For all these reasons, the use of regulatory instruments in isolation from other measures is unlikely, in many cases, to be the least cost method of achieving environmental objectives.

Suasive measures

Suasive measures seek to change the perceptions and priorities by internalising environmental awareness and responsibility into individual decision making. They 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 can complement economic and regulatory instruments and assist in their successful implementation.

Economic instruments

Economic instruments affect the relative ‘prices’ (costs and benefits) of alternative actions open to firms. They 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. Through this, economic instruments aim to provide an incentive to decision makers to integrate environmental concerns into their everyday decisions. Such instruments are often referred to as market based instruments, as they work by using market signals, such as prices, to encourage better decisions.

Compared to regulation, market based instruments allow greater flexibility in the response of decision makers to reduce environmental damage. By allowing polluters to choose the method that is best in their particular circumstances, economic instruments allow firms to achieve environmental objectives in the most cost effective manner. Economic instruments can also make the costs of environmental protection more transparent and encourage ongoing innovation in more environmentally friendly technologies.

Economic instruments may be classified in a variety of ways. Five categories are presented in table 7.1 — charges and taxes; subsidies and tax concessions; financial enforcement incentives; deposit refund systems; and property rights and market creation.

Charges and taxes

By reflecting the extent of environmental damage caused by different activities, charges and taxes can 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 charges and taxes are most efficiently applied at the source of damage, this may be difficult in practice. In such cases it may be preferable to tax a cost effective surrogate.

Charges and taxes can achieve environmental objectives in an economically efficient manner. Those who are able to reduce environmental damage by introducing new technologies and cleaner production processes at a lower cost than the rate of tax or charge are encouraged to do so.

Table 7.1 Main characteristics of selected economic instruments

<i>Type and definition</i>	<i>Advantages</i>	<i>Difficulties/disadvantages</i>	<i>Relevance</i>
Emissions and effluent charges or taxes	— low transaction costs for firms or individuals	— setting the charge at the right level — monitoring	discharges from point sources

charges based on the quantity and quality of pollutants discharged		requirement	
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 level of pollutants or use a certain amount of a resource	— allocation of resources to the highest valued use — reduced information needs for regulators — more certainty regarding pollution or resource use levels	— establishing an efficient market — setting overall level and initial allocation of permits — transaction costs	where environmental impact is independent of pollution source, eg for air pollution within 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: Industry Commission (1993)

Where charges and taxes are too low to provide such an incentive, they mainly serve to raise revenue. In such cases, the revenues are often intended for

collective treatment of the environmental problem, research on new abatement technologies or subsidising new investment by polluters in such technologies (OECD 1994a).

Whilst there are benefits associated with charges and taxes they can also have a number of drawbacks including:

- the difficulty of determining the appropriate level of charge or rate of tax;
- the need to monitor and adjust them to ensure they meet their objectives; and
- overcoming concerns that they will become merely revenue raising devices for the government (IC 1993, p.85).

Subsidies and tax concessions

Subsidies and tax concessions can provide an incentive to modify behaviour, and in many cases give polluters the flexibility to do this in the manner they choose. A subsidy is a payment by government to those who undertake certain activities the government wishes to promote. A tax concession 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.

However, subsidies and tax concessions can have several shortcomings. They may not satisfy the polluter pays principle. They may reward those who have been poor environmental performers prior to their introduction, or those who would have undertaken the change in their absence. Furthermore, they represent a net payment by the government, and may also distort the tax system.

Nevertheless, there may be situations where the desired behaviour is unlikely to occur without a positive financial incentive. In such cases, the use of subsidies and tax concessions may be appropriate.

Financial enforcement incentives

Financial enforcement incentives penalise non-compliance with a certain environmental standard or regulation. There are two main types of financial enforcement incentives: performance bonds and non-compliance 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. Performance bonds provide government with a guarantee against the risk of default of conditions prescribed for environmental

safeguards, and are best suited to situations where there is one source of potential environmental damage and that damage can be reasonably estimated. Finance may be provided in various ways, including provision of up front capital funding which is refunded once compliance with certain regulations has been achieved, and taking out a loan with a financing body in a manner similar to other general cases of risk insurance.

