

# **A Review of Economic Instruments for Environmental Management in Queensland**

## **CRC for Coastal Zone, Estuary and Waterway Management**

Jackie Robinson  
School of Economics  
The University of Queensland.4072

Sean Ryan  
School of Law  
The University of Queensland. 4072

June, 2002

### **Acknowledgements**

The authors would like to thank Geoff Edwards, Natural Resources and Mines, Jean Claude Eono and Greg Fisk, Environment Protection Agency, for their valuable comments on earlier drafts of this paper. The authors would like to thank also staff from the Environment Protection Agency, Department of Natural Resources and Mines, Local Government and Planning, members of the Project Reference Team for the CRC environmental planning project as well as staff from a number of local authorities throughout South East Queensland whose practical experience and advice into this research project has provided invaluable input.



# Contents

<b>Abstract</b>	<b>iii</b>
<b>1.0 Introduction</b>	<b>1</b>
<b>2.0 Framework for economic and regulatory instruments</b>	<b>3</b>
<b>2.1 Duty of care and a regulatory tiering framework</b>	<b>4</b>
<b>2.2 The ecosystem services framework</b>	<b>5</b>
<b>2.3 Considerations for choice of instrument</b>	<b>6</b>
<b>3.0 Financial and market-based incentives</b>	<b>8</b>
<b>3.1 Financial incentives</b>	<b>8</b>
3.1.1 Performance bonds	9
3.1.2 User charges for environmental amenity	11
3.1.3 Resource use charges	11
<b>3.2 Emission and effluent charges</b>	<b>13</b>
3.2.1 EPA license fees	13
3.2.2 Local government waste charges	13
<b>3.3 Environmental taxes</b>	<b>14</b>
3.3.1 Federal	15
3.3.2 State	16
3.3.3 State or regional environmental levies	16
3.3.4 Local government	17
<b>3.4 Other financial incentives</b>	<b>22</b>
<b>3.5 Market based incentives</b>	<b>22</b>
3.5.1 Tradeable water entitlements (TWE)	23
3.5.2 Tradeable fish quotas	24
3.5.3 Tradeable discharge rights	26
3.5.4 Offsets and conservation banking	28
3.5.5 Tradeable development rights	29
<b>3.6 Enhancing market education and access</b>	<b>32</b>
3.6.1 Compulsory disclosure	32
3.6.2 Environmental management systems and eco-labeling	32
<b>3.7 Environmental auctions</b>	<b>34</b>
<b>4.0 Concluding comments</b>	<b>34</b>
<b>References</b>	<b>35</b>

## **Abstract**

This paper reviews the economic instruments to support environmental management currently available in Queensland provides some guidance for their application and describes a policy framework for managing environmental degradation. Environmental degradation resulting from production or consumption of goods and services causes externalities that are not routinely accounted for in a competitive market. Economic instruments are oriented towards improving the economically efficient allocation of resources by modifying the behaviour of economic agents by providing incentives for them to internalise the externalities they may be producing. Economic instruments are designed to affect production decisions either through pricing mechanisms or by changing the economic attractiveness of specific actions. Commonly, economic instruments are classified as financial incentives or market-based incentives. Although referred to as non-regulatory, these instruments require a legislative basis to delineate, modify and enforce property rights over the use of a natural resource. Management of environmental externalities will require a carefully designed economic instrument, or a combination of instruments together with at least some regulation. Design of the instrument must be based on robust science and be established within a legal and policy framework. Such tools would need to reward achievement as well as set and maintain regional minimum standards.

## 1. Introduction

As Australia prepares for the second United Nations World Summit on Sustainable Development in Johannesburg (2002), the last decade of environmental management is coming under increasing scrutiny. Despite an explosion of 'command and control' legislation designed to curb environmental degradation many key aspects of environmental health continue to decline (Commonwealth of Australia, 2001; UNEP 2002). Environmental managers and policy makers are now expanding the scope of instruments available to encourage more sustainable practices. This report<sup>1</sup> assesses the range of economic instruments to support environmental management currently available in Queensland and provide some guidance for their application. The underlying imperative for a review of economic instruments stems from a general acceptance that environmental degradation is a result of market failure. Where the market does not take into account spillover effects or externalities arising from production of a good or service such that the marginal private costs of production do not equate with the marginal social costs, then there is market failure.<sup>2</sup> Market failure is particularly apparent where public or open access resources are involved. In these cases, the market does not respond directly to environmental degradation resulting from the economic activities of economic agents<sup>3</sup>. The problem of externalities is further complicated by both spatial and temporal considerations.

Spatial externalities occur when activities that are detrimental or beneficial to the environment take place at one location but the effects are apparent at another location. For example, managing land use to improve water quality can create benefits such as improved fish habitat many kilometres from the managed land. Temporal externalities occur when there are long time lags between when an activity creating externalities takes place and when the effects of the activity become apparent. In this case, the environment may not suffer noticeable damage immediately but over a longer time period damage may be profound and irreversible. Typical of temporal negative externalities is rising saline groundwater where poor land and water management could take years or even decades to become apparent. Temporal externalities can be positive as well. A farmer who plants large numbers of trees on his/her property will be taking action that would have a positive effect on the condition of the environment, but it takes many years for any positive benefits to be realised.

Temporal and spatial externalities introduce problems when the management of externalities requires the benefits or costs of producing externalities to be identified and internalised. Specifically, delimiting property rights over the externality, enforcing those rights is virtually impossible, and the transaction costs associated with modifying these rights prohibitively expensive.

---

<sup>1</sup> This report was originally prepared as input to the CRC Environmental Planning project.

<sup>2</sup> Externalities can be positive and negative. Positive externalities are described as benefits that occur where the marginal private benefits from production of a good or service do not equate with the marginal social benefit.

<sup>3</sup> Economic agents refer to individuals, firms, corporation and all forms of government agencies involved in the production of goods and services.

Spatial and temporal problems associated with externalities are compounded by a situation called the “tyranny of small decisions” resulting in diffuse or non-point source pollution. This situation arises when people don’t recognise that their actions could be contributing to a much larger problem. This would arise because of a poor awareness, on the part of the perpetrators and of the environmental managers, that there is a problem and that particular actions contribute to the problem. The situation is comparable to a farmer engaging in farm management practices that result in sediment discharge into a watercourse. The farmer may regard his/her contribution to the total sediment loads of the watercourse as insignificant. However, if all farmers were to engage in similar farm management practices the problem would become severe.

When spatial and temporal considerations are relatively minor and where those creating the externality, either positive or negative, can be clearly identified (point source polluters), then, given that the costs of delimiting property rights and enforcing those rights is not substantial, market-based economic instruments are highly relevant to manage the environment. On the other hand, when the source of the externality is diffuse (non-point source pollution) then the choice and application of economic instruments becomes more difficult.

Externalities are a major source of market failure when they are not accounted for or internalised as a part of the costs or benefits of economic agents. Externalities can lead economic agents to behaviours that optimise economic gain at the expense of environmental sustainability. Failure of the market to consider externalities is commonly regarded as due to a lack of appropriation of property rights over externalities that subsequently lead to market inefficiencies.

Delineation and enforcement of property rights over externalities is crucial for appropriation. Without enforcement, the ability of an individual to capture the gains from environmentally beneficial actions is reduced and the ability of polluters to avoid costs is increased. If property rights over externalities were clearly defined and protected then, for the most part, it should be possible for the market to allocate externalities to those producing them and for them to be internalised as costs or benefits, as the case may be. Delineation of property rights is largely the responsibility of the state. As such, legislation is required to appropriate property rights and to set the rules for a market in these rights and it is the role of courts to uphold the legislation and to enforce such rights.

Economic instruments for environmental and natural resource management are defined by James (1997:12) as administrative mechanisms adopted by government agencies to influence the behaviour of those who value the natural environment, make use of it, or cause adverse impacts as a side-effect or externality caused by their activities. For the purpose of this report, economic instruments are more generally described as instruments oriented towards improving the economically efficient allocation of resources by modifying the behaviour of economic agents by providing incentives for them to internalise the externalities they may be producing. Economic instruments are designed to affect production decisions either through pricing mechanisms or by changing the economic attractiveness of specific actions.

There are many economic instruments available to address environmental externalities. One classification of instruments is based on the work of Pigou (1920) and Coase (1960). Pigou advocated the internalisation of externalities through government charges and taxes (i.e. financial incentives). Coase, on the other hand, argued that if property rights were assigned over the use of an environmental resource, such as the capacity to assimilate emissions, and these property rights were enforceable, the market would lead to a socially optimum level of emission through trade and bargaining.<sup>4</sup> For the purposes of this paper, the economic instruments reviewed have been grouped into ‘financial incentives’ after the Pigou approach to management of externalities and ‘market-based incentives’ after the work of Coase.<sup>5</sup>

The objective of this paper is to provide information to decision makers about the range of economic instruments currently available to policy makers that would go some way towards addressing market failure. The remainder of this report is divided into a number of sections. The next section provides discussion on the underlying framework that could be adopted to assist with the selection, design and implementation of the instruments to address key environmental issues. The following section considers the suite of possible economic instruments, the theory underlying their application, head of power, current application, shortcomings and recommendations for future application. The final section makes a number of observations about the direction of future research.

## **2.0 Framework for economic and regulatory instruments**

Instruments for environmental management include command and control regulation, financial and market-based incentives as well as moral suasion approaches. Currently, the choice of instrument is largely made outside of any overall management framework. The traditional expansion of ‘command and control’ legislation can lead to a “complex regulatory web that is uncertain in its application and inefficient in its approach” (Bates, 2001:7). The costs of enforcement can also be prohibitively high. At the other extreme, moral suasion approaches are also limited in their effectiveness (Robinson, 2001). These approaches include education and voluntary industry codes of practice that rely on economic agents voluntarily adopting best management practices.

Financial incentives and disincentives offered to economic agents to encourage them to adapt their behaviour or to undertake improved production techniques require substantial public sector funding and continued monitoring. Where adoption of best management practices by agricultural or industry producers or adoption of environmentally friendly practices by urban communities can be converted into a market or financial advantage, then there is a greater likelihood that these approaches would be successful. Economic instruments for environmental management, particularly those that require appropriation of property rights over externalities, are reliant on a legislative framework to establish their validity and to ensure enforcement. What is needed is a structured provision of incentives to provide a

---

<sup>4</sup> Coase conceded also, that an exchange of property rights through a freely operating market is efficient only if the transaction costs associated with the exchange are low. When the transaction costs are high, such as when there are multiple entities involved in the exchange, then he concedes, there is a role for government.

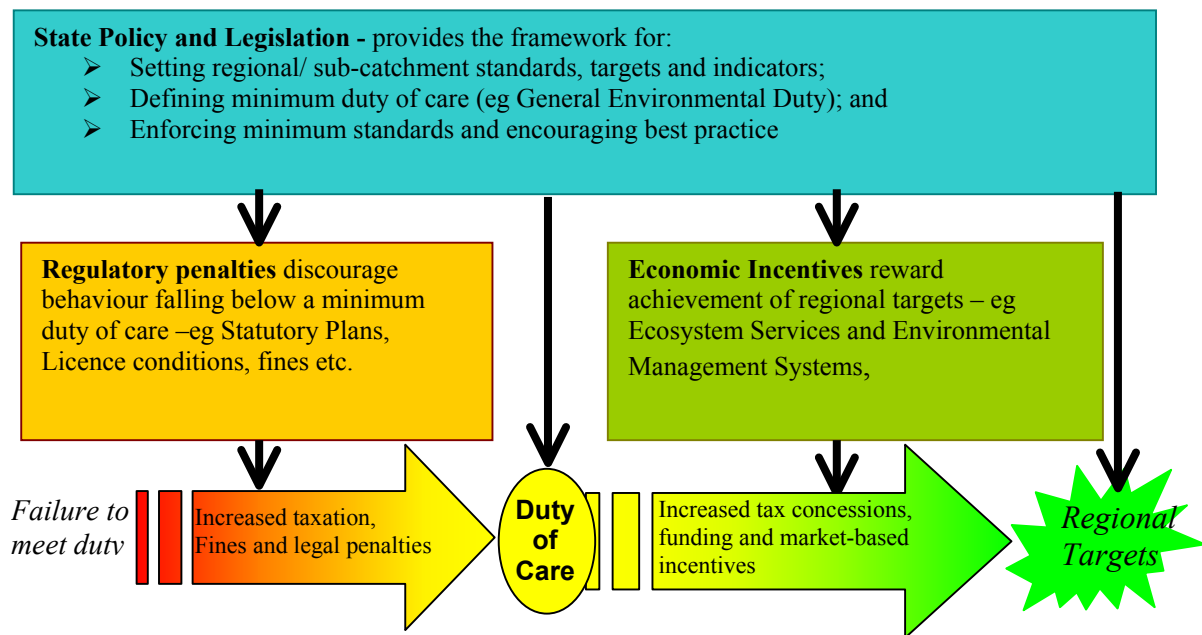
<sup>5</sup> See Opschoor and Turner (1994) for an overview of these approaches.

greater encouragement than moral suasion or the free market, yet avoid complex, prescriptive and penal legislation.

## 2.1 Duty of care and a regulatory tiering framework

A ‘regulatory tiering’ approach could help achieve this balance. Regulatory tiering is the combination of regulatory and policy tools to meet a common objective (Wisconsin Department of Natural Resources, 2001). In the context of this report, regulatory tiering would use regulation to set and enforce minimum standards while using incentives and the creation of new markets to encourage best practice management (see Figure 1). The Industry Commission (1998) in its report *A Full Repairing Lease: Inquiry into Ecologically Sustainable Land Management* recommended that a general duty of care for the environment should underlie future statutory regulations. The adoption of voluntary standards of practice was suggested as a means to encourage self-regulation in preference to command and control mechanisms.

