The Appropriate Role of Property Rights in Environmental Protection

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Abstract

A number of regulatory controls, aimed at reducing water and air pollution, have been implemented in New South Wales. These controls are examined in the paper. The paper also explores the evolution to market based controls, in particular those linked to the notion of property rights.

1. Introduction

Environmental protection in New South Wales, as elsewhere in the world, generally has been pursued using a range of regulatory approaches. While there have been successes in controlling point source water pollution and significant gains in dealing with air pollution from vehicles in Sydney, it has become clear that traditional regulatory approaches alone will not efficiently solve the mounting environmental problems. In particular, the established "command and control" approach, as implemented in New South Wales, has not dealt effectively with problems such as diffuse source pollution of our waterways or global climate change in a sustainable development framework.

Recognising the need for reforms, the response in New South Wales has

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been action to redesign aspects of the regulatory infrastructure, including the enactment of the Environmental Offences and Penalties Act, 1989, and a reformatting of licence conditions and licence fees. These initiatives will lead to greater effectiveness and efficiency, although some benefits may not be evident overnight.

Running parallel with changes to the regulatory mode, interest has developed in the application of market-based approaches to environmental protection. Economists, of course, have argued in favour of such instruments for over 20 years and there is now a modest body of experience in their use building up in Europe and the USA where economic instruments have been introduced as supplements to the basic regulatory mechanism. Economic instruments are purported to offer a number of advantages including greater flexibility in how environmental goals are met, cost efficiencies for industry, the clearer specification of environmental costs in production functions while maintaining continuous pressure for pollution reduction and technological innovation.

The establishment of the New South Wales Environment Protection Authority (EPA), scheduled for July 1991, heralds a new era for environmental protection. The EPA will not only carry forward the reformed regulatory infrastructure from the State Pollution Control Commission (SPCC) but will have a much broader charter to consider new solutions to emerging problems. There exists in New South Wales, thus, a unique opportunity to capitalise on a rare blend of circumstances, including:

* an increased awareness and understanding of the importance of the environment in which we live and the practical experience (both positive and negative) over almost 30 years in implementing a variety of environmental regulatory measures;

* an improved understanding of the principles of business and management in public administration and the acceptance by the community, generally, of the application of these principles to the broader management of the State;

* a willingness on the part of various interest groups to work to define and achieve the principles that underpin sustainability; with the vision of hindsight, we are beginning the tough task of integrating environmental protection and economic development.

But market-based approaches are not a panacea. It is clear from overseas experience that the successful use of economic instruments can only proceed after detailed evaluation of relevant environmental and economic data and careful consultation with all stakeholders. Thus, an important innova-

tion with the EPA will be the establishment of an Environmental Economics Unit charged with evaluating the adoption of more market-based approaches.

This paper examines the current regulatory approach to pollution prevention and control in New South Wales and the evolution of more market-based approaches, especially those linked to the notion of property rights. It examines, first, the traditional regulatory model in New South Wales, to highlight the proposition that change was needed, that some steps have been taken but more effort is yet required. Assessment of the scope for a property rights approach must recognise the particular problems to be handled, and these are examined in the second section. The third section overviews the development of economic concepts about environment protection, including the idea of sustainable development, and the fourth section examines the range of economic instrument utilised for environment protection in the United States, Europe and Australia. In the fifth section lessons from the use of economic instruments are examined. The final section examines some of the key considerations for developing in the New South Wales Environment Protection Authority a property rights perspective.

2. The Regulatory Model in NSW

The predominant mechanism for environmental protection in Australia, as in other Western industrialised economies, is control by regulation. Regulatory instruments have been described by the OECD (1989) as:

> institutional measures aimed at directly influencing the environmental performance of polluters by regulating processes or products used, by abandoning or limiting the discharge of certain pollutants, and/or by restricting activities to certain times, areas etc, through licencing, setting of standards, zoning etc. Their main feature is that there is no other choice left to the polluter: he has to comply, or face penalties in judicial and administrative procedures. (p.12)

This approach has its historical roots in the urban sewerage and other public hygiene programs of the nineteenth century (OECD, 1989:23). It is often colourfully described as 'command and control', the first instance of which in Australia is the order by Governor John Hunter on 2 May 1797 warning that anyone taking water from the Tank Stream in any other way than at the tanks would be 'secured and carried before a Magistrate' for suitable punishment.

The advantage of regulation in environmental protection is that it provides authorities with a direct control over specific pollutants and a basis

for enforcement in cases of non-compliance. A strong regulatory mechanism has been used for the control of dangerous pollutants where only very low levels or zero emissions are acceptable, or where protection of particularly sensitive areas is required. Also, the command and control approach is familiar to society across a range of policy areas, and is clear reassurance that unwanted behaviour is being properly handled, or at least addressed.