Non-compliance 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 non-compliance, are not classed as economic instruments.

Deposit refund systems

Deposit refund systems generally encourage reuse or recycling of goods by including a surcharge in the initial price of the good which is then refunded when the product or 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. They can reduce the volume of waste to the environment and the volume of virgin resource used.

Deposit refund systems can have drawbacks. Their benefits may be achieved at a high cost compared with alternative measures due to additional handling, transport and storage costs. Such costs may put products subject to deposit refunds at a competitive disadvantage relative to substitutes.

Property rights and market creation

Environmental problems can arise where there are no clearly defined property rights as may be the case with air, water, biodiversity and natural areas. As a result, environmental resources may be overused (The Treasury 1990).

In cases where access to the resource can be controlled, it may be possible to create new property rights. Doing so can create a market for the resource — the beneficiaries gain a means of paying for the benefits they receive from the proper management of the resource and the resource owner is compensated for the costs of doing so.

Assigning property rights can potentially reduce the need for regulation or other interventions to protect environmental resources. To work effectively property rights should be well defined (divisible and exclusive), freely transferable, enforceable and secure over the long term.

7.4 Current use of economic instruments

Economic instruments are currently being used to address a range of environmental problems in Australia. In box 7.1 are listed some of the major economic instruments currently operating in Australia. The major instruments used are discussed in more detail below.

Charges and taxes

Emission and effluent charges

Emission and effluent charges are becoming a major part of packages of economic instruments used by some States to achieve environmental outcomes. South Australia has a system of fees to support the *Marine Environment Protection Act* 1990. Fees based on the toxicity of the pollutant, the sensitivity of the environment and the volume discharged are levied on all point source discharges to tidal waters. The charging system is expected to become an incentive based effluent management system rather than one designed, as it presently is, to cover administrative costs.

Load based licensing schemes

Load based licensing schemes provide an incentive for firms to reduce discharges and effluent to air (eg. sulphur oxides, nitrogen oxides), water (eg. salinity, phosphorus, oils and greases) and land (eg. waste water irrigation). A load based licensing system operates in Victoria for waste to air, water and land as well as noise emissions. Since the scheme commenced operation in 1991, fees for individual licences have been based on the volume and nature of the waste. The scheme currently covers about 1200 licences, which primarily cover operators of industrial premises (eg. pulp/paper mills, tanneries), landfills (eg. rubbish disposal) and waste treatment plants (eg. sewage, industrial and chemical treatment plants).

Western Australia has introduced a tiered licensing system with three types of licences for emissions to air, land and water — regulated, monitored and best practice licences. Licensees are allowed some choice in the type of licence, and therefore the basis of fees paid. Firms who do not accurately monitor discharges hold regulated licences and pay the highest fees based on the amount of waste licensed to be discharged. Firms who monitor discharges are able to hold monitored licences and pay lower fees based on the actual volume of discharges. Best practice licences involve an approved environmental management system, an approved continuous improvement plan and audits, and do not require payment of load based fees.

Box 7.1 Some economic instruments used 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
- 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 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

By late 1997 the Environment Protection Authority (EPA) in New South Wales is expected to introduce a load based licensing scheme covering air, water and land pollutants. The fees will be calculated on a similar basis to those of the South Australian scheme described above. Industries initially to be covered by the scheme include cement works, coal and other mines, electricity generation, livestock processing and sewage treatment plants.

Charges for waste treatment and disposal

Charges for waste treatment and disposal are widely applied for household and industrial waste water but not all have demonstrably affected behaviour. There are several examples of industrial user charges for waste disposal via the sewerage system. The Trade Waste Program of the Sydney Water Corporation has cut discharges of certain pollutants since its introduction. Melbourne Water in Victoria and the Hunter Water Corporation in New South Wales have charges for waste disposal and there is some evidence that firms have modified their discharges in response.