**Figure 1 Possible regulatory tiering framework**



Gardener (1998) has expressed concern about the enforcement of a duty of care concept advocating performance-based planning rather than a prescriptive approach. More recently, the Productivity Commission contracted a report from Bates (2001) to clarify the issues associated with the concept of duty of care, particularly in relation to the protection of biodiversity on land. Bates was critical of command and control regulation contending that these policies are generally resorted to by regulators in an effort to coerce landowners to undertake stewardship duties on their land. Bates describes command and control regulations as “inefficient, unnecessarily intrusive and unduly expensive to administer. Some regulations may inhibit innovation and discourage people from searching for new and more efficient ways of using a resource” (p.6). He makes the observation however that “some forms of command and control regulation may serve as an essential safety net, providing a backdrop of

minimum legal biodiversity protection standards” (p.7). In this sense the duty of care concept may play a role to underpin a regulated minimum standard.

This concept suggests the need for a framework to balance regulation and incentives, where regional minimum standards form a duty of care requirement supported and enforced through regulatory penalties (see Figure 1). Regional targets, aimed at best management practices, form the benchmarks for voluntary activities attracting tax concessions, public funding and enhanced market opportunities. Maher et al (2000:53-54) have recognised the need for future regulation and economic incentives to encourage the protection and repair of riparian vegetation through economic measures linked to best management practices and voluntary codes of practice.

## **2.2 The ecosystem services framework**

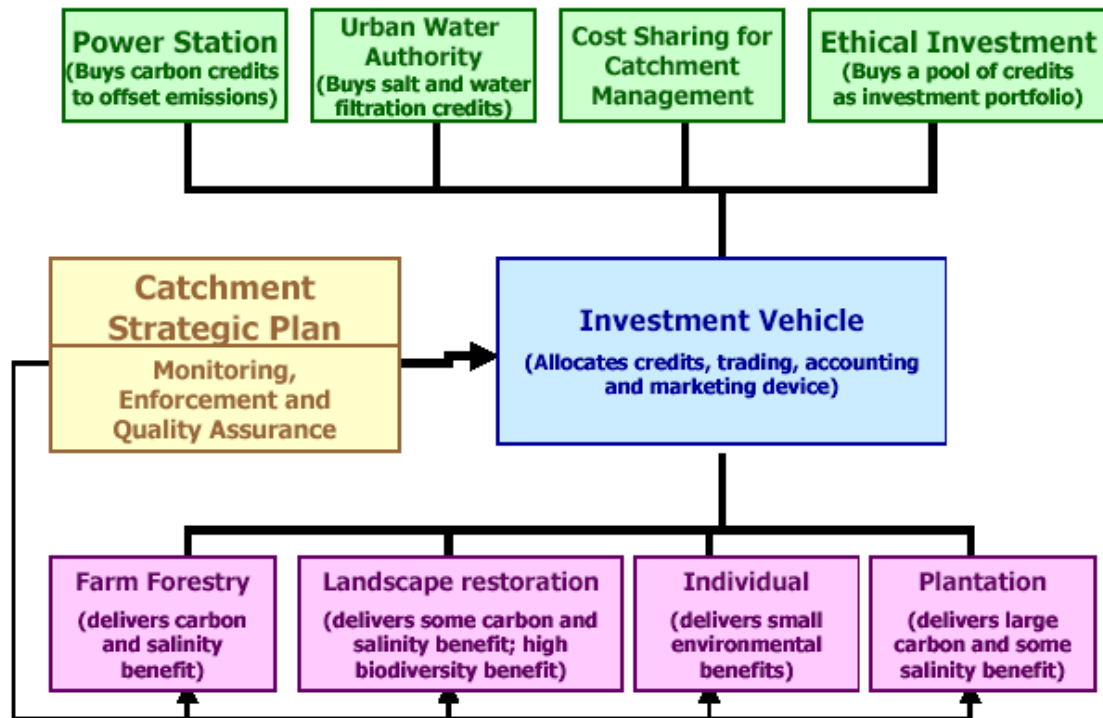
To a large extent, environmental degradation can be attributed to the failure of markets to reward landusers for the provision of ecosystem services. This market failure leads to an under supply of healthy ecosystems capable of delivering goods and services. The role of government in this approach is to regulate resource use by delineating property rights over resources. The market is expected to facilitate the trade or transfer of rights and to encourage private sector investment. One proposal for the promotion of an ecosystem services approach to environmental management, Binning et al, 2002, requires the engagement of non-government investors (see Figure 2). Many of the options to promote investment in the supply of ecosystem services require the enhancement of existing marketing opportunities (see Section 3.5 for more detailed discussion about market opportunities).

The marketing of ecosystem services provides a useful adjunct to the regulatory tiering approach described previously. If markets in ecosystem services could be established then it is conceivable that these would promote best management practices and the achievement of regional targets.

The Rural Industries Research and Development Corporation (RIDC) has put forward an investment framework for ecosystem services that provides a useful structure to incorporate various incentives including ethical investment, carbon credits and salinity credits (Figure 2). The RIDC proposed framework relies heavily on the creation of transferable credit systems that extend beyond catchment or regional boundaries. Small, ad hoc markets are likely to be inefficient and hinder the formation of larger markets. However, statewide, national or global trade in water, carbon or salinity credits is unlikely in the short to medium term. In the meantime the proposal relies on government investment in the purchase of ecosystem services and hence is subject to volatile political will that hinders long term investments. The reliance of the framework on credit markets also risks a narrow focus that stifles innovative and flexible solutions. For example, a farmer providing off-stream stock watering may significantly reduce stream turbidity and nutrient levels yet fall outside the credit systems.

An essential first step for developing investment in ecosystem services is the identification and quantification of environmental benefits provided by individual ecosystems that would form the basis of a currency for markets. This step requires substantial science to establish the criteria for a credible currency.

Figure 2 A buyer, seller investment framework for ecosystems services



Source: Binning et al, 2002: vi

### 2.3 Considerations for choice of instrument

A range of considerations or criteria for selection of appropriate instrument to manage the environment is provided in the literature (see for example James, 1997). The final choice is likely to require at least some degree of compromise.

The following table provides a brief overview of relevant considerations in the selection of economic instruments.

Table 1 Considerations for choice of economic instrument

Consideration	Comments
<b>Tenure</b>	Land ownership significantly affects instrument design. If the issue being addressed is largely on freehold land then it is likely to attract compensation. For State controlled land, access and maintenance issues must be given more attention.
<b>Diffuse/ Point Source Problem</b>	Most tradeable permit or load-based licensing systems require accurate monitoring and are more amenable to point source discharges.

---

<b>Single issue Multiple Benefits</b>	Instruments, such as carbon trading, address single issues with discreet benefits, such as limiting climate change. Where a problem (such as water quality) has multiple solutions or the solution (such as riparian vegetation) has multiple benefits. It is best dealt with through a combination of instruments or through flexible instruments, such as Environmental Management Systems, which can incorporate a broad range of management actions.
<b>Available Information</b>	Design of market-based instruments generally requires reliable data on sustainable yields/limits and the operation of market instruments requires information on issues such as compliance costs. Regulation and financial incentive may be preferable in information poor environments.
<b>Proportional Cost of Tool</b>	Charges, bonds and permit prices can have limited effect on management practices if they represent a relatively small proportion of the total costs for a firm or individual.
<b>Intended Environmental Outcome</b>	Ideally, clear, science based, quality or quantity standards should be stipulated from the outset and the instrument should respond proportionally to the achievement of those standards.
<b>Efficiency Gains</b>	Efficiency gains refer to any improvement in resource use over time as a consequence of the implementation of economic instruments to regulate emissions or product use. Water trading is regarded as leading to efficiency gains as entitlements tend to move to producers with the highest marginal returns. The criterion is difficult to assess if base-line environmental conditions or returns on investment in abatement technology are not readily available.
<b>Ongoing incentives</b>	Economic instruments, such as permit systems, that provide the incentive for perpetual self-management of emissions by industry are generally superior to those that are dependant on limited funding arrangements or require intensive administration and enforcement.
<b>Timing</b>	When environmental degradation is imminent, instruments that are readily available are preferable to those that may take some time to implement. However, implementation of an instrument without due consideration of its impacts may also create problems.
<b>Flexibility</b>	Some instruments may need to be responsive to ongoing scientific research and monitoring information to confirm their effectiveness and to facilitate any necessary adjustments.
<b>Equity aspects</b>	Economic instruments can have equity considerations that should be addressed or acknowledged in their implementation. Examples include: <ul style="list-style-type: none"> <li>(a) Charges for 'public rights' e.g. access to National Parks etc;</li> <li>(b) Differential treatment of similar entities eg targeting properties for economic incentives while neighbours are denied funds;</li> <li>(c) Flat charges or levies which act regressively, impacting most on those less able to pay; and</li> <li>(d) Charges/subsidies leading to industry restructuring e.g. cost recovery for water or prohibitively large discharge licence fees.</li> </ul>

---

<b>Transaction Costs</b>	For market-based incentives, impediments to locating and forming agreements with buyers and sellers and government intervention in trading can create high transaction costs, reducing their efficiency.
<b>Community acceptance</b>	A perception of legitimacy on the part of the community is an important requirement for economic instruments to be effective. For example community support for environmental levies can evaporate if they are seen a merely as method for increasing general revenue. Emissions caps and trading rules also require legitimacy and certainty to gain market acceptance and induce trade.
<b>Administrative feasibility and costs</b>	Financial instruments should not cost more to administer than equivalent command and control regulation and established market instruments should theoretically have low enforcement and administration costs. None the less, costs and management of the instruments should be kept within the capacity of the administering authority. As such, complex emissions trading schemes may be inappropriate for small local governments.

It unlikely that one instrument alone will achieve the desired environmental objective. “[The] complexities of the interactions between environmental and economic processes, as well as the dynamics of innovation preclude straightforward and simple broad-brush recommendations on instruments; rather context-specific and often complex (i.e., mixes of elements of command and control, incentive and suasive natures) instruments will have to be developed.” (Turner and Opschoor, 1994: 33). In brief, correcting market failure by internalising externalities requires a carefully designed economic tool, or a combination of tools, based on robust science and embedded within a comprehensive legal and policy framework. Such tools would need to reward achievement as well as set and maintain regional minimum standards.

There is a need, therefore, to attend to the broader policy framework such as regulatory tiering and the promotion of ecosystem services in which economic and regulatory instruments work together to achieve environmental objectives.

### **3.0 Financial and market-based incentives**

The main distinction between financial and market based incentives is the role of the government in determining the allocation and distribution of the right to produce externalities. For example, the government determines the sustainable quantity of discharge through its regulatory framework. In the case of financial incentives, the government acts as a distributor of permits or rights by issuing licences or permits to discharge. In the case of market-based incentives, once the government authority has determined ownership of the rights to discharge or produce an externality, the market provides the mechanism for distribution of the rights.

#### **3.1 Financial incentives**

The financial incentives/disincentives discussed here include a number of forms of resource user charges and resource access charges. The OECD (2001) observed that although many countries already apply charges for the use of natural resources, including water, such charges often do not reflect the full external cost of using the resource and there is significant scope for increasing the use of these economic instruments (OECD, 2001: 291).

### 3.1.1 Performance bonds

In an environmental planning context, bonds, which are a legally enforceable obligation to pay specified sums of money at specified future dates (McTaggart et al, 1994), can be required to cover the cost of remediation of potential environmental damage arising from a licensed activity. Bonds require the developer to internalise the risk costs associated with the activity, and shift the burden of proof for environmental damage, or lack thereof, from society to the producer (ABARE, 2001).

Power to require bonds is held by a number of licensing agencies under various heads of power (see Table 2).

**Table 2 Scope of various agencies to impose environmental performance bonds**

Agency	Activity	Act
Environmental Protection Agency	All environmentally relevant activities and environmental authorities for mining	<i>Environmental Protection Act 1994</i>
	Coastal Development	<i>Coastal Protection and Management Act 1995<sup>6</sup></i>
Dept. Natural Resources and Mines	Quarrying in Deed of Grant in Trust or Freehold Leases	<i>Forestry Act 1994</i>
	Grants of Mining interests	<i>Mineral Resources Act 1989</i>
	Seabed leases	<i>Land Act 1994</i>
Dept. Primary Industries	Interference with fisheries resources	<i>Fisheries Act 1994</i>
Great Barrier Reef Marine Park Authority	Licensed activities within the Park	<i>Great Barrier Reef Marine Park Authority 1975</i>
	Aquaculture within 5km of High Astronomical Tide (HAT)	<i>Great Barrier Reef Marine Park (Aquaculture) Regulation 2000</i>
Environment Australia	Activities likely to have a significant impact on a matter of national significance	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>

The most prominent use of bonds in Queensland has been for the mining industry where they are referred to as "provision of security". Generally, an applicant for a mining interest must deposit security to cover the costs of remediation, amounts payable under the *Mineral Resources Act 1989*, and to ensure compliance with the environmental authority under the *Environmental Protection Act 1994*. Since the introduction of the 'Environmental Management of Mining' policy in 1991 the amount of security held by the Department of Natural Resources and Mines increased from about \$5 million in 1991 to more than \$370 million in 1997 representing almost half of the total cost of rehabilitation of mining operations at the time (Natural

<sup>6</sup> Per amendments contained in the *Coastal Protection and Management and Other Legislation Amendment Act 2001* due to commence in 2002.

Resources and Mines (NR&M, 2001). The shortfall is due to a categorization system that allows operators to reduce their security by 15-75% through meeting performance criteria that lower the risk of non-performance (NR&M, 2001).

As a result of these incentives, the rehabilitation rate of mines in Queensland increased to about 22%; the quality of rehabilitation improved and environmental compliance assessment program audits increased from seven in 1994-95 to more than 120 in 1997-98 (NR&M, 2001).