Responsibility for environmental protection in New South Wales is spread through a number of portfolios, including Environment, Health, Local Government, Planning, Agriculture and Fisheries, Water Resources, Tourism, Lands and Forests and Industrial Relations (through the work of the WorkCover Authority on dangerous goods and chemicals in the workplace). The environmental regulatory framework is primarily contained in legislation administered by the SPCC.

Established in 1970, the SPCC has through its various Acts responsibility for preventing, controlling or reducing pollution, for controlling waste disposal and for protecting the environment. Its regulatory control is exerted primarily through power over approval to construct and licence to operate. Under the first of these provisions industrial and other premises with significant potential for air, water or noise pollution must obtain SPCC approval before construction can proceed. Approval is based on both an assessment of the receiving environment to accept the impacts of the proposed development, and on the adequacy of the environmental controls to be imposed. The Commission may refuse an application for approval if it assesses that the receiving environment is incapable of assimilating the lowest practicable emissions from the proposed development. Before operation commences, a licence to operate must be obtained. This will specify detailed operating, monitoring and reporting requirements and emission standards to be met. Breaches of approval and licence conditions lead to prosecution in court and fines. Premises not licenced by the SPCC must also meet prescribed standards or operate by best practicable means to minimise pollution and, by notice from a local authority or the SPCC, are required to act to minimise pollution.

In New South Wales, regulatory control has been generally (though not universally) successful in controlling point source pollution into water and air especially in the urbanised Newcastle-Sydney-Wollongong area. However, although such regulation has been successful in many applications over the last 20 to 30 years, various weaknesses are becoming evident as society expects better performance to match its heightened concern about the environment, and as industry struggles to perform by new world standards of competitiveness, more recently in the context of recession. These flaws of the regulatory model include:

* relatively high administrative costs which are borne by the public and industry (even though full administrative costs are not necessarily reflected in the fees charged);
* limited effectiveness in environmental protection resulting from penalties which were too low, and from an enforcement and prosecution record which sometimes has been poor (in part because of limited resourcing);
* failure to provide incentive for polluters to reduce emission levels below limits set in licences or to improve continuously their pollution abatement technology;
* the tendency, on occasions, for industry to feel that the goal posts (which lay out the standards to be achieved) are moved mid-game by the regulators.

A key question is whether these problems are best addressed by reforming the regulatory process, or through the introduction of an alternate model with a stronger emphasis on market-based mechanisms. The theme of this paper is that the greater use of economic instruments shows considerable promise, although as an important adjunct to rather than as a replacement for an effective regulatory mode. It is crucial, therefore, to get the regulatory processes right as a first step, and over the past twelve months a series of measures have been initiated to address the flaws identified above.

The SPCC currently administers some 3,000 pollution control licences, which throughout the 1980s were processed manually. In recent years this antiquated method has severely hampered the Commission's ability to keep track of all licences, and to efficiently review and modify them in light of improving technology and worsening ambient environment conditions. By late 1991 a new computer-based licencing system will be on line. Improvements should be evident in the form of efficient access to and revision of conditions on the basis of available ambient data and technology, as well as automatic updating of licences resulting from new works or statutory orders issued by the new EPA, perhaps because of established pollution reduction programs now embedded in the licence conditions themselves.

Another problem with the old system has been those licences where the limit is cast more in the form of an ideal or a goal. While less than five per cent of licences are in this category, they include some of those which regulate the more prominent industrial operations. Often the SPCC strategy throughout the 1970s and 1980s was to work to encourage the licence holder to bring in new technology over time to achieve goals set out in the licence. However, by definition contemporary emissions or discharges will exceed

the (ideal) limits set in the licence. The BHP Port Kembla licence on discharge to Allen's Creek is a celebrated case in point. Established in 1975, it set the cyanide limit at 0.05 mg/l, although at the time the actual discharge was in the order of 5.0 mg/l or 100 fold the set limit. Over the years, in line with the established pollution reduction strategy, the company lowered the discharge to 0.65 mg/l. Thus, although the old strategy brought a 76 fold improvement in the discharge levels, the 1991 figure was still 13 fold above the standard set in the licence. And this was the situation when Greenpeace focussed media attention on the BHP licence in January 1990.

Since the Greenpeace exercise at BHP Port Kembla the SPCC has moved to modernise its licence limit conditions, on the grounds that the community has a much stronger concern these days to see prosecution for breaches and industry has a concern that prosecution should only proceed when there has been a breach of a clear and fairly set limit. Thus, since mid 1990 the massive task has been underway to review and modernise all the pollution control licences to attach conditions which reflect 'prosecutable reality'. The new limits being written into the licences often will be less stringent than the old limits, but the latter were frequently 'works of fiction' in terms of contemporary operating reality, and the new approach constitutes 'truth in licensing'.