User charges for natural areas and amenity

User charges for natural areas and amenity are applied by all levels of government for access to natural areas such as 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

Product charges and taxes have been imposed on a range of products that cause pollution. One example is the scheduled 2 cents per litre differential in excise tax between unleaded and leaded petrol to favour the former. Another example is the charges on ozone depleting substances applied as part of the Ozone Protection Strategy, however the fees have been designed only to recover administration costs.

Environmental levies

Environmental levies are used to finance environmental improvement programs and projects. In 1989 the Sydney Water Board introduced 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. Levies are also imposed by some local councils. Brisbane City Council has a levy of \$30 per year per household to purchase bushland remnants. Other councils with levies include Eurobodalla in New South Wales, and Caloundra, Cooloola, Logan, Johnstone, Toowoomba and Albert in Queensland.

Subsidies and tax concessions

Subsidies and tax concessions implemented in Australia to encourage actions with positive environmental outcomes include concessional taxes, tax concessions, subsidies, grants and rate concessions.

Concessional taxes

Concessional taxes are used to promote more environmentally friendly alternatives to conventional products. An example was the sales tax exemption for products made of recycled paper — it was abandoned in 1995 because it distorted the importation of recycled paper products.

Subsidies and tax concessions

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

Sections 75B of the *Income Tax Assessment Act* allows capital expenditure for conserving or conveying water to be depreciated over three years. Section 75D allows full deductibility in the year of expenditure for capital expenditure to control degradation of farmland. The Australian Bureau of Agricultural and Resource Economics (Mues, Moon and Grivas 1996) has found that these provisions were of some importance for most farmers with land care expenditures.

Cash donations to approved environmental organisations are tax deductible. Donations of land with conservation value are also eligible if the land has been owned for less than 12 months or is of national cultural heritage significance. However, these conditions may limit the effectiveness of this provision.

Grants

Commonwealth programs such as Landcare and One Billion Trees provide grants for the better management of natural resources. 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

Rate concessions of various kinds are used by some local governments to encourage adoption of environmental protection measures by landholders. One example is the rate rebate by Melton Shire Council in Victoria. The rate rebate

is given to non urban properties larger than two hectares for completed works to prevent land degradation.

Financial enforcement incentives

Performance bonds are being used in Queensland and New South Wales as an inducement for mining companies to rehabilitate mined areas. The size of the bond is based on the likely cost of rehabilitation. Bonds can be provided in various ways. Capital can be paid up front and held in trust, then refunded when compliance is achieved, however this may place constraints on the firm's cash flow. A loan can be taken out with a financing body to overcome this constraint, with the annual cost being interest on the loan. Payment of a risk premium to a bank, insurance company or other financial institution can also be made.

Performance bonds may also be used for other environmental protection purposes. 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 EPA 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 common in Australia. Disposable containers made many such schemes redundant. However, some manufacturers do pay for recycled cans and bottles and this has resulted in improved collection services.

The only State which has legislated a deposit refund scheme is South Australia. Return rates for South Australia are 70 per cent for plastic, 82 per cent for aluminium and 83 per cent for glass containers. These rates are well above return rates from other States.

Property rights and market creation

To date, property rights and market creation mechanisms have not been used greatly in Australia but they are receiving more attention. They generally have the significant advantages of being self funded and of allowing participants to determine the extent of their financial involvement.

Tradeable permits

Tradeable permits are a particular example of creating a market for an environmental resource or a by-product by allocating private property rights. This instrument works first by establishing some multi-source 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 between each other or with other interested parties. 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.

The Salinity and Drainage Strategy, managed by the Murray-Darling Basin Commission, 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.

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.

In New South Wales the South Creek Bubble Licence Scheme is a quasi-tradeable permit scheme operating to reduce phosphorus levels in the Hawkesbury-Nepean river system. The main source of phosphorus is sewage effluent from three Sydney Water sewage plants. Under this scheme, the EPA sets an aggregate load limit of phosphorus discharges for the bubble as a whole and allows Sydney Water Corporation to determine the load allocation between the plants so as to meet the overall required reductions in phosphorus levels at least cost.

