# An Overview of Market-Based Instruments and Environmental Policy in Australia

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## Abstract

Market-based instruments for environmental management are relatively new mechanisms in both an Australian and international policy context. However, they are increasingly being considered for the management of natural resources and the environment. This is particularly so where regulatory approaches have failed to arrest on-going degradation or where the cost of traditional policy tools is proving prohibitive to government or society in general. . In this context we address four issues in this paper:

1. What is the historical policy context that has led to the emergence of market-based policy instruments in Australia?
2. What are market-based instruments and why are they useful as a policy tool? More specifically, what theoretical and practical advantages do they offer over more traditional instruments?
3. What schemes are in operation in Australia and how successful have they been? and,
4. Are there any lessons to date for their future application?

## 1. Introduction

Market-based instruments (MBIs) are gaining acceptance as important policy mechanisms for achieving environmental protection goals. However, their application in Australia and internationally is still in the embryonic phase. Around the world a variety of MBIs are being tested and applied to different environmental problems. In some instances, putting the theory into practice involves some hurdles and practical difficulties. Consequently, there is debate as to whether the benefits of market-based instruments justify the costs involved in their establishment.

Adoption of MBIs is based on the premise that these instruments offer the potential to achieve efficiency gains over more traditional regulatory instruments. Achieving these gains requires attention to detail and overcoming a range of potential obstacles including: aligning instruments and policy options; concurrent or prior removal of perverse incentives; addressing diffuse, or non-point, source problems; and, ensuring instruments are performance based rather than overly prescriptive. Hence, MBIs are often context specific in the sense that their application requires detail to both the existing policy and biophysical environment.

This paper provides an introduction to the potential role of market instruments and some early applications. As such the paper sets the scene for a more in-depth examination of the strengths and weaknesses of these instruments in the papers that follow in this volume. The focus in this paper is on the policy context in which MBIs are emerging, what MBIs and their advantages are, and, some broad principles that are important in their application. These points are illustrated by reference to the application of MBIs to date in Australia and, to a lesser extent, overseas. The paper concludes with a brief discussion of the lessons to date for future MBI development and application.

## 2. The evolution of environmental policy in Australia

Environmental issues have gained increasing attention in the public arena in Australia over the last twenty or more years. At the national level consider the debates; for example, over land and water degradation that resulted in policy initiatives such as The National Heritage Trust (NHT), The National Action Plan for Salinity and Water Quality (NAPSWQ) and the Council of Australian

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Government's (COAG) renewed focus on water reforms. At the state level, at which much of the practical responsibility lies, these debates have played out in legislative changes to water allocation and management, pollution management issues and biodiversity conservation. The core motivating force behind these policy reforms is the changing attitudes of the Australian community to environmental issues together with increasing scarcity of environmental goods and services.

Part of the reason for people's changing attitude towards environmental protection is due to improving incomes, education and standard of living. It is common for developed countries to display a greater preparedness to invest in environmental management than developing nations. Indeed, a survey undertaken by the Australian Bureau of Statistics has shown that people with a high income and/or education level are more likely to express concern about the environment than those with lower incomes and/or education (ABS 2001). Other reasons behind changing environmental attitudes and values include the increasing scarcity of untouched wilderness areas, a better scientific understanding of the impacts of man's disturbance on the ecosystem and more advanced methods for communicating environmental issues quickly and to a large audience.

Governments have tended to respond to community demands for better environmental outcomes via regulatory responses. For example, the Australian Petroleum Production and Exploration Association have identified almost eighty Acts that potentially affect the oil and gas industry (APPEA 2004). The regulatory approach often prescribes conditions for resource access and usage such as various conservation acts that restrict the uses to which land covered with native vegetation can be put by limiting clearing. Similarly, many mining regulations specify the maximum allowable level of pollution, minimum requirements for mine-site rehabilitation and the type of management processes that should be used to prevent environmental damage.

In many cases the regulatory approach has failed to achieve the goals set, or has proved to be very expensive. As a result governments are starting to look for more effective and cheaper ways of achieving environmental outcomes. Efforts are being made to develop systems that satisfy government and community aspirations for higher environmental standards whilst also being flexible and amenable to the running of businesses. Increasingly these efforts are focusing on the potential of MBIs to meet the multiple criteria of effectiveness, efficiency and flexibility. For example, reforms to water resources, pollution management and biodiversity conservation have in part drawn on the use of MBIs such as water markets, pollution taxes and charges as well as 'bubble markets'[2] and auctions for biodiversity.

# 3. Market-based instruments

## 3.1 What are market-based instruments

MBIs are broadly defined as 'instruments or regulations that encourage behaviour through market signals rather than through explicit directives' (Stavins 2000, p. 1)[3]. Stavins further describes these instruments as 'harnessing market forces' because of their potential to redefine the agenda of firms and individuals such that the improved environmental outcomes are in their own interest. The focus in applying MBIs is on achieving outcomes through the self-interest of the firms and individuals. While the key interest in MBI application is achieving policy targets at reduced cost, other interests such as risk may also be targeted (Pannell 2001). MBIs have two potential cost advantages over more traditional instruments.

First, MBIs allow different firms to make different adjustments in response to their unique business structures and opportunities. Second, incentives to discover cheaper ways to achieve outcomes provide dynamic ways of reducing the future costs of achieving targets.

As a way of illustrating the potential cost advantages of MBIs consider how a standard command and control measure operates. Under a command and control instrument firms are required to achieve

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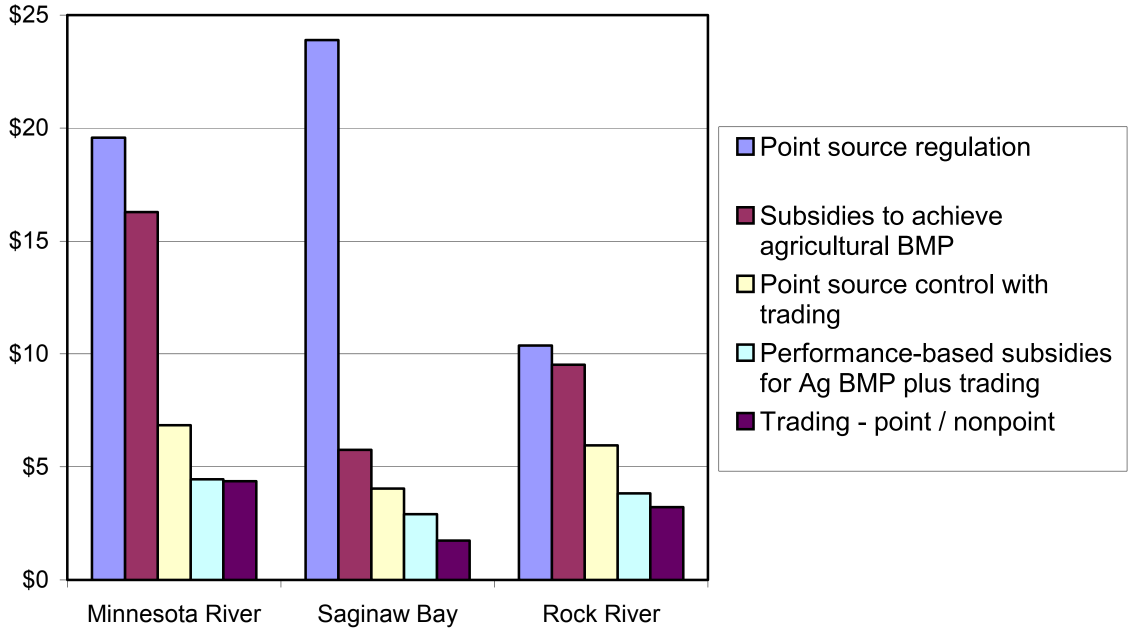
[2] A 'bubble market' is where multiple pollution sources are regulated as a single source allowing a firm or group of firms to seek the least cost way of complying with the regulation.