A review of the use of performance bonds in mining by James in 1997 found them to be innovative and effective because a required outcome was declared at the outset of the mining activity; they encouraged innovation and compliance from mining companies to avoid losing the bond; and work towards lower bonds for future ventures.

The use of bonds appears to have been less prevalent in other sectors. In the Great Barrier Reef Marine Park all permits for commercial operations include a requirement to enter into a deed of agreement binding the permit holder to certain obligations, such as bonds for structures other than vessel moorings (GBRMPA, 2001). This is an example of tourist ventures taking responsibility for any potential environmental damage, so that the marginal private costs equate with the marginal social costs.

The EPA currently only requires bonds for mining and transport of hazardous wastes. Bonds are also uncommon for fishing activities regulated under the *Fisheries Act 1994*.

Thus, while bonds appear to have had some effect in the mining sector for rehabilitation of a site, there has been limited application elsewhere. There is significant scope for the use of bonds to be extended to contingent risk activities such as aquaculture,<sup>7</sup> dredging and extractive industries. In this context, there is scope for bonds to be set as an assurance that a firm issued with a licence, which has conditions of operation specified, actually meets or operates within those conditions. For example, extractors of sand and gravel from an in-stream operation require a licence to operate which has conditions of operation specified. If a bond were set subject to the on-going operation of the firm, and if the size of the bond were influenced by the past record of the performance of the firm in the industry, this would provide an incentive for environmentally sustainable operations.

There are two aspects of the bond system that could be enhanced. Firstly, the size of the bond is currently estimated, in the case of mining, from the leaseholder's own experience/performance, advice from other miners, quotes from contractors, or advice from departmental officers (James, 1997: 61-62). Science could play a more prominent role in the exercise by identifying specific areas and ecosystems that are most at risk of environmental damage from the activity, both in the short and long term, and specifying the level of restoration required. This would legitimize the setting of bonds at realistic levels by using them as an assurance of the environmental sustainability of the operation according to scientifically valid performance criteria

---

<sup>7</sup> Bonds may be required for Aquaculture under the EP Act, GBMPA and EPBC Act and were listed as "a key issue for consideration in approving new aquaculture" in the *Cardwell- Hinchinbrook coast: managing its future, A position paper on coastal management in the Cardwell-Hinchinbrook region*.

accommodating reductions, or increases in the bond at critical stages in the life of an economic activity.

Secondly, that the system of performance categorisation requires the EPA to calculate the risk the company presents and therefore the likelihood that the bond will be forfeited. The economic efficiency of the bonds may be improved and bonds set more realistically if companies covered their liability by taking out insurance for the full rehabilitation costs. Financial institutions, operating through the insurance market, could assess the risks that the company poses and adjust the premiums accordingly. It has been reported that in some situations depreciation has eroded the value of a bond to the level that it is insufficient to meet the costs of rehabilitation. Using the insurance market might resolve this problem.

### 3.1.2 User charges for environmental amenity

User charges for environmental amenity require those who access areas set aside for their natural beauty to contribute to maintaining those attributes. This is based on the ‘user pays’ principle requiring individuals to internalise costs of degradation by use of the goods and services offered by natural resources. Powers to apply user charges for protected areas in Queensland is held by a number of agencies (see Table 3).

**Table 3 Scope of various agencies to apply natural protected areas user charges**

Agency	Activity	Act
Queensland Parks and Wildlife Service	Guided tours and camping in Protected Areas	<i>Nature Conservation Act 1994</i>
Queensland Recreation Areas Management Board (EPA)	Access to a declared Recreational Area; eg Fraser Is. and Moreton Is.	<i>Recreational Areas Management Act 1988</i>
Great Barrier Reef Marine Park Authority	Most commercial operations in the Great Barrier Reef Marine Park	<i>Great Barrier Reef Marine Park Act 1975 and Regulations</i>

These charges have all been applied to varying degrees and proven useful for meeting a proportion of the costs of operating and maintaining the facility but their use is often restricted due to equity considerations. It cannot be expected that individuals using these areas meet the whole cost of maintaining a resource that benefits the entire community.

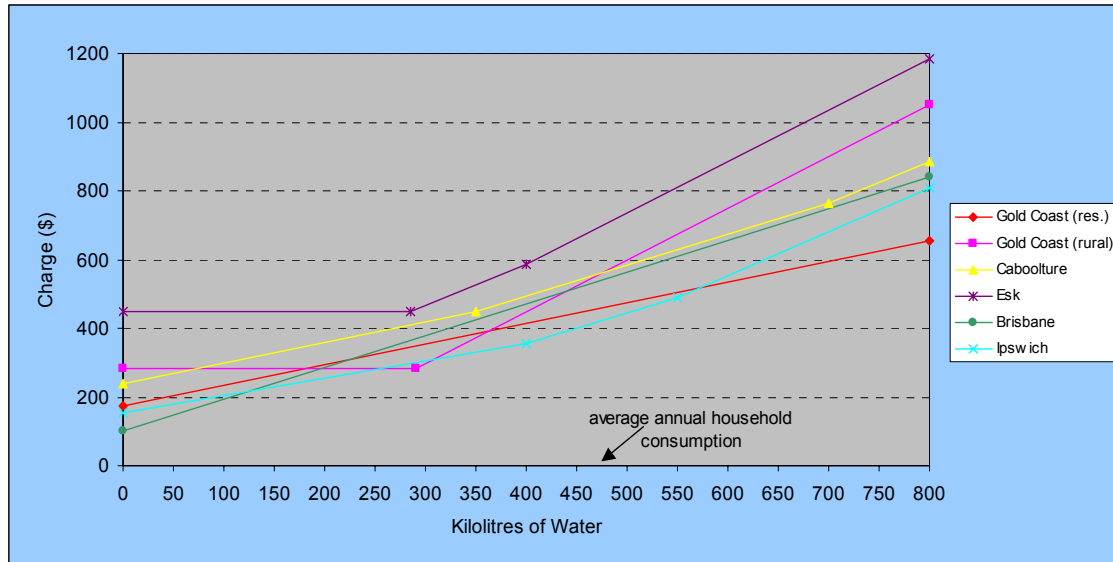
### 3.1.3 Resource use charges

Similar to user access charges, resource use charges alter the price of a resource to reflect the social cost of its maintenance: individuals are expected to meet the cost to the environment resulting from resource use. This facilitates agencies providing incentives for economic agents to internalise environmental costs and encourage economically and environmentally sustainable efficient use of the resource.

A common user charge is that for water. This is primarily administered through licences issued under the *Water Act 2000* by the Natural Resources and Mines (agricultural water users are dealt with in Section 3.5.1). Urban water users are usually supplied as part of the services provided by local government or corporations with prices determined by the water supply agency. Most local governments in SEQ apply, or are moving towards applying, volumetric charges for water. Water use in

Brisbane was reduced by 20% between 1995-6 and 1996-8 after the adoption of metered volumetric charging (OECD, 2001a). Figure 3 illustrates the range of pricing structures currently applied in SEQ.

**Figure 3 Various Water Charging Structures in SEQ**



Source: Council Budget Statements 2001-2002 and personal communications with local government officers. To be used as a rough indicator of pricing structures only, not as a determinant of actual prices. Note: average consumption of a Queensland household is approximately 470 kilolitres.

To internalise environmental costs, charges should be strictly volumetric, with no base allowance (compare Gold Coast urban with rural charges), and be calculated with consideration to environmental costs associated with the extraction of water from watercourses as well as impacts associated with management of water use (loss of habitat, costs of disposal, etc). There is, however, limited scientific information currently available to provide the basis for valid economic valuations to be undertaken to determine the environmental costs of water extraction and use. As a result, prices usually reflect the operating and maintenance costs to authorities of supply which are not inclusive of environmental costs.

Another instance for the implementation of resource use charges has been observed by the Intergovernmental Committee for Ecologically Sustainable Development (1996), which indicated that 'following the National Forest Policy Statement, government agencies are moving towards cost recovery for the use of native forests'. This suggests that cost recovery could, in the future, extend beyond the operating and maintenance associated with the use of native forests.

Royalties for the mining industry (as defined through the *Mineral Resources Act 1989*) are also a form of resource user charge. A royalty represents a payment to the State for the right to use the resources of the State. For the most part, royalties are used as a revenue-earning device for the State rather than an instrument or tool to manage mining resources sustainably.

## 3.2 Emission and effluent charges

Emission or effluent charges are imposed on waste outputs from premises. Currently, these charges, like the resource user charges, reflect only the physical costs of waste disposal rather than the cost to the environment. Such charges have the capacity to internalise the environmental costs of disposal of the waste and thereby encourage its minimisation. Two factors require consideration here. One is the quantity of effluent requiring disposal and the other is quality. For this discussion, no distinction is made between the two, but it is acknowledged that both are equally important.

There are two main applications of emission charges in Queensland:

- *Environmental Protection Act 1994* licence fees for environmentally relevant activities (ERAs); and
- Local government recycling, waste and sewage charges.

### 3.2.1 EPA license fees

There is two fee components to ERA licences administered by the EPA: an initial application fee (currently \$200) and an annual licence fee (ranging from \$300 to \$ 20, 540) both paid in advance. The annual licence fees are set by the category of ERA and generally increase with size of discharge and environmental harm, or risk, of the activity. These fees can be waived, partially, or in whole, based on a number of factors including: the activity poses an insignificant environmental risk or the activity poses a significantly smaller risk than most other activities of its type (this would result in a graded licence).

It might be concluded that this provides an economic incentive for the licensee to reduce the risk of their activity to the environment in order to gain reduced licence fees. However, the relatively small size of the fee, and the discretionary way in which it is assessed, mean that the mechanism does not provide a sufficient incentive for licensees to alter their management practices. Factors used in assessing risk include compliance with industry codes of practice, cleaner production techniques, waste minimisation programs, and implementation of emergency/contingency plans. These are not directly tied to emissions or to any scientific assessment of the impact of the activity on the environment.

As was the situation for performance bonds and resource use charges, there is scope for the enhanced use of science and economic evaluation techniques to assess the relative impacts and costs associated with pollutant loads, and to set licence fees accordingly.

Pollutant load-based licensing has already been applied in Victoria and NSW for several years. In NSW, licensees can calculate current and potential fees using an online calculator. This allows firms to immediately assess their emission costs and adjust their management decisions accordingly.

### 3.2.2 Local government waste charges

Councils are increasingly charging on a 'user pays' basis for the provision of services, which impact on the environment, such as waste disposal and sewage treatment (see Table 4).

**Table 4 Various waste disposal charges for council tips and waste transfer stations**

<b>Council Area</b>	<b>Rubbish User Charge</b>
Caloundra	Volumetric
Noosa	Volumetric (recyclables excluded)
Ipswich	Generally volumetric charges with some exceptions for limited amount of domestic waste from shire residents
Laidley	Mostly volumetric charging, higher rates for businesses and non-shire residents.
Beaudesert	Volumetric charging with some base allowances for residents
Brisbane	Volumetric charging with limited residential permits
Goldcoast	Free for residents, various non-shire and commercial charges.
Redland	Free for residents, except for tyres and motor vehicle bodies. Commercial rates are charged for vehicles of more than three tonnes.

It is difficult to determine what effect these charges have had on the volume of waste produced. Refuse that is not disposed of at the council tip may be dumped illegally or taken out of the local government area. This was the experience of Brisbane City Council (BCC) when it first introduced charging at its waste transfer stations. Residents and industries responded to the fees with avoidance action. Neighbouring shires encountered higher volumes of refuse at their free dumps. In response, the BCC issued permit vouchers, for a limited number of deposits, to each ratepayer. Disposal without a permit attracts a fee on the basis of volume. Although the permit system suggests the potential for a tradeable permit system to be introduced, the permits are currently not transferable (see discussion on tradeable permits Section 3.5.3). However, having to pay a fee after vouchers have been used is an encouragement for waste to be minimised.

### **3.3 Environmental taxes**

An environmental, or eco-tax, is a Pigouvian tax designed to compensate for a failure of the market to respond to the scarcity of environmental attributes, and encourage more sustainable practices. In short, the tax equates the marginal private costs of economic activity with the marginal social costs to encourage environmentally sustainable production. One important consideration for governments considering introducing additional taxes is acceptance by the community. Studies suggest that if the proceeds from the tax simply go into general revenue, then the level of acceptance will be low (Watson, 1995). On the other hand, where special accounts, such as trust accounts, are established for the proceeds, such as has been the case for environmental levies imposed by local councils, the degree of acceptance is much higher. This is an important consideration that might provide encouragement and improve the political will to impose such taxes.

Eco-taxes have been applied in many European countries (Hartzok, 1999). Simulation modelling conducted by the OECD shows that removing fuel subsidies in OECD countries, applying an energy tax linked to carbon and taxing all chemicals could lead to significant reductions in pollution at almost negligible economic cost (OECD,

2001). The United Nations Environment Program's *Global Environmental Outlook 3* (2002) also supported the removal of subsidies and the introduction of green taxes.

Recent work by Binning and Young (1999a:8) concluded that conservation is being hindered by rate and land tax structures in Australia. The existing rating and tax system is described as providing perverse incentives for landowners. In addition, they recommend that the tax structure be reviewed to encourage environmental improvements. In particular, they recommended that tax deductions be extended to cover more capital investments and that they are made available to private owners of conservation land not operated for business purposes.

An advantage of using a taxation system is that administrative resources are largely already in place (Boyd, 1999:10) A general problem with using the taxation system is that it is difficult to target specific properties and difficult to monitor compliance with management requirements (Boyd, 1999: 9)

Although, in Australia, all three levels of government impose subsidies and taxes, income, company and the goods and services taxes (GST) are primarily the responsibility of the Commonwealth.