The concern in the public mind might be that the modernised licence means the system is going softer on polluters. In reality the Commission is going harder on polluters for two reasons. First, the new limits ensure that actual (as distinct from targetted) discharges and emissions this year are no greater than last year, and often are less. In any event, all licences with adjusted conditions must also now incorporate a pollution reduction program into the modernised licence, which means that the licence holder over time must improve performance as better practices and new technology make this feasible. Second, because the Commission's position is now clear and realistic, penalty action can be easily triggered by an exceedence.

Despite the problems with the old licensing regime, in the last couple of years the SPCC has had growing success with prosecutions, both as to the level of the maximum fine imposed under the Acts it administers (see Table 1) and as to the total value of fines imposed (see Table 2). In addition, the Environmental Offences and Penalties Act 1989, amended in late 1990, introduced heavy fines at its 'first tier' of up to $1 million for corporations and $250,000 and/or seven years imprisonment for individuals guilty of wilful or negligent acts causing environmental harm. The first successful prosecution produced a fine of $10,000 in December 1990 for leachate discharge in the Blue Mountains. In its 'second tier' offences the Act consolidates the strict liability offences which were scattered in the various

Pollution Control Acts (see Table 1) with increased penalties up to $125,000. At the "third tier" the new Act provides an infringement notice system for minor offences, which is also intended to increase the efficient administration of the regulatory scheme.

Table 1: *Maximum Fines Imposed UnderPollution Control Acts, 1986/87 and 1990*

Act		1986/87	1990
State Pollution Control Commission Act		$500	$10,000
Clean Air Act		$4,500	$25,000
Clean Waters Act	$3,000	$35,000	
Noise Control Act	$150	$750	

Table 2: *Total Fines Imposed By Courts for Pollution Offences, 1967-90*

Year	Dollars
1967	50
1968	nil
1969	150
1970	nil
1971	nil
1972	550
1973	2,350
1974	11,570
1975	46,220
1976	49,170
1977	47,044
1978	83,790
1979	28,930
1980	32,890
1981	46,710
1982	58,665
1983	64,700
1984	42,800
1985	19,745
1986	53,150
1987	60,415
1988	63,970
1989	341,096
1990	516,225

Note: *Fines are the dollar value of the year involved, and have not been adjusted for inflation. Costs awarded by the Courts are excluded from the figures above.*

Source:*Compiled from records of the State Pollution Control Commission.*

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A further innovation has been the introduction in 1990 of formal pollution reduction programs (PRP). As mentioned earlier, these are attached to licences, particularly where the limits are being adjusted into a modern, "prosecutable reality" form, to ensure an ongoing reduction in permitted pollution over time as technology is upgraded. The most prominent example is the PRP attached to BHP's Port Kembla Steelworks licence issued in December 1990 which provides for BHP to complete a $70 million upgrade of its pollution control systems before the end of 1991. Further, BHP has agreed to post a $9 million bond with the Commission to achieve the pollution reductions required within the agreed timeframe.

Taken with additional changes which are being pursued in the establishment of the EPA, this package of reforms will improve the regulatory framework. It will provide an efficient licensing system, clear goal posts and enforceable emission standards backed up by effective penalties and strong enforcement, as well as ensuring that enterprises accommodate the environmental advantages of technological improvement.

3. Environmental Issues Facing NSW in the 1990s

The nature of environmental problems facing New South Wales is changing. As point sources of pollution are coming under control, the emerging environmental threats have a more regional or even global character. Among the more pressing environmental problems over the next decade are the rehabilitation of contaminated land sites, the management of environmentally hazardous chemicals, the generation and disposal of solid wastes and intractable wastes, eutrophication of inland and estuarine waterways and global climate change. The appropriateness of alternate environment protection strategies, particularly the weight to be borne by economic instruments vis a vis classic regulatory control, must be assessed in the context of the problems to be handled.

3.1 Contaminated Land Sites

A large number of sites, previously used for industrial purposes, are now being redeveloped for residential and other sensitive end uses. Most are located within major cities, although problem areas are also coming to light in the country. The Commission, through the Environmentally Hazardous Chemicals Act, for the most part has power to tackle the contaminated site problem to address unacceptable risks, and is now working with a large number of land owners and occupiers to rehabilitate contaminated lands. Notices requiring rehabilitation work to be carried out have been issued on

about 40 sites, and a further 40 major sites suspected of being contaminated are under active investigation by the Commission to determine suitable rehabilitation strategies. However, not infrequently those responsible for the contamination have disappeared and with current law the Commission faces difficulty sometimes in seeing rehabilitation undertaken by those who should bear the burden to do so. Applying a commons orientation to such cases, the Environmental Restoration and Rehabilitation Trust should be able to play an important role.