[3] Much of the discussion in this section is based on Stavins (2000), Hockenstein, Stavins and Whitehead (1998).

specified outcomes regardless of their individual cost structures. For example, two neighbouring firms producing similar amounts of pollution may face widely differing costs to reduce their pollution (due to processes employed, input mixes, type of goods produced or other reasons). A command and control instrument would lead to each reducing their pollution by an identical amount whereas an MBI with the same target would encourage differential reductions in pollution. That is, firms with high control costs undertake a smaller share of achieving environmental targets in a physical sense but a similar share in a monetary sense. A practical example of the potential cost savings resulting from progressively allowing greater flexibility in adjustment is shown in Figure 3.1. In this example, increasing flexibility by facilitating point-non-point source nutrient trading to manage pollutants in streams produces increasing cost savings in each case.

**Figure 3.1: Potential cost savings from trading versus alternative mechanisms**




**Notes:** Costs saved are $US per pound of Phosphorus removed. BMP is 'best management practices'.
Source: Adapted from Faeth (2000) Table 8.

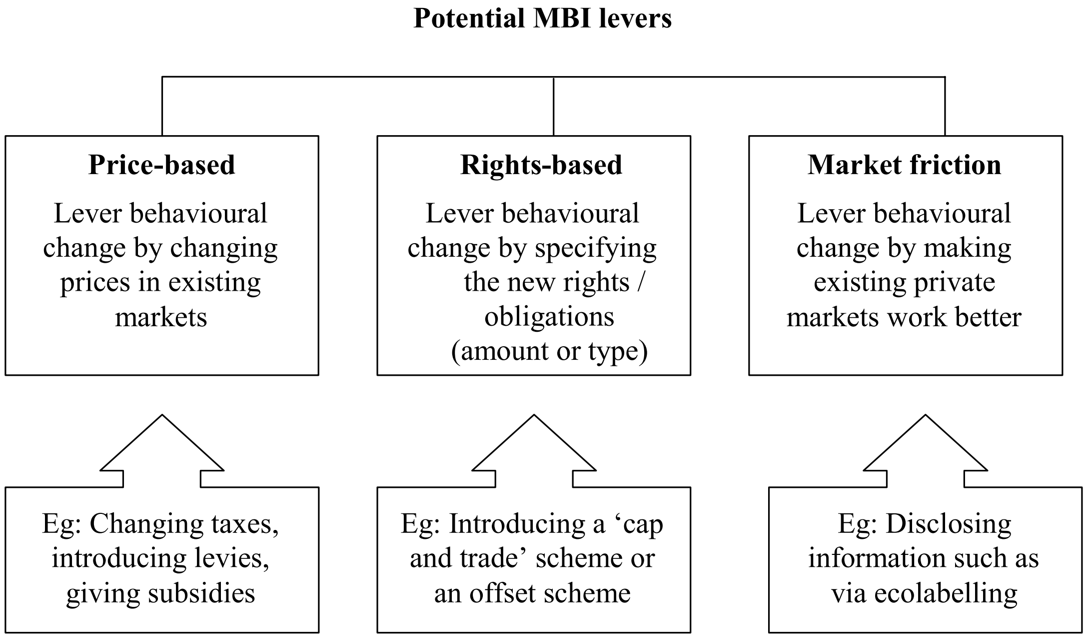
The dynamic incentives to find and adopt innovative solutions are driven by similar factors to those driving cost savings. Command and control simply require the target to be achieved. There are few incentives to reduce pollution beyond the target. Furthermore, many command and control instruments specify technologies that must be used thus reducing the incentive to search for cheaper or more effective technologies. Stavins (2001) and Hockenstein, Stavins and Whitehead (1998) refer to this as 'freezing the development of technologies'.

## 3.2 Types of market-based instruments

The key reason for MBI adoption is their theoretical potential to deliver the same outcome as a command and control mechanism but generally at lower financial cost to industry and at lower overall net social cost. Consider the three potential levers that MBIs are able to employ. Each lever shown in Figure 3.2 generates a range of possible MBIs. Price-based instruments alter the prices of goods and services to reflect their relative impact. They provide certainty to industry as to the compliance costs of achieving an outcome but the environmental outcome generated to the broader community is uncertain.

Rights-based instruments can be designed to control the quantity of the environmental good or service (or a suitable proxy) to the socially desired level. These instruments provide certainty as to the environmental outcome but not as to the cost to industry of achieving that outcome. Instruments designed to reduce market friction are less common. They aim to stimulate a market to produce a desired environmental outcome through improving the workings of existing markets by reducing transaction costs or improving information flows. Responses to market friction tend to be less certain and longer term.

**Figure 3.2: Range of levers employed by MBIs**




Within these categories it is not always clear which one a specific MBI should fall into. For example, a 'rights based' scheme (such as the Renewable Energy Certificate Scheme) could also be described as a 'price-based' scheme as a non-punitive penalty caps non-compliance costs, and in turn if set too low would have a greater bearing on the level of performance than that sought by the created 'rights'.

Whilst MBIs generally reduce the compliance costs faced by operators, especially at an industry level, as noted earlier the overall cost to society may also be significantly less – where MBIs are appropriately applied. In many instances, MBIs will not be the most efficient policy response. There are a number of reasons why, including the relative homogeneity of sources or costs or measurement and monitoring issues, and these are discussed in Section 3.3.

Despite the challenges and modest application of market instruments to date, an impressive range of MBIs has been employed in Australia and other OECD countries. Key instrument types are shown in Table 3.1.