### *3.3.1 Federal*

There are few federal government taxes on environmentally damaging processes, or products, that could be identified for this report. In contrast, recent studies indicate that there are a large number of subsidies granted to unsustainable industries and particularly fossil fuel industries (Riedy, 2001). The Commonwealth has however provided primary producers with tax concessions for Landcare activities on private land through the *Income Tax Assessment Acts 1936 and 1997* (ITAA) (AFFA, 2000 and ATO, 2001). Through this package of concessions, the Commonwealth forgoes income tax on a limited range of activities to prevent land degradation. These activities include tree planting, fencing and water efficiency works.

Recently the *Taxation Laws Amendment Act (No. 2) 2001* has amended the *Income Tax Assessment Act 1997* to provide income tax deductions and Capital Gains Tax concessions for landowners entering into accredited perpetual conservation covenants on their land.

Income tax concessions have proven effective in encouraging conservation activities for farms generating a taxable income. However, most concessions cover operating costs (labour, fuel etc), not capital costs (trees, equipment etc) with the exception of fencing, which covers capital costs if undertaken in accordance with an approved property management plan (NR&M, 1999). In addition, the limited range of deductible activities reduces the incentive for innovative approaches to reduce land degradation. The scheme could potentially be extended to cover activities to prevent land degradation in accordance with an approved regional plan to enhance strategic implementation.

There is scope for the Commonwealth to impose a levy on all taxpayers (similar to the Medicare levy) to fund environmental projects such as the NHT and NAPSWQ (a concept also explored to fund the Murray Darling Basin Commission (MDBC)). The architects of Landcare, Ric Farley, former director of the National Farmers

Federation, and Phillip Toyne, of the Australian Conservation Foundation, proposed that a 1% income tax levy over the next 10 years be applied to raise a portion of the \$65 billion required to reverse land degradation in Australia (NFF and ACF, 2000).

Investments in Landcare-type activities could also be made tax deductible. Similar provisions currently apply to donations to registered charities and for artistic works to public galleries.

### 3.3.2 State

One of the most significant roles played by the state in taxation incentives is in the valuation of properties. This provides the basis for local government rates and state land taxes.

In Queensland, valuation is conducted by NR&M and is currently based on the unimproved value of the land. This means that the value of any improvements is deducted from the market value of the land. These calculations are based on the highest valued use, or development potential, of the land and therefore can discourage conservation and sustainable management, which invariably means a level well short of the development potential of the land.<sup>8</sup> For large tracts of grazing country, there may be little difference between the unimproved value and the development potential of the land but, conversely, in urban and semi-urban areas there is a larger discrepancy.

Due to this perverse incentive, NR&M is currently investigating the practicability of a valuation system based on current use of the land with a 'green accreditation' scheme to reduce values, and consequently rates, on lands exhibiting conservation or sustainability use (Skitch, 2001). This approach could aid retention of native vegetation, but the change is unlikely to occur until at least 2003, if at all, and substantial scientific information would be required to assess and value eligible vegetation. The effectiveness of any change in valuation may also be limited by the ability of local government to set differential rates, and minimum rates, above the rate determined by valuation alone.

### 3.3.3 State or regional environmental levies

Under the *Rural Lands Protection Act 1985* the State could set charges for local government areas, which they can recoup through levies, or increases in general rates.<sup>9</sup> The proceeds of these charges contributed to the Rural Lands Protection Fund and could only be utilized for purposes of the Act, which were generally pest/weed control and stock routes management activities.<sup>10</sup> However, with minor amendment this system could be used by the state to levy charges on a regional or statewide basis to fund environmental objectives such as the retention of riparian areas. Acceptance of such a tax could be improved by dedicating the proceeds from the tax to specific environmental projects.

---

<sup>8</sup> Some limited environmental aspects are taken into account in determining 'best use', such as the presence of endangered regional ecosystem, or evidence of a refusal to clear land.

<sup>9</sup> See section 211 'Precepts'. The *Rural Lands Protection Act 1985* has been repealed by the *Land Protection (Pest and Stock Route Management) Act 2002*.

<sup>10</sup> See section 212 and the long title to the Act.

A Statewide levy system, administered through local governments, is also established under the *Fire and Rescue Services Act 1990*.

Regional levies across one or more local governments can also be implemented through the *River Improvement Trust Act 1940*. The *River Improvement Trust Act 1940* provides for constitution of trusts to protect and improve the bed and banks of rivers and mitigate flooding within a river improvement area. The river improvement area and associated trust are formed through an application to the Minister who may then constitute the trust by regulation. Trusts have a limited power to issue improvement notices prohibiting persons from contributing to damage from floods or cyclones. They may also require local governments to contribute to the trust through a precept. Local governments may make and levy in each year a separate rate under the *Local Government Act 1993*, upon all rateable lands in the river improvement area to repay to the trust operating fund the amount of the precept.

There are several operational river improvement trusts (RITs) in southeast Queensland (Ipswich and Boonah) that primarily undertake engineering works for flood mitigation. It is possible that with a liberal interpretation of 'banks', the mechanism could be used to restore riparian vegetation. With amendment to the long title and scope of works it may undertake, the trust mechanism could be used to achieve a broad range of water quality improvements provided they were balanced with achieving flood mitigation. Being a semi-independent statutory body it could effectively be levied in local government areas without attracting the same political repercussions as would the State or a single local government.

It may be preferable, however, to use the RIT mechanism as a template for a new statutory regional body with levying power rather than forcing an administrative and cultural shift in current RITs.

#### 3.3.4 Local government

There are at least five ways local governments may alter their rating systems to facilitate internalization of environmental costs and benefits, these are:

- Introducing full environmental costs into user charges for services provided by council (see 3.1.3 and 3.2.2).<sup>11</sup>
- Special or separate rates or charges levied on rateable land to pay for an environmental service, facility or activity of public benefit;<sup>12</sup>
- Providing for a rebate on general rates for conservation practices;
- Introducing differential rating to place higher rates of land resulting in higher degradation or reduced rates on low impact land uses;<sup>13</sup> and
- Adjusting general rates to cover cost of managing degradation processes arising from rateable land (land clearing, air pollution etc).<sup>14</sup>

#### Levies

The *Local Government Act 1939* empowers councils to levy special rates for a service, facility or activity, which benefits those upon which it is imposed. Eight local governments responded to a survey earlier this year indicating that they have used this

---

<sup>11</sup> See *Local Government Act 1993*, s963(1)(e).

<sup>12</sup> See *Local Government Act 1993*, sections 963(1)(c) 971 and 972.

<sup>13</sup> See *Local Government Act 1993*, s963(1)(a).

<sup>14</sup> See *Local Government Act 1993*, s963(1)(a).

tool to raise money for environmental purposes (LGAQ, 2001:22). At least seven councils in SEQ are applying environmental levies. In particular, larger councils with a significant rate base were found to have more capacity to implement levies.<sup>15</sup>

Levies have been used primarily to acquire bushland, often in a quite targeted and effective manner (see Table 5). The Gold Coast City Council's Acquisition Policy, for example, requires potential acquisition sites to meet a number of nomination criteria such as ecological significance (including biodiversity, Regional Ecosystem status, habitat and corridor values) and site condition. The sites must then go through a thorough assessment of values, current threats, relative merits and cost effectiveness before being included on the councils' acquisition list. Scientific assessments play a large role in this process. Other councils follow a less formalised procedure with limited reliance on science.

**Table 5 Examples of conservation land acquisition levies in SEQ**

<b>Council</b>	<b>Rate</b>	<b>Expenditure</b>	<b>Area Acquired (ha)</b>	<b>Selection Method</b>
<i>Gold Coast</i>	\$25	\$10.5M (to date)	1,140	Properties are assessed against a comprehensive Acquisition Policy.
<i>Brisbane</i>	\$30	\$46 M (to date)	1,600	Targeted at areas of strategic importance. A major focus is the protection of core habitat areas and wildlife and waterway corridors.
<i>Redland</i>	\$45 (\$20 acquisition + \$25 upkeep)	\$6,107,805	221.77575	By both nomination and targeted. Priorities determined by informal assessment of habitat values and representativeness (process under review)

*Source: Various Local Authorities as at September 2001.*

Precision is required in selecting potential acquisitions as the cost of purchase and maintenance greatly restricts the area of land that can be acquired. It is somewhat ironic that the councils with high populations and rate bases have the greatest capacity to impose levies yet for the same reasons land prices are often too high to purchase large areas. Conversely, in rural local governments, land prices are low but so are rates hence there is limited capacity to impose levies.

Due in part to the financial limitations on acquisition, some councils are utilising an environmental levy to fund a range of environmental programs such as voluntary conservation agreements and land for wildlife. Using this approach Ipswich's \$28 'Enviroplan' levy has resulted in approximately:

- Over 4500 hectares being voluntarily acquired (ICC 2000)
- 660 hectares being placed under voluntary conservation agreements; and
- 3026 hectares participating in the Land for Wildlife program; and

<sup>15</sup> This supports the findings of Hall (1990).

- funding for several other programs.

Such levies with broad objectives not only provide for a more flexible and cost-effective conservation program than those used solely for acquisition, they also appeal as a means to fund increasing environmental management demands without increasing general rates. Caution must be exercised when adopting such an approach to ensure the levy is transparent in its collection and application, has tangible outcomes and is not seen to be a means of raising general revenue or else public support can quickly evaporate (Binning et al, 1999: 78).

Using the levy for acquisition alone has the benefits of administrative simplicity, a high level of security over the land and low monitoring and enforcement costs. On the other hand restoration and maintenance may be costly<sup>16</sup> and, by restricting potentially compatible uses, the conservation outcome is achieved at higher cost (to both the purchaser and community) than a restrictive covenant (Boyd, 1999). Choosing the level at which to set the levy can also be problematic.<sup>17</sup> For some local authorities, programs for land acquisition have been constrained by the need to maintain current acquisitions. In this respect, at least one local authority in southeast Queensland has indicated that it now spends more on maintenance of acquired land than they do on acquisitions. The same council was investigating the possibility of buying land and leasing it back to the original landholder with conditions, which restrict uses incompatible with conservation.

#### Rate Rebates

Another means of funding more flexible conservation agreements is through rate rebates. Binning and Young (1999: 8) espoused the benefits of financial incentives for conservation on private land, finding that in some cases it can be ten times more cost effective than purchasing.

Local governments can offer a reduction in rates in a number of different ways (NR&M, 1998):

- By the State advocating a regulation which exempts a class of land (such as land subject to a conservation covenant or agreement) from obligations to pay rates;<sup>18</sup>
- Through a yearly remission of rates granted at the discretion of local government on application of the land owner;<sup>19</sup>
- Through a differential rating scheme by rating areas under conservation agreements at a lower level;<sup>20</sup> and
- Through cash payments calculated as a percentage of rates.

Both exemptions and differential rating are seen to be too coarse to make it easy to confine concessions to deserving properties (NR&M, 1998). The most common approach in Queensland is to offer a cash grant or yearly remission of rates in return for a landowner entering into some form of voluntary conservation agreement (VCA).

---

<sup>16</sup> Recent restoration and rehabilitation of a riparian area around Bundamba Creek by the Ipswich City Council has cost the Council approximately \$100,000 for work on one kilometre of stream bank.

<sup>17</sup> Economic valuations estimating the willingness of the community to pay may help in this regard.

<sup>18</sup> See *Local Government Act 1993* sections 957(1)(f).

<sup>19</sup> See *Local Government Act 1993* sections 1031 –1033, in particular see 1033(2)(d).

<sup>20</sup> See *Local Government Act 1993* sections 963 and 966.

Brisbane City Council (BCC) pays a ‘cash grant’ to landholders who enter into a VCA (BCC, 2001). The grant is paid as a cash rebate at the end of each financial year. The council considers that this has a stronger incentive effect than a reduction in rates payable under a rebate scheme. The amount is based on the percentage of land under the VCA and the cost of general rates. Maximum cash assistance is currently \$1500 a year, or 50% of the annual general rates, whichever is less (BCC, 2001). BCC also has provision for rate rebates for land subject to its Vegetation Protection Orders (BCC, 2001a).

Caboolture offers two levels of conservation agreements and associated rebates. The lower level agreement involves a contract with council outlining permitted and restricted management activities over the course of a 25-year management plan. Although there are no rebates associated with the lower level agreement, free trees are supplied. The higher-level agreement requires a restrictive covenant on the land and, in some cases, the council is granted the first right of refusal for purchase. In return the council offers a 50% rebate on rates or \$300 (an amount that increases with increasing area), whichever is the lesser. Eligibility for these arrangements is based on the property’s possessing a number of environmental attributes including:

- Remnant vegetation and ecosystems;
- Rare, vulnerable or endangered flora or fauna;
- Corridor linkages; and
- Visual, open space/landscape or cultural heritage values.

Ipswich has a broad range of agreements, which attract rebates (see Table 6). Some of these include rezoning of the land to a rural conservation precinct which, limits clearing and subdivision sizes. Although such restrictions could potentially devalue the property, some properties may gain a market advantage by being part of a green development. The Gold Coast City Council also offers a range of conservation agreements and associated incentives (Table 7).

**Table 6 Agreements supported by rebates from the Ipswich City Council**

Program	Obligations	Incentive	Area (Ha)	Site Selection Method
Vegetation Retention Agreement	None	Grant equivalent to 33% of general rates	229	All Guided by Nature Conservation Strategy based on Regional Ecosystem types and local considerations.
Rural Conservation Agreement	Rezoning to Rural Conservation Precinct	Grant equivalent to 66% of general rates	92	
Nature Conservation Agreement	Management Obligations and Rezoning to RCP	Grant equivalent to 100% of general rates + material assistance	339	
Environmental weed control rebate	Covers cost of weed control but NOT declared weeds	50% of rates up to \$400		

Source: Ipswich City Council 2001.