There is a potential for over 1,000 contaminated sites to exist throughout New South Wales, not counting abandoned cattle dip sites. The effective management of chemicals to ensure that the public health and environmental risks associated with their use are minimised must be a high priority in the 1990's and the role of the EPA will be pivotal.

3.2 Solid Waste

Sydney generates about four million tonnes of solid wastes per year (one tonne for every resident) so the disposal capacity required is very high. Landfill disposal is the primary method used at the moment, but land resources are becoming more valuable and suitable available land is becoming more restricted. It has generally been recognised that waste minimisation is one of the most effective and efficient methods for dealing with solid waste for the future. Effective incentives and programs to induce industry and the public to generate less waste through waste reduction and recycling strategies must be applied. Economic instruments have a strong potential in this category, particularly with regard to waste generation.

3.3 Intractable and Hazardous Wastes

Intractable wastes are materials which contain hazardous substances strongly resistant to breakdown including organochlorine pesticides, polychlorinated biphenyls, hexachlorobenzene (HCB), chlorofluorocarbons (CFCs) and halons. There are an estimated 8,000 tonnes of HCB and 5,000 tonnes of other intractable wastes in Australia. In addition there are 30,000 tonnes or more of CFCs and halons, much of which will become intractable waste in future years.

As with solid waste, mechanisms to prevent the generation of intractable wastes are needed. The same applies to the disposal of existing stores of intractable waste. The difficulties involved in siting a high temperature incinerator to destroy intractable wastes are well documented. Whatever the balance between the regulatory mode and the economic instruments

mode, the result must serve to reduce, and in some cases prevent, the further production and accumulation of these substances.

3.4 Eutrophication of the State's Waterways

Addressing the eutrophication of the State's inland and estuarine waters remains a high priority in New South Wales, given the importance of water supply for drinking, recreation, agriculture, industrial and ecological purposes. Considerable media attention is given to rivers and lakes that record either algal blooms or fish kills, which often can be attributed to the presence of higher than acceptable loads of nutrients such as phosphorus and nitrogen.

The unfortunate reality is that many of our fresh water systems are either eutrophied already or are under serious threat. The problem may be present throughout all of a water body or in certain areas only; alternatively, it may exist for only certain times of the year or under certain conditions such as with reduced water flow or volume. The critical influencess are phosphorus and nitrogen. When nutrients enter the water in a form that can encourage the growth of algae or other undesirable plant-life, the water can be rendered unfit for animal or human consumption and can threaten the existence of those sensitive ecosystems that depend on it. The prevention and reduction of eutrophication rests largely, therefore, on controlling the nutrient phosphorus loads entering waterways.

Phosphorus is derived from two major sources, both of which can be traced back to human activity. First, point source discharges, primarily in urban and industrial areas, contribute enormous loads of phosphorus if uncontrolled. In this respect sewage treatment plants are notorious. On the other hand, a far more insidious and yet comparable contribution comes from diffuse-source pollution in either rural or urban areas. These sources are varied and range from the injudicious application of fertilisers near a waterway, through to urban run off into a river or Sydney Harbour, either through a complex of stormwater drains, or directly from streets and foreshores. Diffuse sources do not lend themselves to the traditional "end of pipe" treatment controls associated with point sources. As a result, the control of diffuse source pollution will require creative preventative strategies to be effective in the long term.

3.5 Global Climate Change

A major environmental threat in the intermediate and long term is climate change associated with the generation of greenhouse gases. The scientific

community has reached a general consensus that atmospheric concentrations of greenhouse gases (carbon dioxide, methane, chloroflurocarbons and nitrous oxide) are increasing as a result of human activity and that these changes are expected to cause a gradual increase in the earth's temperature and consequent climate change. The Commonwealth Government has adopted an interim target to reduce greenhouse gases by 20 per cent based on 1988 levels by the year 2005. The New South Wales and Victorian Governments also have adopted this interim planning target.

Although Australia produces only an estimated 1.25 per cent of the world's CO_2 emissions, some 34 per cent of these emanate from New South Wales. Clearly, climate change induced by greenhouse gases is a global problem and Australian efforts to reduce CO_2 emissions would, in isolation, have negligible impact. Nevertheless, as a responsible member of the international community, Australia is contributing to the development of an international convention restricting greenhouse gas emissions. This convention is scheduled to be drafted at the United Nations Conference on Environment and Development planned for 1992. Should Australia become a signatory to such a convention then the Commonwealth could instigate a national strategy to reduce greenhouse gas emissions. However, implementation and monitoring would need to be conducted at a state level.