**Table 3.1: Market-based instruments by type**

| **Price-based** | **Rights-based** | **Market friction** |
|---|---|---|
| • Emission charges<br>• User charges<br>• Product charges<br>• Performance bonds<br>• Non-compliance fees<br>• Subsidies (materials and financial)<br>• Removal of perverse subsidies/taxes<br>• Deposit-refund systems | • Tradeable permits, rights or quotas<br>• Offset schemes | • Reducing market barriers<br>• Extension / education programs<br>• Research programs designed to facilitate market exchanges<br>• Labelling<br>• Information disclosure |

## 3.3 What characteristics underpin effective MBIs?

Despite the potential advantages of MBIs there are a number of design issues and preconditions that are important to their success. Design issues relate to the regulatory and enforcement aspects of MBIs. Preconditions for effective outcomes relate to the nature of the industries that are impacting or generating the environmental outcome of importance and the broader institutional environment.

### *3.3.1 Regulatory design issues*

MBIs are based on the principle of voluntary actions in response to price signals. Use of the price mechanism to convey incentives is attractive to governments as the market performs the detailed allocative task of identifying who shall reduce pollutant discharges or increase the provision of ecosystem services. However, actions in response to price signals in traditional markets are conditional on ownership of the rights or responsibility, ability to measure the response and sanctions where promised actions are not undertaken. In addition to these more traditional problems there is often a fear that environmental rules and regulations will change through time discounting the significant investment involved in changing behaviour and outcomes by government and industry. These are aspects of regulatory design in market-based instruments.

The rights and responsibilities underpinning MBIs determine who pays and who benefits. For many environmental goods and services these rights and responsibilities are not well defined. Hence, regulations stating definition and allocation may need to accompany and support the MBI. For example, allocating responsibility to firms for their emissions facilitates emissions charges and taxes. Similarly, allocating a right to emit is necessary to implement a rights-based mechanism. Definition of the rights and responsibilities sets up an inherent tension in the application of MBIs. Regulations are often necessary to codify rights or responsibilities but are resented or feared by firms. Where stakeholders are cautious or even oppose MBIs the problem can be compounded (Hockenstein, Stavins and Whitehead 1998).

Hockenstein, Stavins and Whitehead (1998) and Stavins (2000) contend that because most MBIs are ‘bolted onto’ existing legislation they are often limited in their potential to create cost advantages over existing instruments. However, this is not always the case, and for political or other reasons an evolution of MBIs from existing institutions and regulatory platforms may prove to be the most effective approach. Of course, design tradeoffs made in order to ensure political acceptability can undermine the potential effectiveness of MBIs or any policy tool.

Hockenstein, Stavins and Whitehead (1998) also contend that government agencies with responsibilities for environmental management often have little experience in designing MBIs (as opposed to regulatory approaches) and few incentives for their adoption. In practice there clearly are areas of excellence in government (often with greater experience than outside researchers and commentators). But MBI expertise is not widespread, and those areas without the skills are increasingly looking to transfer instrument designs without rigorous assessment of their applicability in the alternative setting. In a similar vein, the skill-base of firms is often structured around technological compliance with prescriptive regulatory settings rather than those needed to capitalise on the flexibility offered by MBIs.

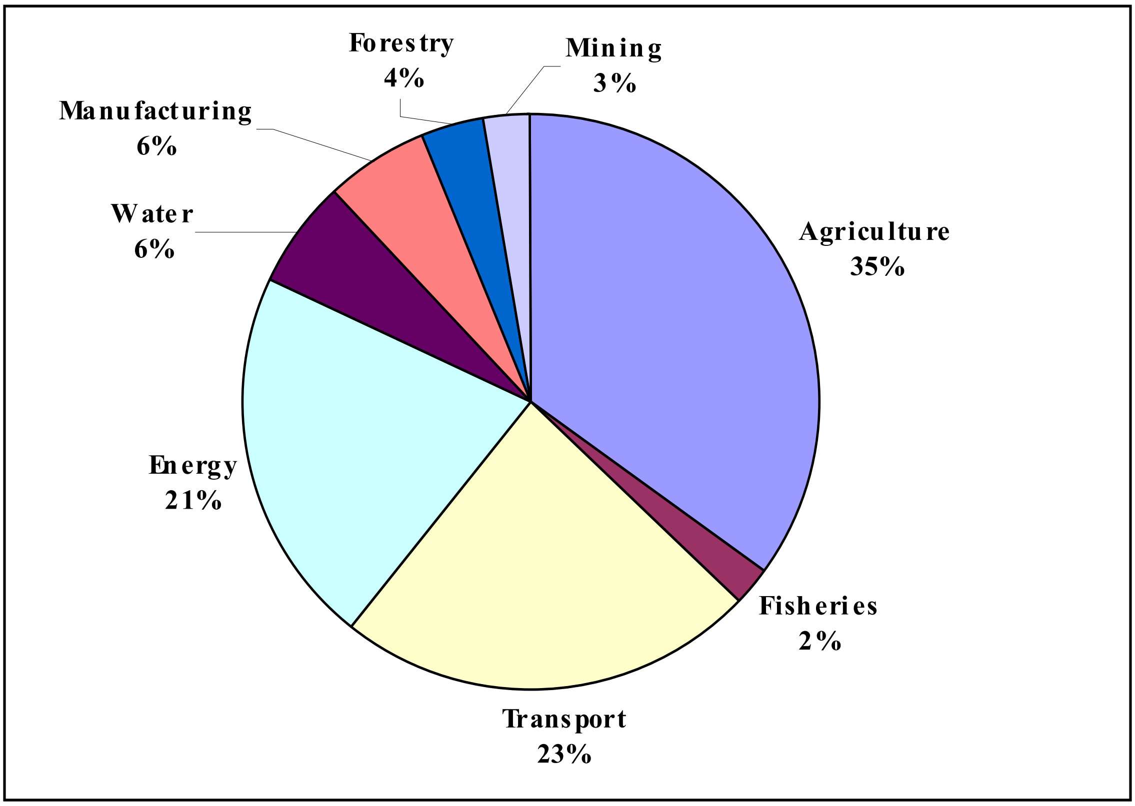
Rights and responsibilities necessary for MBIs will only be credible where there is a clear and demonstrable link between the rights specified and environmental outcomes sought. The allocation of rights, trading of rights, and the monitoring and enforcement of performance, are all dependent on sound metrics. That is, physical measures of the environmental outcome, or a suitable proxy for the outcome. For example, an emissions permit may have a 'performance basis' defined in terms of the annual quantity of allowable emissions. Alternatively, the basis may be specified in terms of a pollution ‘process’ – such as the expected recharge of a groundwater aquifer, which has a functional relationship to the level of dryland salinity in a catchment. In some cases an 'input basis', such as the permissible use of a polluting input, may be used when there is a clear quantifiable link between the quantities of input used and consequent pollution levels.