**Table 7 Conservation Agreements Available from the Gold Coast City Council**

<b>Title</b>	<b>Requirements</b>	<b>Incentive</b>
Higher Voluntary Conservation Agreement	Covenant placed on land + property placed in Conservation Domain + Property Management Plan + annual inspections	Up to 100% of rates remitted (thus not collected and rebated) + up to \$2000 management costs
General VCA	Property Management Plan and annual inspections	20-50% of rates remitted + up to \$2000 management costs

Source: Gold Coast City Council 2001.

Conservation agreements under the *Nature Conservation Act 1992* may be registered as an encumbrance on the land title that binds successive purchasers.<sup>21</sup> Similarly, the *Land Title Act 1994*<sup>22</sup> allows land to be subject to a covenant by registration, which relates to the conservation of a physical, or natural feature of the lot, including soil, water, animals and plants. Voluntary conservation agreements recently brought the total number of declared nature refuges in Queensland to 73 protecting an area of more than 35,000 hectares.

While the number of councils involved in this program is steadily increasing, many of the smaller councils have yet to provide a rate rebate program. This may be due to their rate bases being too slim to tolerate even a small remission. Some councils, such as Ipswich, have avoided this problem by funding the incentive programs with a levy. Others such as Johnstone Shire Council have relied on Natural Heritage Trust funding to establish an effective rebate program (Johnstone Shire Council, 2001). It has been recommended that further rate and tax relief be funded by State and Commonwealth governments, as part of a package of measures for improved conservation of remnant vegetation and habitat (Lockwood et al, 1999). There could be scope for similar arrangements, particular for securing riparian vegetation, through the federal National Action Plan for Water Quality and Salinity (NAP).

The reliance of rebate schemes on voluntary arrangements may result in habitat being secured in a piecemeal fashion but it avoids the risk of local government's liability to pay compensation if they unilaterally alter a planning scheme, or planning scheme policy, to reduce the development potential of land.<sup>23</sup> Liability for compensation payments is a major consideration for councils considering altering a planning scheme.

Also rate and tax relief are likely to be a major incentive where they are high, such as in coastal areas. Otherwise they simply reinforce existing motivations of landholders (Williams, 2000: 51).

<sup>21</sup> See sections 45, 51 and 134

<sup>22</sup> See section 97A(3)(b) Note: these are still subject to s181 of the *Property Law Act 1974* which allows restrictive covenants to be modified or removed under certain circumstances by application to the courts.

<sup>23</sup> See *Integrated Planning Act 1997*.

### **3.4 Other financial incentives**

The 'Land for Wildlife' program offers financial incentives in the form of free trees, informal networks, and landholder recognition in return for a non-binding agreement to retain habitat areas on their land. This has been by far the most popular private conservation program with 1051 registered landholders across 57 councils (including most of the SEQ councils) and covering a habitat area of 49 981 hectares within 72 103 hectares of property (LGAQ, 2001:24).

The Queensland government also conducts financial incentive programs such as those through the EPA's Sustainable Industries Division, including:

- Solar Hot Water Rebate Scheme, \$3 million/year;
- RAPS Program \$1.3 million/year;
- Renewable Energy Pumping Scheme \$2 million over four years;
- Renewable Energy Diesel Replacement Scheme \$28 million over four years;
- Working Properties Rebate Scheme \$12 million over four years; and
- Qld Sustainable Energy Innovation Fund \$1 million/year.

### **3.5 Market based incentives**

Market based incentives require the government to delineate property rights over the use of resources, including water, fisheries, the disposal of emissions and, more recently, goods and services provided by ecosystems. A freely operating market is expected to determine the distribution of those rights. Establishment of a market in the services provided by ecosystems, such as carbon sequestration and water filtration, is anticipated to lead to investment by landowners in maintenance, or protection, of ecosystems.

Marketing of permits or rights to use a resource, tradeable resource use rights, operate by determining the sustainable rate of utilising a natural resource and allocating permits for use up to that rate. This allows the scarcity of the permits to be reflected in their cost. By making the permits tradeable, those operators who can use the resource more efficiently can sell excess permits for additional revenue or buy out inefficient users. The result is that the use of the resource passes to the most efficient operators or highest value uses so that the setting of the sustainable limit is met at the lowest cost to the community.

The market incentives proposed and trialed for trade and legal transfer of goods and services provided by ecosystems including offsets and conservation banking have the overall objective of ensuring "no net loss" or "net gain" to the environment as a result of development. Instruments including habitat offsets or credits and carbon and salinity credits are an attempt to encourage investment in ecosystem services. Identification and valuation of the goods and services provided by ecosystems facilitates the use of instruments such as tax concessions and habitat credits. These instruments encourage investment by land managers in best management practices internalising the benefits landholders create for the community through retaining and restoring natural areas. In other words, these instruments help pay landholder for the ecosystem services their land and natural assets provide. There is a growing body of Australian publications relating to establishing markets in the provision of ecosystems

services (see, for example, Binning et al, 2002). Identification of the services provided by an ecosystem could provide the basis for determining the habitat credits associated with land that may be marketed for conservation banking or as an offset.

### 3.5.1 Tradeable water entitlements (TWE)

To create a system of tradeable resource rights in water, (and therefore legally transferable) the Queensland Government has enacted the *Water Act 2000*. The relevant sections of the *Water Act 2000* aim to “advance sustainable management and efficient use of water” primarily through the development of water resource plans. Under the Act, such plans are envisaged to set ‘environmental flow objectives’ (EFOs) for the protection of the health of natural ecosystems for the achievement of ecological outcomes. They also allow for the allocation of tradeable water entitlements. Most applicants for a new, or increased water allocation are required to have an approved land and water management plan (LWMP) before taking up their allocation.<sup>24</sup> These plans may be used to help reduce sediment runoff and enhance water quality through best practice irrigation techniques and retaining riparian vegetation.

There are a number of legal, scientific and economic difficulties this market has yet to deal with:

- Firstly, the science utilised in planning process, though sophisticated, still has a significant degree of uncertainty due, in part, to the variability of Australia’s climate. This creates problems in over-allocated systems where scientific information is required to justify a reduction in water entitlements. The reductions in allocations may be challenged in court and lead to expensive and lengthy scientific debate. Scientific uncertainty can also be a problem in under-allocated systems as there is a temptation to sell or auction off the remaining water allocations, leaving little scope for revising the EFOs upward in the light of future science. Once property rights are granted in water they are difficult and expensive to ‘claw back’, requiring revisions of water resource plans, which are to be reviewed every 10 years.
- Secondly, the Act provides for EFOs for “the achievement of ecological outcomes”, broadly defined as “a consequence for an ecosystem in its component parts specified for aquifers, drainage basins, catchments, subcatchments and watercourses”. The *Water Resources (Boyne River Basin) Plan 2000* includes the following ecological outcome “River flows are to be managed ... to allow for an increase in the frequency and duration of marine conditions in the estuarine reach downstream of Awoonga Dam leading to a shift towards plant species that tolerate the increase”<sup>25</sup>. Coffey (2001:416) suggests “this ecological outcome is arguably a negative outcome” though “it appears that ecological outcomes are not envisaged by the Act to be negative”. Coffey (2001:418) also observes that in relation to environmental flow objectives, “the draft Burnett Basin plan proposed a level representing a limit of flow regime that used the minimum safety margin suggested by the [Technical Advisory Panel]”. However, at one reference site the final plan set “three of the five environmental flow objectives ... beyond the environmental flow limits proposed in the draft Burnett Basin plan”.

---

<sup>24</sup> *Water Act 2000* Section 73 see also NR&M (2000).

<sup>25</sup> *Water Resources (Boyne River Basin) Plan 2000 SL No. 358 of 2000, s7(g)*.

- Finally the decision whether or not to trade in entitlements is largely an economic question for the water user. Queensland's only experience with water trading has been in the Mareeba-Dimbulah Irrigation Area (NR&M, 1999a). Water allocation holders have been unwilling to trade, as the revenue they would receive from the sale would not offset the risk of having insufficient water if rainfall was low or if they changed their crops in the future (Robinson, 2000).

The OECD (1999) suggests that water use is less amenable to tradeable permits systems due to:

- Higher transaction/transportation costs;
- Limits on direction of trade (i.e. downstream);
- Limits on market size (often restricted to one water body or catchment); and
- Increased importance of time and place of use or concentration of emissions.

In brief, designing tradeable permit systems for water is difficult and many of the attributes of a competitive market are currently not present in the market for water entitlements. If authorities carefully design the market, setting the rules and facilitating low cost exchange, some of these difficulties could be mitigated. Tradeable water entitlements have become firmly entrenched in NSW and Victoria and were promoted by the 1992 Industry Commission's review on the basis of economic efficiency.

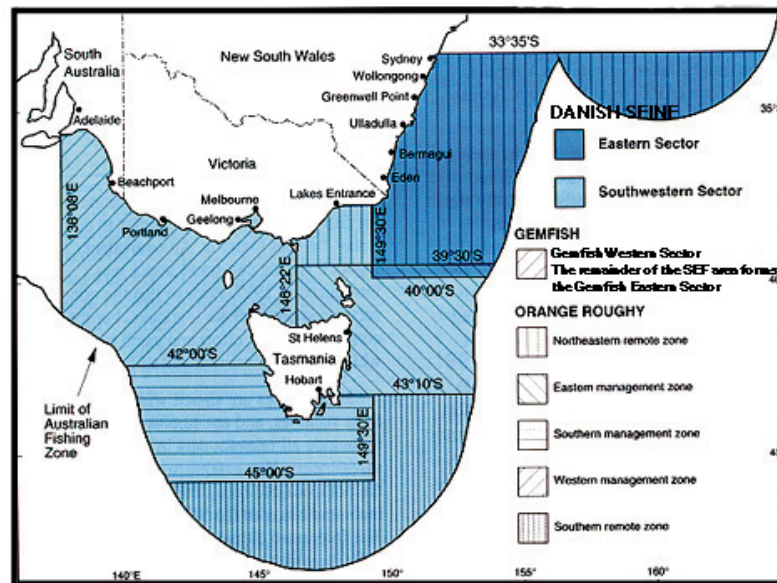
### *3.5.2 Tradeable fish quotas*

Tradeable fish quotas operate by determining the maximum sustainable yield (or Total Allowable Catch) of a given fish species and allocating Individual Tradeable Quotas (ITQs) to the operators in that fishery. Australia has ITQs for 16 species of fish in the South East Trawl Fishery including the Eastern Gemfish and Orange Roughy (see Figure 4).<sup>26</sup>

---

<sup>26</sup> AFMA (November, 2001) "South East Trawl Fishery"  
<http://www.afma.gov.au/fisheries/south%20east%20trawl/default.php>

**Figure 4 South East Trawl Fishery**



Management boundaries within the South East Fishery trawl sector. The management area for the non-trawl sector extends from the Western Australia – South Australia border to Fraser Island (Old) with the exception of areas subject to State control.  
**Source: BRS Fishery Status Reports 1998**

There are also national tradeable quotas, as part of the Statutory Fishing Rights (SFRs),<sup>27</sup> for several fish species including the Southern Blue-Fin Tuna.<sup>28</sup> State run systems, such as in NSW, also utilise ITQ systems or adaptations.<sup>29</sup> In Queensland ITQs exist for the Spanner Crab under the *Fisheries (Spanner Crab) Management Plan 1999*.<sup>30</sup>

Rationalisation of fleets in fisheries using individual tradeable quotas has led to higher economic returns to operators and the industry as a whole.<sup>31</sup> Despite this apparent economic success, difficulties in estimating the total allowable catch have limited the ecological success of the system.<sup>32</sup> In addition, trawl fishing is by its very nature imprecise. Of the 300 species caught in the nets only 90 are commercially valuable leaving 37-58% of the catch to be discarded.<sup>33</sup> Hence, even if a sustainable yield for a species can be determined it, may be difficult to exclude that species from the nets when fishing for other species.

These practicalities limit the use of market based allocations in achieving sustainable use of fish resources.

<sup>27</sup> Section 31 of the Fisheries Management Act 1991

<sup>28</sup> Organisation for Economic Co-operation and Development (OECD) (1999) *Implementing Domestic Tradeable Permits for Environmental Protection*. OECD: Paris, France p19.

<sup>29</sup> See NSW Fisheries Management Act 1994 and “Reimbursing the Future” p117.

<sup>30</sup> See section 23.

<sup>31</sup> James (1997) p73.

<sup>32</sup> “Reimbursing the Future” appendix 1 p22.

<sup>33</sup> Bohm, C (2001) “Communities and Fisheries Management: the South East Trawl Fisheries in Profile” pages 4.1-4.7 in *Finding Our Seagrass Roots: Practical Approaches to Coastal Sustainability*, proceedings of the EDO Network Conference: Brisbane.

### 3.5.3 Tradeable discharge rights

Tradeable discharge rights create property rights in the assimilative capacity of the environment. This allows the scarcity of environmental assimilative capacity to be represented in the market place leading to its allocation to the highest value uses and allowing emissions reduction to be achieved at low cost to industry.

To establish a system of tradeable emission permits, the assimilative capacity of the environment is determined and set as the maximum allowable total emissions. Permits are issued for emissions up to that level and all agents producing emissions are required to have permits to emit. Any emission by an agent in excess of those allowed by its permit would cause the agent to face severe monetary sanctions (Tietenberg, 1996:337). This process requires both robust science to determine a maximum limit that will stand up to intensive scrutiny as well as a strong regulatory framework to define the property rights, provide a system of allocation of permits, set an enforceable cap and establish penalties for breaches.

Tradeable permits allow companies with high costs of abatement to purchase emission rights from those emitters who can reduce emissions at a lower cost encouraging investment in abatement technology and reducing the overall cost of achieving the reduction in emissions.

There are several mature emissions trading systems in Chile, Canada and the United States of America. In addition, international carbon trading systems may come into place through the Kyoto protocol to the Framework Convention on Climate Change (ABARE, 1998). OECD analysis suggests that international emission trading would lower the cost of emission abatement to Australia by 50 per cent (Cornwell et al, 1997:xi).