Some of the strategies for reducing greenhouse gas emissions which have been proposed include more efficient energy production, changed patterns of transport use, a more energy efficient manufacturing sector, and development of more energy efficient technologies through research and development.

The serious environmental threats facing New South Wales for the rest of this decade, some of which are outlined above, have in common their diffuse nature and regional and global characteristics. These emerging difficulties have not responded in the past to "command and control" regimes alone and will require some of the more flexible and innovative approaches now associated with a property rights environment.

4. Development of Economic Concepts about Environmental Protection

The roots of environmental economics encompass the gamut of economic doctrines and sub-disciplines. These are clearly summarised by Pearce and Turner (1990) in *Economics of Natural Resources and the Environment.* They note that current mainstream economic thought, as applied to the

environment, draws its foundations from neoclassical theory of the market. However, the evolution of economic theories, particularly as they relate to natural environment, over the past 100 years has brought earlier concepts, new methodologies and new criteria to the debate. Each of these provides a different perspective on, among other things, the role of the individual and the firm, their behaviour under varying conditions, the role of government intervention and the capacity of the market to operate effectively and efficiently under varying circumstances.

4.1 The Competing Paradigms

The Pearce and Turner overview has identified "four basic world views... ranging from support for a market and technology driven growth process which is environmentally damaging, through a position favouring managed resource conservation and growth, to 'eco-preservationist' positions which explicitly reject economic growth." (p.13) What becomes clear from the variety of positions and the alternative points of view is that there is no uniform or unifying theory. The differing objectives and values held by different people dictate the paradigm adopted.

The property rights paradigm is based on the premise that the existence of well defined and transferable property rights will create an economy in which individuals and firms have the proper incentives to operate efficiently, including in their use of natural resources. Increased government intervention would lead to more, not less, inefficiencies. However the transfer of the application of property rights from the more tangible natural resources, such as fisheries or forests, to the more intangible air quality or water quality area has created more difficulties. Further, as Pearce and Turner note, 'overall, property rights paradigm supporters would probably concede that markets are imperfect', but equally 'they would emphasise that their failings do not automatically imply that collective action is superior. The market mechanism is then judged to be superior to any other practical alternative' (p.19). This may be the case in some situations, but it certainly does not apply to others, where the regulatory mode is more appropriate given goals set.

A basic tenet behind both established regulatory and newer economic measures for environmental protection has been the polluter-pays principle (PPP). Recommendations on PPP were approved by OECD member countries in 1972 to the effect that polluters should, subject to certain exceptions, bear the full costs of pollution-reduction measures decided upon by public authorities to ensure that the environment is in an acceptable state (OECD, 1972). More recently, the PPP has been extended to accidental pollution.

There should be little quarrel with this.

To analyse environmental problems in terms of property rights suggests that the role of government is to establish clear, transferable property rights to environmental resources. The question is, how far should this go? Some would argue for private ownership of national parks, for example, as a means of providing protection for these assets. A less direct, and perhaps less contentious, approach is to create tradeable permits to use an environmental resource, as for example with tradeable emission permits which establish rights to the assimilative capacity of air or water or land. There are other circumstances where it is not feasible to create property rights to an environmental resource at all and in these cases economists have turned to price-based mechanisms including charges and deposit-refund schemes to internalise environmental externalities.

The main competing paradigm is that the environment should be protected to a much higher standard than that implied in the idea of property rights to be traded, with preference for stern regulation based on the idea of non-tradeable or inalienable rights. But where does society want the balance to lie between the interests of the environment and the interests of the economy? This will be one of the two or three most contentious public policy issues in the decade ahead, perhaps longer. The issue of sustainable development is central to the debate.

4.2 Sustainable Development

The debate on sustainable development has, more than any concept in recent times, brought to the fore the competing paradigms in economic analysis. To date, the most commonly used definition of sustainable development comes from the Brundtland report as "development that meets the needs of the present without compromising the ability of future generations to meet their needs" (WCED, 1987). Considerable intellectual capital in Australia and elsewhere is being invested in determining what sustainable development really means for future strategies of resource use and environmental protection.

A major contribution to the sustainable development debate has come from Professor David Pearce in his book *Blueprint for a Green Economy* and other publications. Pearce sees sustainable development as "about being fair to the future" (1989:1). He argues for a narrow interpretation of sustainable development, where total environmental capital is not to be decreased from generation to generation. This position is based on:

* the irreversibility of some environmental damage;

* uncertainty about how environmental impacts will manifest themselves in the longer term; and

* the lack of substitutes for many environmental assets.