Environmental liability

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. In Victoria, lenders who finance firms whose activities involve a high degree of pollution are subject to limited liability for cleaning up any environmental spills. As a result, companies with good environmental records are more likely to obtain finance at a lower cost than competitors with poor environmental performance.

7.5 Extending the use of economic instruments

This section summarises the contemporary use of economic instruments to address some key environmental problems and suggests opportunities to extend the use of economic instruments in addressing these problems.

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. This coverage is not meant to be exhaustive.

Atmosphere

At a global level, greenhouse gas (GHG) emissions and stratospheric ozone loss are key issues. At a local level, loss of urban air quality is of concern in some areas.

Greenhouse gas emissions

Australia's approach to reduce greenhouse gas emissions is currently based on 'no regrets' abatement action. However, it is unlikely that no regrets actions will be sufficient for Australia to meet existing international abatement commitments. Other policy options to reduce GHG emissions include 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 who wish 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 has some potential advantages over a carbon tax. A permit scheme may be able to cover more sectors than a carbon tax. A permit scheme can also allow non-polluters to buy but not use permits to reduce total emissions. Furthermore, carbon tax rates would need to be revised more often — with changes in technology, incomes and public attitudes and preferences. Finally, the transparency of compliance with a tradeable permits scheme may be greater.

Stratospheric ozone loss

There has been significant action to address stratospheric ozone loss in Australia. Under the Ozone Protection Strategy, the Commonwealth Government has introduced stringent regulation 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 chlorofluorocarbons and is on target to phase out hydrochlorofluorocarbons. No further initiatives are expected to be needed.

Urban air quality

As motor vehicle usage increases in urban areas there is a greater likelihood of a loss in urban air quality from increased photochemical smog and airborne lead levels. Economic instruments could help 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 1994a). The Industry Commission recommended the progressive introduction of electronic user charges in its report on *Urban Transport* (IC 1994). The technologies required for such a system of charges are already established and in use overseas but require substantial investment in road based and in-vehicle equipment.

A tradeable emissions permit scheme may be able to be applied to vehicle suppliers to achieve specified cuts in vehicle emissions. Such a scheme would allow vehicle suppliers to reduce the weighted average of emissions rates across all vehicles they sold, and thus allow suppliers flexibility in achieving vehicle emissions reductions. At present all vehicles have to meet the same emission standard.

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 used to meet their own emissions reduction requirements or sold to polluting firms.

Inland Waters

Inland waters and related habitats are being adversely affected by pollutants, exploitation of water for economic uses and the clearing of native vegetation. Three of the more significant environmental problems are salinisation of waterways, nutrient enrichment and overuse of water.

Salinity of inland waterways

Salinity of inland waterways can be caused by dryland and irrigation salinity. Therefore, measures to address dryland salinity have the potential to reduce salinity of inland waters — dryland salinity is discussed later in this paper under ‘Land resources’. The main economic instrument applied to address irrigation salinity is the tradeable salt permits scheme operating in the Murray-Darling Basin. There is scope for this scheme to be expanded to include dryland areas. As irrigation practices are a major cause of salinity, measures to improve the efficiency of water use are also important, as is appropriate water pricing. Water pricing will be discussed below under ‘Increased demand for inland water’.

For point sources of saline discharges such as mines and 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 schemes. There is potential to extend the Hunter River Salinity Trading Scheme to other point, as well as non-point, sources of salinity.

Whilst including other point sources should be fairly straightforward, involving non-point sources in a tradeable permits scheme is likely to be 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 non-point 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 non-point 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 EPA (NSW EPA 1994b).

Nutrient enrichment of inland waters

Nutrient enrichment of inland waters is mainly caused by nitrogen and phosphorus in discharges from sewage treatment plants, as well as eroded soils, fertilisers, septic tanks and animal wastes. Nutrient enrichment can degrade the health of water environments by killing flora and fauna species and producing algal blooms. Discharges from point sources such as sewage treatment plants present an opportunity for the application of tradeable permit schemes. There is potential to extend the use of tradeable permits or offset schemes to a range of nutrient discharges and to regions and States where they currently do not exist. For example, the South Creek Bubble Licence Scheme on the Hawkesbury-Nepean river system could be extended to other point and non-point sources of phosphorus, in a similar manner to that described above for the Hunter River Salinity Trading Scheme. Where tradeable permits schemes are not cost effective, an alternative instrument for point sources of nutrient discharge is a tax or charge on nutrient levels.