There is a range of tradeable permit systems currently in place in Australia, including:

- The Commonwealth has set a target of an additional 9,500 GWh of renewable energy by 2010, by requiring electricity generators to source a percentage of electricity sold from renewable sources. Generators of electricity from renewable sources are granted certificates for the amount generated which they can trade on the open market. This ensures that the highest price is obtained for the renewable generation activities and allows the target to be met at a lower cost to non-renewable generators.
- Salinity credits have been introduced within the Murray-Darling Basin which are tradeable between the irrigation districts of NSW, Victoria and South Australia (Cornwell et al, 1997:5) but the opportunities for trade is presently limited (NSW EPA and DLWC, 1998).
- The Hunter River Salinity Trading Scheme provides for tradeable salt discharge permits between 11 coal mines and two large power stations (Cornwell et al, 1997:5). The NSW EPA claims that the scheme has been successful in achieving its stated objectives but that few trades have taken place (NSW EPA and DLWC, 1998).
- The South Creek Bubble Licence Scheme was established by the NSW EPA to reduce phosphorus levels in the Hawkesbury-Napean river. The EPA sets an aggregate load limit for the bubble and allows Sydney water to allocate the load between the three sewage plants in the area, implying a 'trade' between the sites (Cornwell et al, 1997:5).

- New South Wales is researching also the possibility of implementing non-point source trading schemes for phosphorus discharge (ICESD, 1996).

The federal government has entered into a lengthy negotiation process to assess the design of a carbon trading system in Australia, although it is unlikely to be established until the international framework is established.

There is currently limited use of tradeable permit systems in OECD countries and considerable scope for their introduction. They can provide substantial efficiency gains provided transaction costs are low, there are clear rules on ownership rights and obligations, together with effective monitoring, reporting and legal enforcement (OECD, 2001:301).

Despite the uncertain future of the Kyoto Protocol, and therefore any enforceable legal framework for the international trade in carbon emissions, there has been speculative investment in credit-generating sinks. To facilitate this, the Queensland Parliament amended the *Forestry Act 1959* and *Land Title Act 1994* in 2001 to separate ownership of timber harvesting rights and carbon rights in a stand of trees from ownership of land (NR&M, 2001a). This protects the interests of investors in sequestered carbon against changes of land title thereby encouraging speculative investment. Although there are few formal emissions trading in Queensland, facilitating speculative investment in carbon sinks may encourage farm revegetation. There remains significant scope for the application of tradeable permits in Queensland with the benefit of knowledge accumulated from other states and countries.

Some relevant considerations include:<sup>34</sup>

- **Nature of emission source:** Tradeable permits are mainly useful when dealing with point source pollution where it is feasible to measure discharge from individual sites (ABARE, 2001), such as nutrients from sewage treatment plants. They are inappropriate for non-point source problems such as sediment loads from stormwater.
- **Determining cap and participants:** Greater numbers of participants reduce the marginal cost of abatement and hence increase economic efficiency. In 1991, the Industry Commission estimated that the cost of reducing green house gas emissions would be lower if a tradeable permit system was national rather than State based. However, it is more difficult to set caps for larger areas due to regional variation in assimilative capacity, and large areas increase the risk of creating hot-spots (local increases in emissions fuelled by purchase of distant permits). This risk can be mitigated by allowing only localised trading or maintaining local environmental constraints (for example, Air Quality National Environmental Protection Measure)<sup>35</sup> so that obtaining the appropriate quantity of permits is a necessary but not sufficient condition for emitting. NSW appears to have avoided these difficulties by creating

<sup>34</sup> Adapted from Cornwell et al, 1997:xi and OECD, 1999:11-12, 14-15 and 26.

<sup>35</sup> National Environmental Protection Measures are passed by the National Environmental Protection Council which is established by corresponding federal and state legislation (*National Environmental Protection Council Act 1994* (Cth) and *National Environmental Protection Council (Queensland) Act 1994*). Responsibility for enforcing these measures rests largely with the States. See <http://www.nepc.gov.au/>

small markets, which are administratively more manageable and allow the processes to be refined before application to larger markets.

- **Defining the permit:** Defining the scope of a permit (pollutant type and circumstances of generation/ sequestration) is essentially a scientific exercise where as the size of the permit (i.e. 1 kg or 1 tonne etc) is a question of economic and administrative efficiency. In any case, the permit should be defined with enough legal certainty that they can confidently be traded.
- **Method of permit allocation:** Initial allocation of permits is a critical issue. Despite a theoretical preference for an auction approach, “grandfathering” of the initial permits has been applied to virtually all applications in practice. Only the US sulphur trading system also auctions permits to correct market imperfections, allow newcomers and reveal important market information about the marginal cost of abatement.
- **Administrative structure, monitoring and enforcement:** Tradeable permit systems are often perceived as requiring costly monitoring though any effective system would require monitoring. A prerequisite for the successful implementation of tradeable permits is a credible system for their enforcement. Thus, they must be supported by some kind of legislative enforcement structure. Another key issue is that tradeable permit schemes must be compatible with the existing regulatory framework. This has been one of the reasons for its slow uptake in Europe.

#### 3.5.4 Offsets and conservation banking

Offsets refer to a broad range of circumstances by which a loss, or gain, in ecosystem resources in one area is compensated by a similar loss, or gain, in another. It requires landholders who create an environmental impact in an area to offset this impact by investing in conservation elsewhere. This provides a means of channeling private funding to the conservation of key habitat areas (see Section 2.2 for a discussion about markets in ecosystem services).

On-site offset and mitigation measures have been required in Queensland for many years both through infrastructure charges for development approval under the *Integrated Planning Act 1997* and through land surrender powers under the *Coastal Protection and Management Act 1995*.<sup>36</sup> Offsite mitigation measures, usually in the form of compensatory habitat, have also been accepted as a condition of development approval. Mitigation banking, however, has yet to be applied in Queensland though it has had some apparent success in the US and is being investigated for formal implementation in Western Australia (WA EPA, 2001).

One potential use of an offsets policy is for the impacts of native vegetation clearing on one property to be offset by action on another property to increase or improve native vegetation. It is envisaged that this could lead to a market for credits. The main advantages for such a market include the potential for increased regional development by providing opportunities for new enterprises, possibility for farm incomes to be diversified by earning credits for maintaining high valued ecosystem habitats, and finally, that this approach offers a cost-effective way to ensure remediation. There are however a number of obstacles including the lack of accurate scientific data to ensure

---

<sup>36</sup> Land surrender powers were previously established under the *Beach Protection Act 1968* and will be transferred to the *Coastal Protection and Management Act 1995* by amendments commencing in 2002.

a net gain or at least no net loss, that there are likely to be high costs associated with undertaking these transactions, including search costs, that there is a need to establish an institutional framework for administering and monitoring habitat trade and finally, the relatively small market that currently exists in this area could constrain their use. Considerable work is in progress in this area to design a set of criteria for estimating the “worth” of a habitat area (see for example, Gibbons et al, 2001).

In the US, conservation banking arose from legislative provisions which adopted the principle of “no net loss”, or “net gain”, and required mitigation efforts to be undertaken to ensure that there is no net loss of environmental amenity resulting from development.<sup>37</sup> Mitigation can involve minimisation of environmental impact, rectifying environmental impact, avoiding or eliminating environmental impact, or compensation for environmental impact. Conventional mitigation requires environmental mitigation, usually in the form of compensation, to be provided on-site. This means that the developer sets aside a part of the development site to ‘compensate’ for environmental damage elsewhere on the site. This conventional form of mitigation has more recently been developed into the concept of conservation banking.

Conservation banking, such as wetland banking, provides a mechanism for the restoration, enhancement, conservation or creation of habitat, principally through the establishment of “banks” in advance of anticipated losses (WA EPA, 2001). For restoration and conservation activities in valuable habitat areas, or banks, the government determines and grants a number of “credits”. Developments that could adversely impact on the environment are required to offset any unavoidable impacts by the purchase of these credits in the desirable conservation area; performance bonds could be used to ensure the credits were met (see Section 3.1.1 for discussion about performance bonds). Developers can meet mitigation obligations through the purchase of the credits without having to be involved in the restoration themselves. This enables speculative investment where entrepreneurs restore large areas to gain credits for later sale (i.e. a habitat bank).

Conservation banking requires a public authority to determine the activities and areas, which will generate credits and the range of impacts requiring the purchase of credits. This process also involves an assessment of the relative value of ecosystems, for example whether the loss of one hectare of rangeland to development is worth the restoration of one hectare of wetland habitat. Considerable scientific understanding of the ecosystems is required to support such a system which favours a state-sponsored system to pool scientific expertise. There would also need to be a state register of those who own credits and other infrastructure to facilitate brokerage. It is also unclear whether habitat credits can be required as a condition of development approval under the *Integrated Planning Act 1997*, legislative amendments may be required to enable an offset system.

### 3.5.5 Tradeable development rights

Related to the offsets concept are tradeable development rights (TDRs) (tradeable and therefore legally transferable). Tradeable development rights are proprietary rights

---

<sup>37</sup> Norling (2001) cites references to mitigation banking in the supporting guidelines to the *Federal Endangered Species Act 1973*; Section 404 of the *Federal Clean Waters Act 1977*; Section 10 of the *Rivers and Harbours Act 1899* and wetland provisions of the *Food Security Act 1985*.

that are granted to a landowner in return for accepting development limitations on their land. Tradeable development right systems enable those rights lost through conservation restrictions to be compensated by planning concessions exercisable within a defined area of the planning scheme (Boast, 1984). This limits the need for government to pay financial compensation for restricting development potential in sensitive areas and enables the landowner to recoup their costs through use or sale of the rights.

These schemes have been implemented for over a decade in regard to heritage buildings through planning schemes in New York and Chicago in America and Adelaide, Brisbane and Melbourne in Australia (Arnold, 1991). Brisbane's TDR system was implemented in the late 1980s by Brisbane City Council Ordinance 22 (Manning, 2001). Ordinance 22 allowed restrictions on heritage buildings within the CBD (such as limits to floor space) to be compensated by permitting extra development on non-heritage property sites. The proprietary nature of this tradeable right has been established by case law in several States.

Manning (2001) has described the TDR scheme currently being operated in relation to conservation in the Johnstone Shire Council. The Shire planning scheme designated two zones: a Rural Conservation Zone and a Conservation Zone. The use rights in the Rural Conservation Zone were identical to those in the former planning scheme in the Rural Zone. The Conservation Zone, on the other hand, removes certain use rights and protected habitat values. Private land owners were then encouraged to rezone their land from the Rural Conservation Zone to the Conservation Zone in return for bonus TDRs which allowed additional development (such as a reduced minimum allotments size) provided it was compatible with the planning scheme. The Australian Rainforest Foundation recently used these provisions when it purchased and secured a Cassowary habitat corridor in return for bonus rights which it intends to sell in order to establish a rolling fund for the purchase of further habitat. It must be noted, however, that this system operates under a transitional planning scheme and the authors are not aware of any operational TDR systems under the *Integrated Planning Act 1997* planning scheme (though a similar system has been proposed for Douglas Shire Council).

An alternative American model described by Boyd (1999:10) uses the "cap and trade" approach whereby a limit, or cap, is set on the area available for development within a region and development rights are issued up to that cap. Trade in development permits should result in the developable area going to its highest value use and therefore restricting development in an economically efficient manner. Traded on an open market, such rights are expected to result in the development of the highest value area and conservation of areas of lowest development value. If the restriction is set below the current level of potential development, there may be a net cost, or opportunity cost, to land holders. There is also a risk that the highest development value of land coincides with the highest conservation value resulting in a loss of the best areas of conservation land. In addition, if the potential development areas are made small, the market may be too thin to be a cost effective redistribution system. Dealing with these difficulties creates a number of administrative challenges.

Internationally, trials of TDRs have been viewed as encouraging (UN ECOSOC CSD IPF, 1996) though the OECD (1999:11) recognises that legal issues resulting from

trying to separate land rights, i.e. the right to develop from land ownership, have restricted the application of tradeable permits to land use management.

In Queensland the *Integrated Planning Act 1997* requires all local governments to develop planning schemes, which seek to achieve desired environmental outcomes (DEOs) through a development assessment process. Zones or areas designate broad land use allocations in which development application may be assessed against one or more codes. Codes contain performance criteria, required to achieve DEOs, and propose Acceptable Solutions (AS) as management actions which are one accepted means of achieving the performance criteria, and therefore DEOs. A TDR system could operate by providing a second AS that allows a greater level of impact provided a TDR is purchased. For example, a Waterways Code may hypothetically state that to achieve the DEO of 'ecologically healthy waterways' requires a development proposal to meet the performance criteria of 'minimising adverse impacts on the hydrological regimes of waterways and wetland'. One of the acceptable solutions could be 'minimum allotment size of 800m<sup>2</sup> without stormwater infrastructure' (to reduce the density of impervious area and therefore stormwater volume and velocity). A TDR system would add to the acceptable solution '...or a minimum allotment size of 600m<sup>2</sup> and the purchase of sufficient transferred development rights'. The council would ensure, on a case-by-case basis that the increased impact resulting from the higher density development would be more than offset by the gains in water quality from the development restrictions that generated the TDR thus resulting in a net gain for the environment.