Consideration of sustainability has also highlighted the need to consider intergenerational equity. Many economists would argue that the use of non-renewable resources will be limited by the operation of the market through the pricing mechanism. Others would suggest that sustainable development implies no further use of non-renewable resources and a non-degradation approach to all environmental assets. The concept of sustainability and its centrality to any stance on environment protection, understandably has brought contributions from competing vantage points. Little has been resolved yet which would provide practical guidance to the policy maker or environmental regulator, but the debate is seen as a worthy one, and therefore lines of communication between different perspectives have been opened. Also, the sustainable development debate has brought to the fore and legitimised the crucial concept of intergenerational equity. Inescapable is the need to fully cost the environmental impact of productive activity. Thus, the question is not whether economic instruments are significant in the protection of the environment, but rather which instruments should be invoked, how they are to be used and within which paradigm. The selection of paradigm, in the final analysis, is a matter for public policy determination.

5. Economic Instruments in Environmental Protection

Policy instruments available to government in environmental protection are generally classified as either regulatory or economic although the division is often blurred at the border. The OECD has provided the following definition:

> "Instruments could be labelled as "economic" insofar as they affect estimates of costs and benefits of alternative actions open to economic agents, with the effect of influencing decision-making and behaviour in such a way that alternatives are chosen that lead to an environmentally more desirable situation than in the absence of the instrument." (OECD, 1989:12)

There are two main classes of economic instruments, those which create property rights to environmental resources and those which act on prices. Across these two categories, the OECD has identified the following range of economic instruments:

* tradeable emission rights or permits;
* charges levied on inputs, outputs, users or emissions;
* deposit-refund schemes;
* subsidies including grants, soft loans and tax allowances; and
* financial enforcement incentives such as performance bonds and non-compliance fees.

Economists have argued in favour of economic instruments at least since the early 1960's and, indeed, economic instruments have been used in environmental protection in Europe and the United States over the last 20 years. In most cases economic instruments have been adopted as supplements to, rather than substitutes for, regulation. For example, the European Council of 26 June 1989 in Dublin adopted in its Declaration a chapter on environmental issues containing the following statement:

> Standards designed to ensure a high level of environmental protection will remain the cornerstone of environment policy. But the traditional "command and control" approach should now be supplemented, where appropriate, by economic and fiscal measures if environmental considerations are to be integrated into other policy areas, if pollution is to be prevented at source and if the polluter is to pay. (Commission of the European Communities, 1990:2)

In Australia most of the recent reports on environmental protection have mentioned the potential advantages of economic instruments, at least as an option for consideration. For example, the Commonwealth Discussion Paper on Ecologically Sustainable Development (June 1990) acknowledges that 'It would now appear desirable to pay more attention to the contribution that economic analysis and market-based measures could make to achieving environmental objectives efficiently and effectively.'

In New South Wales the possible use of economic instruments figures in the *Discussion Paper on Establishing the EPA* (July 1990) and in the companion *Information Paper on the EPA* (January 1991), both published through the Ministry for the Environment. In reality, economic instruments, in the form of increased charges for use of environmental resources have been implemented over the past year by the Water Board and the Waste Management Authority. The SPCC and the Water Board have also introduced the use of performance bonds as a form of financial incentive/disincentive. These bonds provide another economics-based instrument in the absence of an operating property rights model. Tradeable emission permits usually are prominent in a property rights model, and these are considered

in the next section, followed by attention to charges and deposit-refund systems.

5.1 Tradeable Emission Permits

Tradeable emission permits (TEPs) are quotas, allowances or ceilings on pollution emission levels of specified polluters that, once allocated by the appropriate authority, can be traded subject to a set of prescribed rules. Tradeable permits give the polluter a marketable property right to use a specified amount of the disposal capacity of the land region, water system or air shed.

If the total amount of pollution allowed under the sum of the permits is set by authorities at less than existing pollution levels, then permits have a scarcity value and therefore can be traded at a positive price among firms. Firms whose clean-up costs are less than the market price of the permits may decide to sell their permits and firms whose costs are greater than the price of the permits become potential buyers. In theory this results in a least-cost reduction in pollution while meeting ambient quality goals, at whatever level they are set to meet the community's preferences.

Tradeable permits may be allocated initially by either assigning them to firms in proportion to their existing pollution rates (grandfathering) or by auctioning the quota of allowable permits.

The concept of TEPs first arose in the United States in the 1960's and these instruments are still used mainly in the United States, and to a lesser extent in Germany. Tradeable emission permits currently are a topic of much discussion among policy makers in Australia and it is worthwhile examining their history in some detail.