Generally an instrument will be more efficient if applied closest to the point of environmental damage. However this needs to be balanced with the technical capability and costs involved in establishing workable metrics. Some MBIs have been introduced that are applied to inputs or processes when a more efficient outcome metric could have been used.

*3.3.2 Preconditions for effective MBIs*

A critical factor in MBI success is a supportive broader institutional environment. Worldwide $950 billion dollars US, or 3.6% of world GDP is consumed in international price-based instruments (van Beers and van den Bergh 2001). The sectoral breakdown of these instruments is shown in Figure 3.3. While many of these subsidies are in sectors with potentially significant environmental impacts such as forestry, water and agriculture, most are targeted towards resource exploitation and industry development rather than towards environmental management. Where these subsidies actively promote environmental externalities they are referred to as 'perverse subsidies'. In recent times there has been an increasing shift towards reducing the 'perverse' impacts of broader subsidy programs, particularly within the US farm program and related instruments and within the Common Agricultural Policy in Europe. At the same time there has been a shift towards environmentally beneficial subsidies such as those offered in Australia through state and federal aspects of the National Heritage Trust and National Action Plan on Salinity and Water Quality Australia and the Conservation Reserve Program in the US.

**Figure 3.3: Breakdown of world subsidies by sector**




Source: van Beers and van den Bergh (2001) and Steenblik and Munro (1998).

The structure and variation in the firms that impact (positively or negatively) on the desired environmental outcome is also important to the effectiveness of potential MBIs. A number of characteristics can be used to effectively design MBIs:

1. the greater the degree of heterogeneity amongst firms generally the greater the gains relative to traditional command and control regulations (Newell and Stavins 1999; Stavins 2000);
2. the less site specific the impacts of pollution (that is, the less likely it is that hot-spots will develop) the more likely an MBI will be cost-effective (Stavins 2000);
3. if outcomes are critical (for example due to threshold or irreversibility) then rights based methods are preferred (see for example Stoneham, Lansdell and Strappazzon in this volume);

4. rights-based instruments work best when the firms using these have experience with similar tools (such as trading in water markets) and there are low cost mechanisms for exchange (Stavins 2000).

Other exogenous factors can also impact on the effectiveness of MBIs. Stavins (2000) notes for example that economic growth and inflation tend to erode effectiveness of performance-based taxes and charges while technological changes tend to increase the effectiveness of these instruments.

# 4. Australian and international experience with MBIs

In this section we provide a broad overview of Australian and international experience with MBIs. The number of MBIs that have been implemented has been steadily increasing over recent years, and a new generation of Australian MBIs are now under development as part of the National Market-Based Instruments Pilot Program under the National Action Plan for Salinity and Water Quality. A list of the range of MBIs currently in operation in Australia is shown in Table 4.1 with potentially many more operating at pilot or local scale that are not included in this list.

**Table 4.1: Examples of Australian market-based instruments**

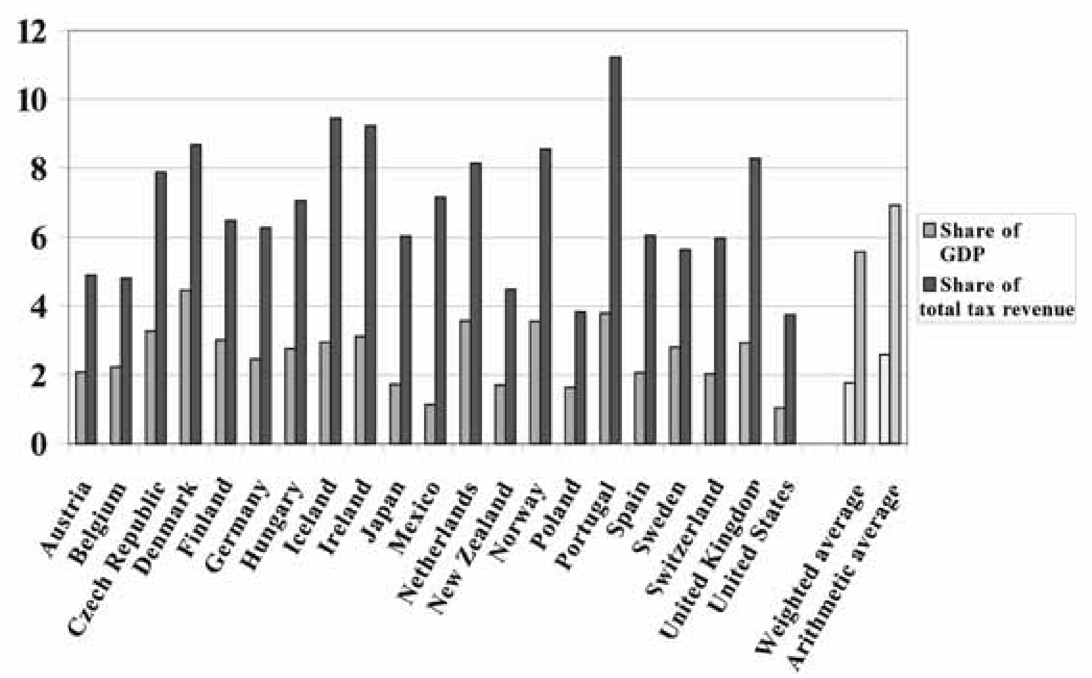
| Lever | Instrument |
|---|---|
| **Price-based** | • Licence fee for use of marine waters<br>• Aircraft noise levy (Sydney)<br>• Ozone depletion fee<br>• Waste effluent charges (Load based licensing)<br>• Mine site rehabilitation performance bond<br>• Greenhouse challenge subsidy<br>• South Australian beverage container deposit scheme<br>• Bushtender in Victoria |
| **Rights-based** | • Hunter river salinity scheme<br>• Tradable Renewable Energy Certificates (RECs)<br>• Nutrient offset scheme in South Creek, Sydney<br>• Carbon legislation (see for example NSW, QLD or Vic)<br>• Development offsets (local and state levels) |
| **Market friction** | • Banrock Station Wines environmental labelling<br>• Revolving funds for nature conservation<br>• Eco Certification Program (Tourism) |

Sources: OECD (1999), National Action Plan on Salinity and Water Quality (2002), Van Bueren (2002).

## 4.1 Price-based MBIs

The main price-based mechanisms in use internationally are 'eco-taxes' and subsidies. Across the OECD there has been increasing use of 'eco-taxes' and similar instruments. These taxes amount to around 2% of GDP and about 5.5% of total tax revenue across the OECD. They are primarily imposed on energy in the transport and heating sectors (60% and 5% respectively) as well as vehicles (30%) and electricity (4%) (OECD 1999). The revenues from environmentally related taxes in OECD countries are shown in Figure 4.1.