There are at least three difficulties with implementing TDRs under the *Integrated Planning Act 1997*:

- 1) **Administratively intensive:** Unlike tradeable floor area for heritage conservation, the nature of the right traded, and therefore legally transferred, for habitat conservation is different from the donor to the recipient site. For example, landowners in a Rural Zone may forgo the right to clear some riparian vegetation on their property by placing it under a conservation covenant. They could be compensated by a TDR which then allows a reduced minimum allotment size from 800m<sup>2</sup> to 600m<sup>2</sup> over 3 lots in a Rural Zone. The nature of the right forgone and the right exercised are obviously different, hence there needs to be a process for calculating what rights would be generated by which conservation activities. Scientific studies would need to be undertaken to ensure there was a net gain to the environment from such a transfer. As each situation will be different, it would require a council officer to undertake a site assessment and weigh the values that would be retained to determine the tradeable rights generated. Small local governments are unlikely to have the capacity to undertake these assessments and calculations.
- 2) **Subject to legal challenge:** The *Integrated Planning Act 1997* introduced a system of performance based planning. Planning schemes may no longer prohibit certain developments. Instead planning schemes must state DEOs and only reject applications that do not provide acceptable solutions to performance criteria needed to achieve DEOs. If a planning scheme provides two acceptable solutions to a performance criteria, i.e. one without the purchase of a TDR and one with, then developers will argue that if, for example, a lower allotment size is acceptable with the purchase of a TDR then they must be acceptable for that area regardless. Also it could be argued that requiring the developer to effectively

conserve land in another area of the shire is not a condition which is 'reasonable and relevant' to the development. Both these points are arguable but would require scientific and legal research to support the TDR system.

- 3) **Uncertainty:** Since performance based planning schemes cannot prohibit any development, a developer can submit (in our hypothetical system) an application for a 600m<sup>2</sup> allotment without a TDR and it must be considered on its merits against the performance criteria and DEOs. Occasionally 600m<sup>2</sup> will be acceptable without a TDR and the application must be approved. Alternatively, even if an application is submitted for a 600m<sup>2</sup> lot with a TDR the proponent is not guaranteed approval as it may be rejected on other grounds or the area may be so sensitive that the DEO cannot be met even with a TDR. Given these layers of uncertainty it is questionable what the market value of a TDR would be if it only makes a certain kind of application more probable, but not certain, the desired lot size may be approved without it. The administering authority would have to be consistent in its application of TDRs to assign them an economic value.

### 3.6 Enhancing market education and access

#### 3.6.1 Compulsory disclosure

Compulsory disclosure of environmental credentials can help to stimulate investment in sustainable practices. There are a number of compulsory disclosure mechanisms currently in place:

1. As a result of the recent (Commonwealth) *Financial Services Reform Act 2001* financial investment fund managers are required to disclose the extent to which labour standards or environmental, social or ethical considerations are taken into account in investment decisions.<sup>38</sup>
2. Australian companies are already required to report to their shareholders on compliance with environmental regulations by virtue of the *Corporations Law*.<sup>39</sup>
3. The National Environmental Protection Council, by way of a National Environmental Protection Measure established the National Pollution Inventory that provides industry emissions information to the public (EA, 2001).

#### 3.6.2 Environmental management systems and eco-labeling

For markets to function properly full knowledge of the product by consumers is required. Lack of information forms market barriers; providing additional information can stimulate niche markets. One mechanism to achieve this is eco-labelling which includes the voluntary, yet certified 'organic',<sup>40</sup> 'ISO14001 accredited',<sup>41</sup> and 'Environmental Choice Australia',<sup>42</sup> labels.

---

<sup>38</sup> The *Financial Services Reform Act 2001*, schedule 1, Part 7.9, Division 2, Subdivision C, section 1013D(l). This Act will take effect through amendments to the *Corporations Act 2001* and is due to commence, for the most part, on 11 March, 2002.

<sup>39</sup> *Corporations Act 2001* (Cth) section 299(1)(f).

<sup>40</sup> Certified by organisations such as Biological Farmers of Australia (BFA) and National Association for Sustainable Agriculture Australia (NASAA).

<sup>41</sup> ISO 14001 is an internationally recognised environmental management standard, part of the ISO 14000 series, established by the International Organisation for Standardisation (ISO). See <http://www.iso.org/iso/en/iso9000-14000/iso14000/iso14000index.html>

<sup>42</sup> To be launched mid-2002, see <http://www.aela.org.au/>.

Over 1200 farms in Australia are already ISO 14001 accredited but it is only one of a number of environmental management systems (EMSs) in use. EMS is a generic term used to describe any systematic management approach used to manage impacts on the environment (SCARM, 2001). It provides a framework for continuous improvement through a ‘plan, do, check, act’ cycle within which industry codes of practice can be upheld (SCARM, 2001). There are numerous potential economic, social, environmental and legal benefits from following this process, including:

- Improved market access;
- Increased net revenue (through efficiency gains and price premiums);
- Reduced compliance costs with government regulation;
- Confidence in management;
- Enhanced reputation and recognition as good environmental steward;
- Creation of markets for ecosystem services;
- Increased health of natural resource systems;
- Retention of biodiversity;
- Satisfaction of legal “duty of care”.

In Queensland, landholders are obliged to exercise a ‘duty of care’ for the land and environment under the *Land Act 1994* and *Environmental Protection Act 1994*. The Commonwealth House of Representative Standing Committee on the Environment and Heritage has recommended that a commonly defined, national duty of care should underpin all Commonwealth funding for private conservation and sustainable practices (Parliament of the Commonwealth of Australia, 2001).

The Commonwealth Standing Committee on Agriculture and Resource Management (SCARM) is currently attempting to identify the role of government in facilitating the adoption of EMS in Australia (SCARM, 2001). One option aims to meet a widely accepted EMS protocol and recognised regional environmental standards.

This approach has parallels with the two-tier system proposed in draft legislation before the Wisconsin Government (Wisconsin, Department of Natural Resources, 2001). The system sets minimum standards. If landholders voluntarily exceed those standards through EMS programs, they are recognised and rewarded but if the minimum standards are breached then landholders face regulation and penalties (Wisconsin, Department of Natural Resources, 2001a). See Section 2.1 for discussion about regulatory tiering.

While EMSs appear to be an excellent voluntary approach to deal with a wide range of environmental issues, particularly non-point source problems such as sediment and nutrient runoff, there is little empirical data on their effectiveness in achieving environmental objectives. This may be addressed by an EMS currently being developed by Agriculture Forestry and Fishing Australia. With science guiding the setting of regional standards and assessing the effectiveness of EMSs, they hold much promise in delivering enhanced economic benefits to landholders while improving environmental health.

### **3.7 Environmental auctions**

Auctions can provide a flexible, market-based mechanism for allocating government funds. They encourage landholders to compete for government funding to undertake desirable environmental activities thereby maximising the benefit of limited funds.

The Victorian Department of Natural Resources and Environment has tested this mechanism through a “BushTender Trial” (DNRE, 2001). In this trial the government designated several areas that qualified for funding and field officers visited interested landholders within these areas to discuss management options. Landholders developed an agreed management plan with field officers and submitted a sealed bid nominating the desired level of government contribution. Bids were assessed and funding allocated on the basis of “best value for money” provided the landholders sign a three-year agreement based on the management plan and incorporating periodic payments and reporting. An initial review by the Department and the University of Melbourne Business School found “the discriminative-price auction system used in the BushTender would be superior to a similar scheme that used fixed-price offers” (Stoneham et al, 2002: 24).

This system has proved to be a flexible policy instrument for allowing management agreements to be tailored to individual circumstances rather than only funding a limited range of actions. It has also revealed market information about the minimum cost of various environmental management options.

### **4.0 Concluding comments**

There is a vast range of economic instruments available to environmental managers to address failure of the market to deal with environmental externalities. There are two broad groups of economic instruments that can be applied; financial incentives and market-based incentives. Though frequently described as non-regulatory, economic instruments require legislative support to be implemented. The effectiveness of the instrument will depend on the specifics of the activity requiring correction. Correcting market failure requires a carefully designed economic instrument or a combination of instruments based on robust science and embedded within a comprehensive legal and policy framework.

Governments need to be strategic in their design of economic instruments to ensure they are well coordinated, consistent and credible. This paper has suggested that a regulatory tiring framework, where regulatory penalties enforce minimum duties of care and financial and market incentives are directed towards encouraging actions that would lead to attaining regional targets. The marketing of ecosystem services to encourage non-government investment is offered as one approach to address a failure of the market to produce efficient supply of these services. As financial and market-based incentives increase in number and complexity, regional bodies will need to be established to act as brokers to facilitate private sector investment. Brokerage will include the promotion, coordination and delivery of incentives and monitoring to ensure that the incentives achieve environmental goals or regional targets cost effectively.

## References

- Arnold, C. (1991) *Transferable Development Rights - A planning tool for the preservation of Heritage Buildings*. A dissertation submitted in partial fulfilment of the requirements of the Degree of Masters of Laws at the University of Queensland.
- Arnold, C. (1992) "Landmark Decision for Heritage Owners" *The Proctor*. November: 6
- Australian Bureau of Agricultural and Resource Economics (ABARE), 2001, *Alternative Policy Approaches to Natural Resource Management*, Commonwealth of Australia, Canberra.
- ABARE (1998) *Emissions Trading – Proceedings of the International Conference on Greenhouse Gas Emission Trading*. Australian Bureau of Resource Economics: Canberra.
- Australian Taxation Office (2001) *Businesses - Landcare*  
<http://www.ato.gov.au/indexlist.asp?placement=AS/BS&k=Landcare&d=Landcare&l=L>
- Agriculture, Fisheries and Forestry Australia (2000) *A Guide to Tax Incentives for Landcare*, AFFA: Canberra.
- Australian Fisheries Management Authority (2001) *Commonwealth Fisheries- South East Trawl Fishery* <http://www.afma.gov.au/fisheries/south%20east%20trawl/default.php> (Accessed November 2001)
- Bates, G., 2001. *A Duty of Care for the Protection of Biodiversity on Land*, Consultancy Report, Report to the Productivity Commission, AusInfo, Canberra.
- Bateson, P. (2001) *Incentives for Sustainable Land Management: Community cost sharing to conserve biodiversity on private land*. A Guide for Local Government. Revised Edition. Environment Australia, Canberra and Environs Australia, Melbourne.  
<http://www.ea.gov.au/land/bushcare/publications/incent/index.html>
- Binning, C. and Young, M. (1997) *Motivating People: Using Management Agreements to Conserve Remnant Vegetation*, National R and D Program on Rehabilitation, Management and Conservation of Remnant Vegetation, Research Report 1, Environment Australia, Canberra.
- Binning, C., Young, M. and Cripps, E.(1999), *Beyond Rates, Roads and Rubbish: Opportunities for local government to conserve native vegetation*, National R and D Program on Rehabilitation, Management and Conservation of Remnant Vegetation, Research Report 1/99, Environment Australia, Canberra.
- Binning, C. and Young, M. (1999a), *Conservation Hindered: The impact of local government rates and State Land Taxes on the conservation of native vegetation*, National R and D Program on Rehabilitation, Management and Conservation of Remnant Vegetation, Research Report 3/99, Environment Australia, Canberra.
- Binning, C., Baker, B., Meharg, S., Cork, S and Kears, A. (2002) *Making Farm Forestry Pay – Markets for Ecosystem Services*, Rural Industries Research and Development Corporation, Canberra.

- Boast, RP. (1984) "Transferable Development Rights" *New Zealand Law Journal*, October: 339- 342
- Bohm, C (2001) "Communities and Fisheries Management: the South East Trawl Fisheries in Profile" pages 4.1-4.7 in *Finding Our Seagrass Roots: Practical Approaches to Coastal Sustainability*, proceedings of the EDO Network Conference: Brisbane.
- Boyd, J., Caballero, K. and Simpson, R. (1999) *The Law and Economics of Habitat Conservation: Lessons from an Analysis of Easement Acquisition*. Resources for the Future: Washington.
- Brisbane City Council (2001) "Environmental Management Initiatives: Voluntary Conservation Agreements"  
[http://www.brisbane.qld.gov.au/council\\_at\\_work/environment/bushland/environment\\_initiatives/vca.shtml](http://www.brisbane.qld.gov.au/council_at_work/environment/bushland/environment_initiatives/vca.shtml) (accessed 23/10/01)
- Brisbane City Council (2001a) "Environmental Management Initiatives: Vegetation Protection Orders" [http://www.brisbane.qld.gov.au/council\\_at\\_work/environment/bushland/environment\\_initiatives/vpo/](http://www.brisbane.qld.gov.au/council_at_work/environment/bushland/environment_initiatives/vpo/)
- Brisbane Region Environment Centre (1998) "BREC Proposes 120 Million Dollar Catchment Protection Revenue Bond for SEQ"  
<http://www.brec.ozecol.org/news/current/catchmentbond.html>
- Coase, R.H., (1960) "The Problem of Social Cost", *The Journal of Law and Economics*, III:1-44.
- Coffey, F.C., (2001) "Assessment of Water Resource Plans under the *Water Act 2000* (Qld) With Consideration of Ecological Outcomes and Environmental Flow Objectives in the context of the Precautionary and Sustainable Management" *Environmental and Planning Law Journal* 18: 410.
- Commonwealth of Australia, (1992) *National Strategy for Ecologically Sustainable Development*, AGPS, Canberra.  
<http://www.ea.gov.au/esd/national/strategy/summary95.html>
- Commonwealth of Australia, (1992) *Intergovernmental Agreement on the Environment (IGAE)* AGPS, Canberra. <http://www.ea.gov.au/esd/publications/igae.html>
- Commonwealth of Australia, (2001) *Australia State of the Environment 2001 Report*, CSIRO Publishing on behalf of the Department of Environment and Heritage, Canberra.  
<http://www.ea.gov.au/soe/2001/index.html>
- Cornwell, A., Travis, J. and Gunasekera, D. (1997) *Framework for Greenhouse Emissions Trading in Australia*, Industry Commission Staff Research Paper, AGPS, Canberra.
- Cripps, E., Binning, C., Young, M. (1999) *Opportunity Denied: Review of the legislative ability of local government to conserve native vegetation*, National R and D Program on Rehabilitation, Management and Conservation of Remnant Vegetation, Research Report 2/99, Environment Australia, Canberra.
- Dean Wells, Environment Minister, Media release 16/09/01