Overuse of inland water

Increased demand for water is placing increasing pressure on the environment of inland waters and contributing to land degradation. Use of water for irrigation accounts for around 70 per cent of water use in Australia. Much irrigation water is used inefficiently for marginal economic benefit (SEAC 1996). Full cost pricing of water and tradeable water entitlement (TWE) schemes 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.

While TWE schemes currently operate in some States, there is potential to extend their use to those States where they currently do not exist. 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. Once the trial has been completed, there is potential for an amended scheme to be expanded to other areas. Potential also exists for a TWE scheme to operate between different industries or sectors.

Coastal environment and the sea

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 occur as a result of coastal development, exposure of coastal waters to contaminants, recreation, tourism and fishing.

Coastal development

There is scope for economic instruments to complement regulation to manage coastal development. Such instruments could include performance bonds, user charges, load based licensing schemes, effluent charges 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 breach or failed to meet previously agreed environmental conditions.

Development of coastal subdivisions has occurred in some cases without adequate infrastructure. In addition to provision of adequate infrastructure, economic instruments such as user charges, load based licensing schemes and effluent charges have the potential to help minimise pollution and the volume of wastes to be disposed. Environmental levies could also be extended to help address the environmental impacts resulting from development.

Contamination of coastal waters

Contamination of coastal waters by nutrients, sediments, chemicals, heavy metals and litter 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 run-off, sewage effluent discharges and urban stormwater (SEAC 1996).

The measures discussed previously to address the problems of nutrient enrichment of inland waters can also reduce the flow of sewage effluent and agricultural run-off into coastal waters. Sedimentation is a similar problem and can be addressed using similar measures.

Sewage outfalls can 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 previously, 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.

Urban stormwater is now recognised as a major pollutant of the coastal environment. Economic instruments have potential to complement engineering and suasive measures to reduce the quantity of stormwater and improve its quality. 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. Economic instruments with potential to complement suasive and regulatory measures to address these problems 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 tourism facilities. Taxes on tourism related goods and services also have the potential to ensure that tourists contribute to the costs of environmental 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 can exert pressure on Australia's fish stocks, in the form of excessive catches of species, alteration of food chains, changing species composition and alteration of the genetic composition of fish stocks (SEAC 1996). Tradeable resource use rights have been implemented in a number of fisheries. Most are effective but non-compliance can be a problem. For example, quotas in the South East Fishery are confined to Commonwealth waters, creating incentives

for fishers to report some catches made in Commonwealth waters as being from State waters. There is scope to make the quota rights more clearly defined, secure and enforceable. Transferable quotas could be applied to other Australian fisheries where species are being over exploited.

Land resources

Australia's land resources have suffered from a number of environmental problems, mainly loss of native vegetation and soil degradation.

Vegetation clearance

Clearance of native vegetation has a number of impacts, including 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 GHG 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 urban expansion. A poor understanding of the value of native vegetation and the consequences of vegetation clearance have also contributed to the problem.

A number of economic instruments have been applied to reduce vegetation clearance and encourage revegetation. These include, for example, environmental levies administered by some local governments to raise funds for purchase of native bushland, and grants and subsidies provided through various government programs for fencing and other activities to conserve native vegetation. Conservation covenants and management agreements between government or non-government organisations and landholders have also been used to encourage native vegetation retention. These can specify terms of management, can be legally binding and can offer financial incentives, as well as providing support and information to landholders. There is scope to extend the use of management agreements and conservation covenants to protect areas of conservation value.

There may also be scope for the use of other property right instruments such as tradeable rights to cleared land, in which landholders would be able to buy or sell rights to cleared land. However, the practicality of such a scheme would need considerable further research, and attention would need to be given to issues such as trade between areas of high and low conservation value and how to assess the conservation value of different areas.