**Figure 4.1: Revenues from environmentally related taxes in percent of GDP and total tax revenue, 1995**




Source: OECD (1999, p. 60)

There is also strong Australian experience with price-based MBIs, though not generally with 'eco-tax' arrangements. Many Australian state and local governments have imposed pollution, development and waste management fees. Further product taxes are imposed on lubricating oils and used tyres to pay for product recycling. Other common price-based mechanisms designed in part with an environmental outcome in mind include parking and toll charges as well as noise levies (such as that imposed on landings at the Kingsford-Smith Airport in Sydney). Subsidies are also prevalent in Australia including those through tax concessions for Landcare management, NHT and NAPSWQ grants and numerous water and energy related programs such as that shown in Figure 4.2.

A well known price-based MBI is pollution taxes under the 'Load-Based Licensing' scheme (LBL) in NSW. Under LBL polluters are charged a fee that is based on the mass and relative impact potential of the pollutants emitted. The key factor is that the charge is performance based. If polluters are able to reduce their emissions then their LBL fee will fall. Firms are required to submit an annual return to the NSW EPA detailing their emissions. Firms may also be audited by the NSW EPA to ensure that returns are accurate. In order to reduce the potential for hot-spots developing the pollutant potential can also include the geographic location of the emission.

**Figure 4.2: Example of a price-based MBI – water efficiency rebates**


## 4.2 Rights-based MBIs

Rights-based MBIs have been used extensively in Australia to manage resource over-allocation in fisheries and water. They have also been used to cap emissions contributing to environmental damage. Three examples are caps placed on salinity in the Murray-Darling Basin and in the Hunter River, and on nutrients from a group of wastewater treatment plants in the Hawkesbury-Nepean system. More recently rights-based MBIs have also been employed to promote the uptake of environmentally positive activities such as low greenhouse gas energy under the Tradable Renewable Energy Certificates (RECs) program

### *4.2.1 Rights-based MBIs and renewable energy*

The RECs program in Australia is an innovative rights-based program intended to encourage generation of electricity from renewable sources.[4] In April 2001 the Federal Government introduced a mandated target that requires electricity retailers to generate an additional 9500 Giga-watt hours of electricity from renewable sources by 2010. The measure applies nationally, with all electricity retailers and wholesale buyers contributing proportionately to the achievement of the target. The target would increase the renewable share of electricity generation from 0.24 per cent in 2001to about four per cent by 2010. The target will be phased in via interim targets over the period 2001 to 2010.

Individual firms will be proportionately liable for meeting their share of the target. For example, if a retailer purchases 10 per cent of the nation's electricity it will need to meet 10 per cent of the interim target for that year. A system of tradeable renewable certificates (RECs) has been developed to assist

[4] Detailed information on the RECs program can be found on the Office of Renewable Energy Regulator website: http://www.orer.gov.au/

firms in meeting their obligations. Each REC is equal to one Mega-watt hour of renewable electricity. Electricity retailers can purchase these certificates to make up any shortfall in physical purchases of renewable electricity. Certificates can be acquired directly from renewable energy generators or purchased off the market. Each year liable parties must surrender RECs to the Regulator to cover their share of the target, with certificates subsequently expiring as a result of this process. A central registry of RECs has been established to support this requirement.

The RECs trading scheme has been designed to improve the cost-effectiveness of achieving the target. If renewable electricity is expensive in some locations then electricity retailers in those regions can purchase REC's generated in lower cost regions to minimise the cost of meeting the target. The certificates remain valid until surrendered and can be banked for use in future periods, although borrowing certificates will not be permitted. As with all such schemes a penalty for non-compliance is incorporated into the MBI design. The RECs penalty is set at a fine of $40 per mega-watt hour that is not surrendered, which sets an upper limit on the price of RECs. However, this amount is estimated to be greater than the expected marginal cost of obtaining renewable energy – implying that the penalty is not expected to constrain certificate prices (ABARE 2001b). The compliance mechanism is a soft penalty regime as penalties will be redeemable if compliance is achieved within three years.

*4.2.2 Rights-based MBIs and air quality*

A number of different rights-based MBIs have been effectively used to improve air quality in the US as shown in Table 4.2. These programs have been used to address lead, nitrous oxides, sulphur dioxide and chlorofluorocarbon (CFC) emissions. The most notable of these programs, in terms of its size and success, is the US Acid Rain Program. The Acid Rain Program is a cap-and-trade system that regulates sulphur dioxide ($SO_2$) emissions, the primary precursor of acid rain. The first phase of $SO_2$ emissions reductions was started in 1995, followed by a second phase in 2000. Now almost all electric power-generating units have been issued with allowances and brought within the system. Emission allowances were 'grandfathered' to industry participants, which helped to make the scheme more palatable to industry. Electric utilities must have adequate allowances to cover their emissions with high penalties for non-compliance (US$2000 per tonne plus a requirement that excess emissions be offset the following year). A robust market of $SO_2$ permit trading has emerged resulting in estimated cost savings of approximately US$1 billion per annum relative to the costs under command and control regulation (Stavins 2000).

**Table 4.2: United States air quality trading programs**

| | |
|---|---|
| **Baseline and credit programs** | |
| Lead trading | Introduced in 1982 to allow gasoline refiners greater flexibility in meeting reduction targets for lead content in fuel |
| Heavy duty motor vehicle engine emissions trading | Introduced in 1990 to meet standards for particulate matter, nitrous oxides and other emissions from heavy duty truck engines |
| Gasoline constituents program | Established in 1992 to meet minimum oxygen concentrations in fuel |
| **Cap and trade programs** | |
| Acid Rain Program | Established in 1995 to control sulphur dioxide emissions |
| CFC Trading Program | Established in 1986 to help comply with the Montreal Protocol, which called for reductions in the use of chlorofluorocarbons (CFC). |
| RECLAIM Program | The Regional Clean Air Incentives Market Program (RECLAIM) was launched in 1994 to reduce nitrogen oxide and sulphur dioxide emissions in the Los Angeles area |
| Other US state programs | In addition to RECLAIM, emission trading programs are in various stages of development in several US states |
| NOx Regional Ozone Program | A national program introduced in 1999 to meet reduction targets for nitrous oxides |

Source: United States EPA (2001)

*4.2.3 Rights-based MBIs and water quality*

Another apparent MBI success story has been water quality. The United States is at the forefront in developing trading programs for controlling the discharge of effluent into waterways. There has been strong experience and success in Australia as well with the Hunter River Salinity Trading Scheme and Pilot Pollution Trading in the Lower Hawkesbury Nepean systems. The main forms of effluent being regulated in this way are nutrients, salts and pesticides from point sources – including sewage treatment plants, piggeries and industrial plants. More recently, efforts are being made to incorporate non-point sources into the regulatory framework although the success has been mixed. These sources primarily constitute broad-acre farms.