The United States Environmental Protection Agency (USEPA) began in 1974 to experiment with the use of TEPs to allow firms greater flexibility and to provide efficiencies in meeting national air quality standards. The success of this experience has been reviewed extensively, especially by Professor Robert Hahn and his colleagues. (Hahn 1988, Hahn 1990, Hahn and Hester 1988 and Hahn and Hester 1989)

The US EPA's emission trading program extended rather than replaced the regulatory system established under the Clean Air Act, which assigned responsibility for setting air quality standards to the federal EPA and responsibility for their implementation to the states. Those air quality regions which achieved federally established ambient air quality standards when they were formed were called "attainment areas", with the rest designated "non-attainment areas". Each state was required to develop a State Implementation Plan (SIP) for EPA approval, detailing which sources of pollution would be regulated and how this would be done.

Emission standards state the amount of a given pollutant that a particular type of source may emit. They are generally more stringent for new sources than established sources and for non-attainment compared with attainment areas. States implement emission standards through permit systems described in SIPs.

Emission trading allows the exchange of emission rights both between and within firms. In the United States an intricate program was developed, which featured individual firms generating credits for reducing emissions and then being allowed to trade those credits in a marketplace. The commodities exchanged are emission reduction credits which are, in effect, property rights to emit air pollutants.

Emissions trading encompasses four programs:

* **Netting** allows a firm creating a new emissions source within a plant to reduce emissions from another point source in the plant so that net emissions across the plant do not increase significantly. The firm can thereby avoid the stringent emission limits which would otherwise apply to the new source

* **Offsets** have been developed as a way of allowing new development in non-attainment areas, while ensuring that emissions continue to fall toward the set ambient standards. The offset rule specifies that new emission sources may be located in non-attainment areas but only if they offset new emissions by even larger reductions from existing sources. Offsets trading may occur within or between firms

* **Bubbles** allow a firm to sum the emission limits for individual sources of a pollutant within a plant, and to adjust the levels of control applied to different sources so long as the aggregate level is not exceeded. Bubbles apply to existing sources and can extend across more than one plant or firm in a particular geographic area

* **Banking** allows firms to save emissions reduction credits for future use in emissions trading (Hahn and Hester, 1987:49)

The generally agreed evaluation of the TEPs program in controlling air quality in the United States is that it has led to cost savings in the billions of dollars but has had a negligible impact on environmental quality. On this basis, the program could be considered more worthwhile for the economic dimension than for the environmental dimension, with the result that more balanced terms of trade perhaps should be built into the equations.

Other conclusions about the United States experience with tradeable permits include:

* netting is the most frequently used activity, followed by offsets then bubbles;
* most trading is internal to a particular firm, which is possibly the result of high transaction costs;
* banking is almost non-existent; and
* active markets in TEPs have not developed.

An important constraint to the program has been the lack of information on ambient air quality values as well as existing or baseline emission levels of firms. In order to implement the US EPA's program, states required complete and accurate air emission inventories which often were not available. This is likely to be a major concern for New South Wales, where the quality and extensiveness of the databases are not good enough yet to sustain the operation of tradeable permits.

In November 1990 the United States amended the Clean Air Act so that it now relies even more heavily on the use of TEPs. For example, the Act's acid-rain provisions place a cap on sulphur-dioxide emissions from electricity utilities but allow them to trade permits for sulphur-dioxide emissions. Other examples of the use of TEPs in the United States are lead phase-down in petrol, and in the water area the programs for the Fox River in Wisconsin and the Dillon Reservoir in Colorado (Hahn & Hester 1988:43).

Of all the examples of emissions trading, the lead phase-down is reported to have been most effective in reducing the costs of environmental compliance. Success has been linked to previous industry experience in trading products and additives, minimal administrative requirements for trading and the ability to bank lead reductions exceeding EPA standards (Moore et al 1990).

The Dillon Reservoir program is especially interesting in that it allows trading between point source polluters and non-point source polluters. The purpose of the program was to reduce the cost of abatement and thus achieve greater reduction in phosphorus to the reservoir by allowing point sources such as municipal treatment plants to trade discharges among themselves or, alternatively, to pay for reduction of non-point source pollution. A further aim is to avoid treatment capacity constraints, such as septic systems and urban runoff, on local economic growth.