- Department of Local Government and Planning and Dept of Natural Resources and Mines (2001) *Proposed State Planning Policy Extractive Resources and Extractive Industry*.
- Department of Natural Resources (1998) "Concessions on Valuations and Rating" Part G – Chapter G11 *Handbook of Planning Guidelines*, Department of Natural Resources: Queensland.
- Department of Natural Resources and Environment, Victoria (DNRE) (2001) *Bush Tender Trials*. Department of Natural Resources and Environment: Victoria.
- Department of Natural Resources and Mines (1999) "Land Facts: Land Management and water conservation plans for taxation purposes" Department of Natural Resources: Queensland.
- Department of Natural Resources and Mines (1999a) "Permanent Trading in Water - what it means for the Mareeba-Dimbulah Irrigation Area" [http://insite.dnr.qld.gov.au/resourcenet/water/awatereform/water\\_trade\\_price.html](http://insite.dnr.qld.gov.au/resourcenet/water/awatereform/water_trade_price.html)
- Department of Natural Resources and Mines (2000) "DNR Facts: Water Series - Land and Water Management Plans" [http://insite.dnr.qld.gov.au/resourcenet/fact\\_sheets/pdf/water/w56.pdf](http://insite.dnr.qld.gov.au/resourcenet/fact_sheets/pdf/water/w56.pdf)
- Department of Natural Resources and Mines (2001) *Environmental Management and Regulation of Mining in Queensland*. <http://www.dme.qld.gov.au/environ/regulate.htm>
- Department of Natural Resources and Mines (2001a) *Carbon Credits from Forestry: Questions and Answers for Rural Landholders*. [http://insite.dnr.qld.gov.au/resourcenet/veg/carbon\\_credits/index.html](http://insite.dnr.qld.gov.au/resourcenet/veg/carbon_credits/index.html)
- Department of Natural Resources and Mines (2001b) "Implementing Plans for Natural Resource Management (operational draft)" *Chapter G100 Resource Planning Guidelines*, Department of Natural Resources: Queensland.
- Environment Australia (2001) *National Pollution Inventory* <http://www.nepc.gov.au/>
- Environmental Protection Agency (EPA), 1999, *Cardwell-Hinchinbrook's coast: managing its future*, EPA.
- Environmental Protection Agency (2001) *Queensland Water Recycling Strategy*, EPA.
- Fischer, S. (1996) "Air space as property" *Australian Property Law Bulletin* 8(3):53-58
- Gardner, A., 1998. "The Duty of Care for Sustainable Land Management", *Australasian Journal of Natural Resources Law and Policy*, 5[1]: 29-63.
- Gibbons, P., Briggs, S., and Shields, 2001, "How Many Credits is Your Property Worth? A proposed biodiversity scoring system", *Australian Landcare*, Dec 2001.
- Great Barrier Reef Marine Park Authority (20/11/01) *Permits* [http://www.gbrmpa.gov.au/corp\\_site/permits/](http://www.gbrmpa.gov.au/corp_site/permits/) (accessed 20/11/01)
- Hall, C (1990) "Local Government Perspective" *Canberra Bulletin of Public Administration* **62:28-36**

- Hamilton, C., Schlegelmich, K., Hoerner, A., and Milne, J. (2000) "Environmental Tax Reform – Using the tax system to protect the environment and promote employment" *Tela Series, Issue 4*. Australian Conservation Foundation
- Hartzok, A (1999) "Financing Local to Global Public Goods: An Integrated Green Tax Shift Perspective" *Taxation Alternatives for the 21st Century Proceedings of the 1999 Global Institute for Taxation Conference on Fundamental Tax Reform*, John's University, New York, September 30, 1999 <http://www.earthrights.net/docs/financing.html> (accessed 29/8/01).
- Industry Commission (1991) *Cost and Benefits of Reducing Greenhouse Gas Emissions*. Report 15, Canberra.
- Industry Commission (1992) *Water resources and Waste Water Disposal*, Report No.26, AGPS, Canberra.
- Industry Commission (1997) *A Full Repairing Lease: Inquiry into Ecologically Sustainable Land Management*, Industry Commission, Canberra.
- Intergovernmental Committee for Ecologically Sustainable Development (1996) *Summary Report on the Implementation of the National Strategy For Ecologically Sustainable Development 1993 - 1995* <http://www.ea.gov.au/esd/national/strategy/summary95.html>
- Ipswich City Council (ICC) (2000) *Nature Conservation Strategy*, Ipswich City Council: Ipswich.
- James, D., (1997) *Environmental Incentives: Australian Experience with Economic Instruments for Environmental Management*, Environmental Research Paper No. 5, Environment Australia, Canberra.
- Johnstone Shire Council (2000) *The State of the Johnston Shire Year 2000 Benchmark* <http://www.jsc.qld.gov.au/stateofshire/chapter8/1.htm>
- Jorgensen, B. S., Syme, G. J., Smith, L. M., and Bishop, B. J. (in review). "Random error in willingness to pay measurement: A review of the reliability of contingent values" *Risk, Decision and Policy*.
- Land and Water Australia (2002) *RipRap – River and Riparian Lands Management Newsletter, Edition 21*.
- Local Government Association of Queensland (2001) *Local Government's Role in Integrated Catchment Planning and Management: Good Practice Guideline*. LGAQ: Brisbane.
- Lockwood M, Walpole S and Miles C (1999) *Final report and Summary of the Project: Economics of remnant native vegetation conservation on private property*. Johnstone Centre Report No. 134, Charles Sturt University, Albury.
- LYCOS Environment News Service (9/4/01) "Worlds Richest Nations Urge Green Taxes" <http://ens-news.com/ens/apr2001/2001L-04-09-03.html> (accessed 22/8/01).
- Maher, M., Cooper, S., and Nichols, P. (2000) *Australian River Management and Restoration Criteria for the legislative framework for the twenty-first century*. Land and Water Resources Research and Development Corporation (LWRRDC) Occasional paper 02/00. LWRRDC: Canberra.

- Manning, L (2001) "Tradeable Development Rights" *unpublished forum proceedings: Department of Primary Industries Information Forum on Market Based Instruments Wednesday December 5, 2001.*
- Mayers, J., and S. Bass. (1998) "The role of policy and institutions" pages 269-299 in *Tropical Rain Forest A Wider Perspective*, (ed.) F. B. Goldsmith. London: Chapman and Hall.
- McTaggart, D., Findlay, C. and Parkin, M. (1996) *Economics*. Addison-Wesley Publishing Company: Sydney.
- Millar, J. (2001) *Listening to landholders: Approaches to Community Nature Conservation in Queensland*. Queensland Parks and Wildlife Service: Brisbane.
- Millar, J., Chew, C., Tarrant, P. and Walsh, D. (2000) *Listening to landholders: Community Nature Conservation Market Research 2000*. Queensland Parks and Wildlife Service: Brisbane.
- Murray Darling Basin Commission (1996) *Cost Sharing for On-Ground Works*. Murray-Darling Basin Commission, Canberra.
- Myers, N. (1998) "Global biodiversity priorities and expanded conservation policies" In *Conservation in a Changing World*, (eds.) G. M. Mace, A. Balmford, and J. R. Ginsberg, 273-286. Cambridge: Cambridge University Press.
- Nancarrow, B. E., Jorgensen, B. S., and Syme, G. J. (in review). "Promoting neighbourhood action in stormwater management: A field experiment" *Journal of Environmental Management*.
- National Farmers Federation and Australian Conservation Council (2000) *National Investment in Rural Landscapes: An Investment Scenario for NFF and ACF with the assistance of LWRDC by The Virtual Consulting Group and Griffin Pty Ltd*
- Norling, J (2001) "Transferable Development Rights – Mitigation Banking" *unpublished forum proceedings: Department of Primary Industries Information Forum on Market Based Instruments Wednesday December 5, 2001.*
- NSW EPA and Department of Land and Water Conservation (DLWC) (1998) *Hunter River Trading Scheme, 1998 Review*, NSW EPA: Sydney.
- Organisation for Economic Cooperation and Development (OECD) (1989) *Economic Instruments for Environmental Protection*, OECD: Paris.
- OECD (1999) *Implementing Domestic Tradeable Permits for Environmental Protection*. OECD: Paris.
- OECD (2001) *Environmental Outlook*, OECD: Paris.
- OECD (2001a) *Environmentally Related Taxes in OECD Countries: Issues and Strategies*, OECD: Paris.

- Opschoor, J.B. Turner, R.K. (eds) (1994). *Environmental Incentives and Environmental Policies: Principles and Practice*. Kluwer Academic Publishers: Dordrecht.
- Parliament of the Commonwealth of Australia (2001) *Public Good Conservation: Our Challenge for the 21<sup>st</sup> Century. Interim report of the inquiry into the Effects upon Landholders and Farmers of Public Good Conservation Measures Imposed by Australian Governments*. House of Representatives Standing Committee on Environment and Heritage: Canberra.
- Pigou, A.C., (1920) *The Economics of Welfare*, Macmillan: London.
- Radio National, Earthbeat, broadcast 29/09/01 “Shopping Thoughtfully with Ambitious New Labelling System” <http://www.abc.net.au/rn/science/earth/stories/s381225.htm>
- Riedy, C. (2001) *Public subsidies and incentives to fossil fuel production and consumption in Australia - A Draft Discussion Paper*. Institute for Sustainable Futures, University of Technology: Sydney.
- Robinson, J.J., (2000) “Does MODSS offer an Alternative to traditional Approaches to Natural Resource Management Decision-Making”, *Australian Journal of Environmental Management*”, 7[3]: 170-180.
- Robinson, J.J., (2001) “From rhetoric to reality; are the outcomes from a MODSS approach to decision making living up to the claims?” *Discussion Paper, The School of Economics, University of Queensland, St Lucia*.
- Ruttan, V.W., (1971) “Technology and the Environment”, *American Journal of Agricultural Economics*, 53[5]: 707-717.
- Standing Committee on Agriculture and Resource Management (2001) *Towards a National Framework for the Development of Environmental Management Systems in Agriculture – a public discussion paper prepared by the Environmental Management Systems Working Group* (available from the AFFA website: <http://www.affa.gov.au/>)
- Stoneham, G., Chaudri, V., Ha, A. and Strappazon, L. (2002) ‘Auctions for contracts: an empirical examination of Victoria’s BushTender Trial’ Paper Presented at the Australian Agricultural and Resource Economics Society, Canberra, February 2002.
- Skitch, R.F., (2001) “Encouraging Conservation through Valuation” Department of Natural Resources and Mines: Queensland. <http://insite.dnr.qld.gov.au/resourcenet/land/landplan/ectv/index.html>
- Tietenberg, T. (1996) *Environmental and Natural Resource Economics*. Harper Collins College Publishers: New York
- Tietenberg, T. (2000) *Environmental and Natural Resource Economics*. 5th Ed, Addison Wesley: Reading, Massachusetts.
- Turner, K. and H. Opschoor (1994) “Environmental Economics and Environmental Policy Instruments: Introduction and Overview” *Environmental Incentives and Environmental Policies: Principles and Practice*. J.B. Opschoor and R.K. Turner. Dordrecht, Kluwer Academic Publishers: 1-38.

- Urban Development Institute Australia (UDIA) – Queensland (2001) “Queensland’s Top Developments Honoured” <http://www.udiaqld.com.au/awardwinners2001.html>
- United Nations Economic and Social Council Commission on Sustainable Development Ad Hoc Intergovernmental Panel on Forests (UN ECOSOC CSD IPF) (1996) *International Cooperation in Financial Assistance and Technology Transfer for Sustainable Management*. United Nations Economic and Social Council: E/CN.17/IPF/1996/5  
<http://www.un.org/documents/ecosoc/cn17/ipf/1996/ecn17ipf1996-5.htm>
- United Nations Environment Program (UNEP) (2002) *Global Environmental Outlook 3*  
<http://www.unep.org/geo/geo3/>
- van Bueren, M. (2001) *Emerging Markets for Environmental Services – Implications and Opportunities for Resource Management in Australia*. RIRDC/ Land and Water Australia
- Watson, A.S., (1995) *Conceptual Issues in the Pricing of Water for Irrigation*, Dairy Research and Development Corporation: Glen Iris.
- Western Australian Environmental Protection Agency (2001) *A Policy Framework for the Establishment of Wetland Banking Instruments in Western Australia- Draft for Public Comment*. EPA: Perth.
- Williams, J., (2000) *Managing the bush: recent research findings from the EA/LWRRDC National Remnant Vegetation Rand D Program*, Land and Water Resources Research and Development Corporation: Canberra.
- Wisconsin, Department of Natural Resources (2001) *Green Tier - Wisconsin's "Regulatory Choice" System of Environmental Performance*  
[http://www.dnr.state.wi.us/org/caer/cea/green\\_tier/](http://www.dnr.state.wi.us/org/caer/cea/green_tier/)
- Wisconsin, Department of Natural Resources (2001a) *How the Green Tier Works*  
[http://www.dnr.state.wi.us/org/caer/cea/green\\_tier/factsheets/speeches/fig2.htm](http://www.dnr.state.wi.us/org/caer/cea/green_tier/factsheets/speeches/fig2.htm)
- World Commission on Environment and Development (1987) *Our Common Future*, (The Brundtland Report), Oxford University Press: Oxford.
- Young, M.D., Gunningham, N., Elix, J., Lambert, J., Howard, B., Grabosky, P., McCrone, E., (1996) “Reimbursing the future. An evaluation of motivational, voluntary, price-based, property-right, and regulatory incentives for the conservation of biodiversity” *Biodiversity Series Paper No 9*, Biodiversity Unit Department of the Environment, Sport and Territories