Compared to air emissions trading, the application of trading to manage water quality is significantly more complicated. Water pollutants do not necessarily mix uniformly throughout a drainage system[5]. That is, the environmental impact of a unit of discharge entering the waterway at one location is different to the impact of an equivalent unit discharged at another point along the waterway. This problem can sometimes be overcome with trading ratios but these must be founded on a solid understanding of the biophysical relationships involved. A related risk is that trading could induce these so called 'hotspots' if market rules are not carefully crafted. The source of water pollutants also differs. Non-point sources – such as agricultural runoff and stormwater – often contribute a large proportion to the total effluent load in waterways. Non-point sources are difficult to incorporate into a trading program because, by definition, discharge from these sources is dispersed and often unobservable. Thus, proxies for the amount of effluent being discharged by individual sources may need to be used, subject to the robustness of assumed relationships. This may require a functional relationship to be established between land use practices and the quantity of discharge. Even if these functional relationships are established, it can be costly to monitor non-point sources because they are dispersed across a wide geographic area.

[5] Air and other pollutant "hot spots" also exist but are less common

**An Australian Example: The Hunter River Salinity Trading Scheme**

The NSW Environmental Protection Agency (EPA) operates the Hunter River Salinity Trading Scheme. This cap-and-trade scheme regulates discharges of saline water from coalmines and power stations in the Hunter River catchment above Singleton. The program was introduced as a trial scheme in 1995 after extensive consultation with the NSW Department of Land and Water Conservation[6] (DLWC), the Coal Industry Association, the Hunter Catchment Management Trust and Pacific Power.

The objective of the scheme is to manage saline water discharges so as to minimise impacts on irrigation, other water users and on the aquatic ecosystem. The scheme manages salinity by restricting discharges to a share of that which can be safely diluted within a high flow event. The total salt that can be discharged during the high flow event is calculated according to the ambient salinity in the Hunter River and concentration targets at key points in the river (Denman and Singleton). A comprehensive system of real time monitoring is used to ensure that participants do not exceed their pollution entitlement. Monitoring is the responsibility of permit holder, with the EPA and DLWC conducting regular audits to verify the accuracy of the monitoring data. It is estimated that the scheme costs between \$150 000 and \$200 000 per annum to administer (ABARE 2001a). This cost is covered through a fee levied on participants based on credit holdings.

The scheme was introduced as a pilot scheme. The environmental targets were achieved during the pilot period despite a series of seasons with low flows that made it harder for participants to manage their discharges (ABARE 2001a). The evolution of the scheme shows how MBIs can evolve from traditional command and control regulation. Initially the scheme was managed through EPA licensing with 'credits' allocated to coalmines and power stations in the region and including a reserve held by the EPA. More recently, the pilot has moved to a permanent footing under separate legislation. A number of innovations have accompanied introduction of the permanent scheme, including extending the life of credits to 10 years and allowing third party ownership. In order to maximise the potential benefits from trade and facilitate new entrants, twenty percent of credits expire every two-years and are reallocated via auction.

**A US Example: The Lower Boise River Trading Program**

The Lower Boise River Trading Program is one of the prototype schemes being developed by the US EPA. The Boise River catchment is located in southwest Idaho and is subject to discharges from sewage treatment plants, factories and agricultural producers of which the primary concern is the amount of phosphorous entering the Boise River (see Figure 4.3). In 1997 the US EPA, in partnership with stakeholders in the watershed, began to examine the potential for setting up a trading program as a means of reducing the costs of meeting new water quality standards to be introduced in 2001. While existing regulations under the National Pollutant Discharge Elimination System (NPDES) regulate point source discharge limits these are expected to become more stringent and subject to 'total maximum daily loads' (TDMLs) from all pollutant sources. It was decided to develop a demonstration program for trading phosphorous reduction credits because initial investigations suggested the costs for nutrient reductions range widely among sources yielding potential benefits from trade.

The objective of the TDML plan is to meet a water quality target measured at the mouth of the Boise River. However, the sources of pollution are distributed unevenly through the catchment. Furthermore, non-point sources in particular are complex and costly to measure. In order to incorporate non-point nutrient pollutants the impact of many BMPs is estimated using a generalised model. The uncertainty about the actual impact is then incorporated via an 'uncertainty discount'. To take account of the spatial differences in pollution generation trading ratios between different locations in the catchment have been devised. These trading ratios are used as conversion factors to ensure that the market does not create or exacerbate 'hot spot' problems.

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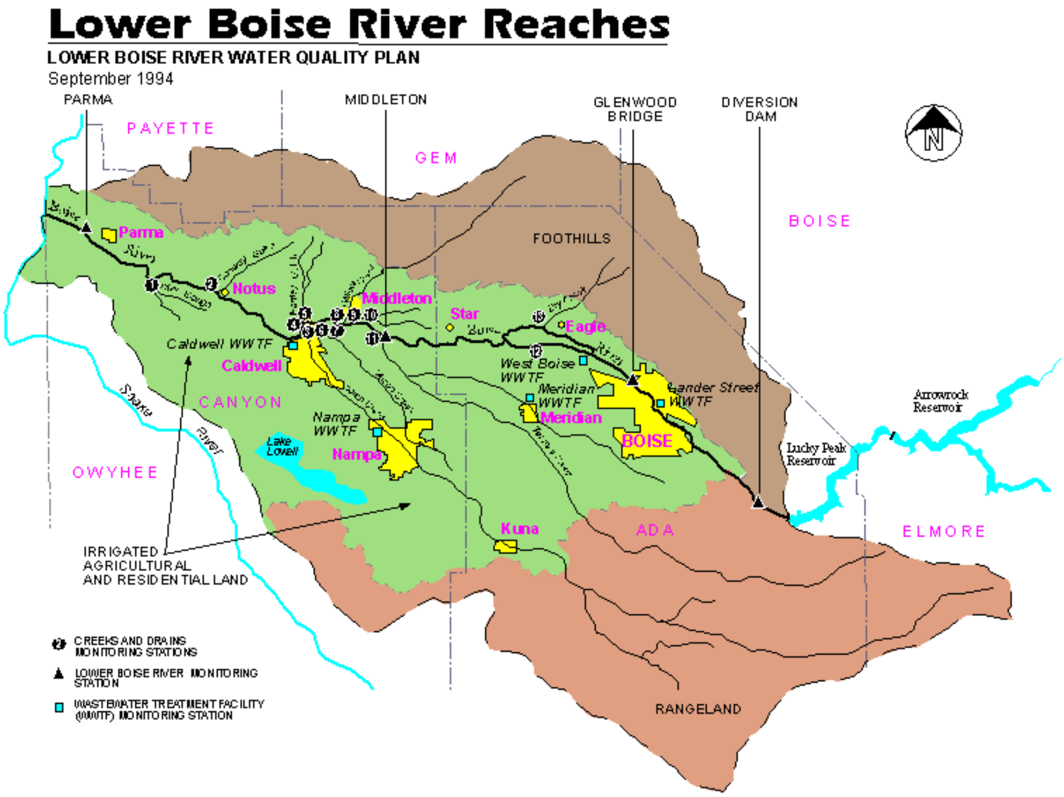
[6] In 2003 DLWC was merged with Planning NSW to create The Department of Infrastructure, Planning and Natural Resources (NSW)