Soil degradation

The major types of soil degradation in Australia include salinity, soil erosion, soil acidification and soil structural decline. The two main causes of most forms of soil degradation both relate to changes in land use — land clearance, and 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, and there is further scope to extend their use.

Where soil degradation problems are related to land clearing, instruments to address vegetation clearance and encourage revegetation discussed previously are likely to help. 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.

There are several forms of *salinity*, of which dryland salinity and irrigation salinity are the most common. To date, no economic instruments have been applied to directly address the problem of dryland salinity, although instruments such as grants, tax concessions and local government rate rebates to encourage vegetation retention and revegetation may have some impacts. There may be scope in the future (if adequate information and viable technologies become available) to extend to dryland areas the salt credits scheme currently operating in irrigation areas in New South Wales, Victoria and South Australia. Again, such a scheme would need considerable further research.

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 the above mentioned tradeable salt credits 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, acidification and *structural decline* are often private problems where the cause and effect occur on the same land. Where this is the case, and landholders have adequate information, there is no case for government intervention. Where off-site effects exist there may be a case for government to implement economic instruments, such as taxes or subsidies, to internalise these external costs. Cost-sharing for on-ground works may also be a useful instrument in some cases.

Biodiversity

The National Strategy for the Conservation of Biological Diversity 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.

Economic instruments are already being utilised to conserve biodiversity, albeit to varying degrees. This is because the conservation of biodiversity is an indirect outcome of the application of many of the economic instruments discussed in this paper. For example, water pricing reforms and the introduction of TWEs aim to encourage more efficient use of water resources, which may help to reduce the environmental pressures on inland waters. Similarly, economic instruments aimed at reducing pollution to land, air and water are likely to have beneficial consequences for biodiversity.

Significant opportunities exist to extend the use of economic instruments to conserve biodiversity. The potential to extend the use of economic instruments to encourage retention of native vegetation has been discussed previously. The potential to extend the use of economic instruments to address other environmental issues which have consequences for biodiversity are discussed elsewhere in this paper. This includes instruments to reduce pollution to 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.

Biodiversity conservation could also be encouraged by the creation of markets to provide agreements for the use of genetic resources. These agreements in effect would represent payments for prospecting rights for the genetic resources of plants in a geographical area. Such arrangements could help to strengthen incentives for the conservation and sustainable use of biological resources for particular geographic areas (OECD 1994b).

7.6 Role of stakeholders

Governments, industry and the community can all play a critical role in extending the use of economic instruments to manage the environment.

Role of government

As discussed previously, government intervention in environmental problems can be justified on the basis of a number of factors including market failures. 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 responsibility in a wide range of areas (IC 1997b). Effective implementation of incentive based mechanisms to address environmental problems may also 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, non-government 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. Governments also have a role in understanding the environment and identifying environmental problems in a pro-active way, since there is no private interest in addressing these issues at an appropriate regional or national scale.

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 the administration of a carbon tax or tradeable emission permit scheme to reduce GHG 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 large role in addressing environmental problems for a number of reasons. These include a lack of financial resources and the fact that local government boundaries do not usually reflect natural boundaries. 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.

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). Through mechanisms which facilitate industry and community involvement in decision making processes, opportunities exist to learn from industry experience with respect to economic instruments, including, for example, the experience of some firms in relation to the application of economic instruments in other countries.

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, 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 decision making processes; establishing accountability mechanisms; 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).

7.7 Agenda for the extension of economic instruments

The use of economic instruments to address key environmental problems could be extended by the 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 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 of action for governments to review opportunities to implement economic instruments or modify existing economic instruments could include the 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 managing environmental problems.

The Council of Australian Governments water reform process is a good example of inter-governmental cooperation to address an environmental issue of national importance.

Areas for further work

For economic instruments to operate efficiently, supporting information needs to be available. Information 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 can also play a valuable role in the provision of information.

Other 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 GHG emissions.

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