**Figure 4.3: The Lower Boise River**




Point and non-point sources are incorporated using a 'baseline and credit' MBI format. Point sources will need to meet their discharge limits by either reducing their discharge or purchasing ‘offset credits’. ‘Offset credits’ may be purchased from other point sources (point-to-point trading) or from the agricultural sector (point-to-non-point trading). The agricultural sector is not subject to an enforceable baseline level of discharge, but farmers can generate credits for sale to point sources by adopting approved 'best management practices' (BMPs). For example, BMPs include buffer strips, wetland construction, irrigation control systems, and tillage systems. ‘Offset credits’ will only be issued in circumstances where a farmer has changed his management practices in adopting a BMP. That is, credits will not be issued retrospectively.

An innovative aspect of the Boise River trading scheme is the proposed establishment of a private ‘Trading Association’. The purpose of the Trading Association is to facilitate trades via a single source of information about trade types and location and potential buyers and sellers. The World Resources Institute is developing a similar Internet based scheme across catchments (see: www.nutrientnet.org).

## 4.3 MBIs designed to reduce market friction

Relatively few MBIs have been specifically targeted towards reducing market friction in a way that stimulates a market to emerge thus ensuring environmental outcomes are met. This is because the impacts of such measures are generally less certain and may take considerably longer to occur than either price-based or rights-based measures. Furthermore, many instruments that may ultimately serve this purpose are not specifically directed towards reducing market frictions. For example, extension schemes directed at better biodiversity management might reduce the set-up costs of farm-based tourism with a biodiversity component. Despite this constraint, government, industry groupings and the private sector have developed MBIs that effectively reduce market friction. In this section we briefly discuss an example of eco-labelling as an information tool and revolving funds as a market facilitation tool.

*4.3.1 Banrock Station wine eco-labelling*

Banrock Station Wines has 2070 hectares of vineyards amongst 1600 hectares of native vegetation. The vineyards are managed to minimise their impacts on the Ramsar listed wetlands. Marketing campaigns for Banrock Station Wines feature the environmental management of the property with a portion of each sale being returned to wetland conservation in the projects around the world including Australia, New Zealand, the Netherlands, Sweden, Finland, Denmark, the United States, Canada, and the United Kingdom.[7] The marketing aims to inform wine consumers that some revenues are being notionally committed to purchasing a positive environmental outcome at the vineyard or for wetlands in their own neighbourhood. The BRL Hardy owned venture, Banrock Station Wines has been extremely successful reaching sales targets well in advance of forecasts.

The success of eco-labelling approaches relies on consumers responding to marketing and advertising campaigns that link the sale of the product with a positive environmental outcome. Such 'product branding' usually requires some form of assurance (for example, accreditation) for consumers to know that the claims related to the branding are being carried out. In the case of Banrock Station Wines, this accreditation is provided by linking the purchase to a donation to a reputable conservation organisation such as Landcare Australia and the Swedish Wetland Fund. These organisations then permit the use of their logos on Banrock Station products. Broader eco-labelling schemes are also under consideration in Australia (for example, Blackwood Environmental Stewardship Trial - BEST Farms in the Blackwood Basin in WA).

*4.3.2 Victorian Trust for Nature revolving fund*

The Victorian Trust for Nature has operated a revolving fund since 1989. Revolving funds commit a pool of funds to purchasing properties with significant native habitat or of cultural value, and then reselling the land to conservation-minded people wishing to own a native habitat property. The advantage of a revolving fund is the ability to recycle the funds many times over as lands are progressively purchased and resold. For example, the Victorian Trust for Nature fund had purchased and resold 14 properties by 2000 with a further 8 awaiting sale. Properties are often resold with a conservation covenant attached to further protect the natural values.

The revolving fund essentially works by matching buyers and sellers that would not otherwise occur due to information constraints or time-of-sale mismatches in a highly specialised market. In the US revolving funds are often used to make quick purchases that are then on-sold to governments due to the much slower way in which government funds would be approved for such purchases. Revolving funds may also purchase properties to allow community or non-profit organisations time to raise funds for their purchase as community assets.

Revolving funds usually require that the land purchased must be of a specified conservation importance. Such lands may have threatened plants or animals, or be one of the last remaining areas of native vegetation in the region. The land may also form part of an important riparian or wildlife corridor or contribute important functions for landscape 'health'. Important factors include: degree of disturbance; diversity of flora and fauna; presence of threatened or endangered species; value as a buffer or wildlife corridor; size and shape of area; and, management input required to maintain the ecological integrity of the site. Eligible sites are often brought to the attention of the fund by Trust for Nature supporters or property vendors.

# 5. Discussion

As more is learnt about the requirements for successful MBI establishment, the range of policy contexts to which trading is being applied continues to broaden. During the coming decade it is likely that trading instruments will become increasingly common in Australia and overseas as a means of managing domestic and international environmental problems. Consequently, it will be important for Australian industry sectors to keep abreast of developments so that it can actively engage in the MBI design and implementation.

[7] See www.banrockstation.com.au

A number of factors have been responsible for the heightened interest by Australian and international governments in environmental markets. Firstly, the overwhelming success of the US Acid Rain Program – which used a trading scheme to reduce the emissions of sulphur dioxide emissions – has convinced many governments and prominent environmental groups of the merits of trading. Since its establishment in 1995 the Program has surpassed expectations, with firms exceeding the reduction target at less than one-half the forecast cost (Ellerman, 2000). A robust market of sulphur dioxide trading has emerged, resulting in cost savings in the order of US$1 billion annually compared to the costs under some command and control regulatory alternatives (Stavins, 2001). The cost savings are mainly a consequence of tremendous technological change in the electricity generation sector, and opportunistic use of low-sulphur coal that has become more economic with rail reforms in the 1990s. The profile and prospects of similar emissions trading schemes has been significantly increased under the terms of the Kyoto Protocol.

Second, the philosophy of environmental trading is consistent with micro-economic reforms introduced by successive state and federal Australian governments over the last fifteen years or so. For example, sweeping market reforms have been made to the banking, transport and electricity sectors. There has also been a noticeable paradigm shift in the way natural resources are being managed. The shift has been away from centralised 'command and control' regulations and towards market-based schemes. For instance, Australia now has a tradable property rights framework for controlling the extraction and use of irrigation water (tradeable water entitlements). Similar frameworks have been developed for managing Commonwealth and State fisheries.

In another development, Australian resource management agencies have embraced the concept of commercialising 'environmental services' because it is perceived that this could attract private investment in natural resource management. Environmental services include the services of nature that society often takes for granted - such as the pollination of agricultural crops by bees, water purification by forests and the salinity control benefits of trees. Many of the MBI pilot projects funded under the National Market-Based Instruments Pilots Program focus on such environmental services.

A fourth reason for the growing interest in environmental trading is the ongoing and rapid improvements in information technology and computer processing. These advances are revolutionising our abilities to monitor the environment. Simultaneously, the cost of remote sensing and 'real time' monitoring is continuing to fall. The Internet has also reduced the transaction costs of trading, because it allows buyers to locate sellers quickly and easily. These developments are expected to improve the economic feasibility of environmental markets. A related development is the advances being made in modelling complex biophysical relationships between land use change and ecosystem impacts. Reliable scientific information on the nature of these relationships is critical for the functioning of environmental markets.

Despite these encouraging signs for the development and adoption of MBIs some caution should be exercised. Poorly defined environmental goals are not conducive to efficient market instruments. As an example consider the issue of solid waste management.

Government interests in waste management have moved away from that of focussing primarily on managing post-consumer disposal impacts to promoting perceived upstream benefits associated with reducing waste generation and increasing recycling and reuse of waste materials (such as resource conservation and industrial emissions). While such upstream benefits will vary markedly between different waste materials and recycling processes, little attention has been focussed on identifying which actions will deliver what benefits. Rather, driving down waste disposal *volumes* to landfill has become the policy metric. Accordingly, MBIs have focussed on volumetric landfill taxes and recycling subsidies.

By using an indirect metric where environmental outcomes associated with the subsequent behavioural changes are poorly understood, environmental benefits may be small, even perverse. The key issue is that the market failure and therefore the policy objective must be clearly defined prior to instrument selection and then every effort made to apply policy instruments closest to the point of the market failure (environmental damage), not at some distant point in product supply chains. .

A third concern is that reforming current and perverse incentives may be the most effective way of addressing policy goals rather than immediately considering new MBIs. As is the case overseas there are potentially significant perverse incentives in the energy, transport and agricultural sectors in Australia. For example, there has been a recent shift in emphasis in the agricultural sector from supporting production and prices to natural resource management issues. But this shift remains incomplete with significant concerns remaining over the direction of drought policy and the prevalence of industry 'rescue' packages, such as the latest assistance package for the sugar industry.

Finally, many MBIs to date have been narrowly applied. These instruments limit community responses as much as prescriptive regulations that seek to 'pick winners'. For example, consider the range of water conservation incentives applicable to appliances (see Figure 4.2), water tanks and irrigation technology. The ACT water efficient showerhead scheme for example is estimated to cost approximately \$1,700 per mega-litre of water saved[8] whereas the opportunity cost of irrigation water in the Southern Murray Darling Basin (that incorporates the ACT) ranges between \$500 - \$1,000 per mega-litre.[9] The piecemeal application of instruments for narrowly defined outcomes is a poor surrogate for fundamental property right and institutional reforms. Generally the gains from MBIs increases with the volume of trade, and the potential for trade in turn will be greater where market boundaries are broader – looking to capture as many low cost opportunities for reform as possible.

# 6. Conclusions

MBIs are becoming a 'mainstream' policy instrument for managing a wide range of environmental problems. Australia's uptake of MBIs for environmental management has so far been modest compared to other OECD countries (OECD 2001). However, recent government reforms in natural resource management policy – both at Federal and State level – suggest that MBIs will play a greater role in the future. Governments appear to be undergoing a paradigm shift in their views on what constitutes good environmental policy, with greater emphasis being placed on the role of decentralised instruments to achieve change within industry. Just as the 1990's saw great advances in microeconomic reform in transport, electricity supply and water, so too it is likely that significant reforms will be made in NRM.

This new era of environmental policy presents both opportunities and challenges. Environmental awareness and the growing demands placed on businesses to be accountable for their environmental performance is an international phenomenon. In general, the traditional response by government has been to instigate 'command and control' regulation. Environmental markets are a departure from these unnecessarily prescriptive regulations with potential benefits from the greater flexibility and certainty. If designed well, these instruments offer the potential to drive down environmental compliance costs.

On the other side of the ledger, environmental trading poses future challenges. First, there is a risk that environmental targets will be set by government without a comprehensive assessment of all the costs and benefits implied by the target. Ideally, what is needed is a consultative process that is not open to abuse by interest groups or being gazumped by impatient politicians. All too often, environmental targets are implemented without full consideration of the economic and social trade offs involved or of the fundamental property right reforms that may be necessary.

A second, related, risk is the erosion of MBI gains via arbitrary reallocation of rights or resources within these instruments. The legal basis of the MBI must be soundly specified if they are to function successfully. Thirdly, poorly designed trading programs can impose high transaction costs, particularly where the responsibility of monitoring and verification is also devolved. A fourth is to work with government to develop MBIs that are unambiguous in their operation and that have simple, transparent rules that are not open to manipulation. In some applications, such as biodiversity and salinity management, there is a need for good quality science to underpin any MBI.

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[8] Derived from Energy Strategies (2003), AAA Showerhead rebate program: audit and evaluation

[9] Marsden Jacob Associates (2002), *Improving water use efficiency in water conveyancing systems*. Report to Land and Water Australia

Finally, the advent of environmental trading will require new management skills and stakeholders will need to undergo a period of 'learning'. In the industrial sector many firms were ill-equipped to fully utilise the opportunities created by trading instruments and this may well be the case in the rural sector.

To sum up, the papers at this symposium will showcase a variety of MBIs that have gained widespread acceptance by the majority of stakeholders. In most cases this has been achieved through extensive consultation and pilot testing, the development of fair and unambiguous rules, and the provision of secure tenure. But poor instruments also exist, generally reflecting poor design, ambiguous policy goals or governments implicitly still 'picking winners'. Greater use of market instruments as environmental 'band-aids' should not be at the expense of fundamental property right reforms.

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