In 1984 the Colorado government adopted a plan requiring that advanced treatment techniques be applied to point sources and that non-point sources, new after 1984, be required to use controls to minimise waste loads. The plan also introduced the following trading mechanisms:

* point sources are allowed to acquire discharge rights in excess of the amounts allowed under the plan;

* rights can be acquired from point sources or non-point sources existing before 1984;

* trading ratios are 1 to 1 between point sources and 2 to 1 for point sources acquiring rights from non-point sources (to provide a margin of safety in light of uncertainty about non-point source controls);

* to implement the trade between point and non-point sources, point sources agree to pay for and install phosphorus reductions at non-point sources, acquiring a property right by the credit they get for phosphorus reduction; and

* after 1990, trading for reductions from non-point sources will be the only way to accommodate future municipal waste loads.

An example of one trade to date involved a developer paying for sewering of some septic systems. The Fox River program in Wisconsin involved a trading system for paper mills and other dischargers. It has not proved effective, reportedly because of restrictions on trading, the time required to get state approval and uncertain tenure of the discharge right (Moore *et al* 1990).

In Australia experience with TEPs is very limited. Tradeable emission quotas have been introduced in effect at the federal level in the phasing out of ozone-depleting gases (chloroflurocarbons and halons). The Commonwealth Ozone Protection Act 1989 establishes a system of quotas for the import, export or manufacture of CFCs and halons. These quotas may be traded by firms across Australia.

The Commonwealth legislation is complemented by State and Territory implementary legislation. In 1989 the New South Wales Government passed the Ozone Protection Act enabling the regulation of the handling of ozone-depleating substances, and the Gazetted Regulation has effect from 31 March 1991.

5.2 Charges

Charging industry a price for disposing of waste products in air and water bodies entails the use of an economic instrument (Dates 1984:11). The terms charges or taxes are often used interchangeably although the two are sometimes differentiated on the basis of revenue destination. Tax revenues are added to the public budget, while charge revenues are used for directly

financing environmental measures.

Charges can be imposed at a number of points on the production cycle. When properly designed, charges should represent the shadow cost of pollution. Such charges act as incentives by encouraging polluters to reduce discharges to the extent that it is cheaper to treat them than to incur the charge (with the unit rate of charge equalling the marginal abatement cost). Various types of environment charge can be identified:

* **Input charges** are levied on inputs to polluting activities, for example taxing of chemicals used to manufacture toxic products.

* **Output charges** are levied on output of a polluting activity rather than the pollutant itself, for example taxing electricity rather than CO_2 or SO_2 or SO_3 or SO_4 production.

* **User charges** are payments for the costs of collective treatment of effluents or wastes. They include charges paid for services rendered by authorities, for instance for collection and treatment of municipal waste water and solid waste.

* **Effluent or emission charges** are payments on the emission of pollutants into air or water or onto soil and on the generation of noise. They are calculated on the basis of the quantity and/or quality of pollutant discharged.

* **Product charges** is a term frequently used to cover charges levied on products that are considered to be harmful to the environment when used in production processes, consumed or discarded. Product charges may be applied to raw materials, intermediate goods or final products. The term covers both input and output charges.

A survey of OECD countries in 1987 (OECD, 1989) found that charges are by far the most frequently used economic instruments: of a reported 153 economic instruments in use, 81 were categorised as charges.

Effluent charges have been used widely in Europe, notably in France, Germany and the Netherlands in water pollution control, solid waste management and in the abatement of noise from aircraft. User charges are commonly applied by local authorities for the collection and treatment of solid waste and sewage.

Water effluent charges became operational in Germany in 1981 with increasing charge rates per unit of pollution to 1986. The charge applies to households as well as firms that discharge into the river and is calculated on a number of parameters including chemical oxygen demand, organic halogen compounds, heavy metals and toxicity to fish. The incentive

character of this charge is reflected by a system of corrections on the charge bill in the case of good performance by the polluters. The most important corrections are discounts on the charge bill if actual discharges are lower than those laid down in the permit or licence (Commission of the European Communities, 1990 Annex 2).

In Australia, charges frequently are made for the use of environmental resources, for example entrance fees to national parks, garbage disposal charges and water use charges. But the levels set are generally too low either to take account of the full value of the environmental resource or to influence polluters' behaviour towards environmental protection. The trend, however, appears to be towards increasing charges to levels where they might be considered legitimate economic instruments, and the Water Board, the Waste Management Authority and the SPCC all are looking in this direction, as will the new EPA.

The Water Board's Trade Waste Policy was revised in early 1990 to provide for a progressive increase in charges, in essence as a pollution tax on the creation of trade waste. The increased charge provides an incentive for firms discharging trade waste to the sewer to examine their processes and find more cost effective ways to reduce, reuse or recover materials from their trade waste. The pricing strategy incorporates mass and concentration and differentiates between industrial waste of domestic strength, and the discharge of non-domestic substances such as heavy metals, and provides an incentive for dischargers to bring effluent concentrations down to set standards. The extra revenue generated by increased trade waste charges is allocated to the Environmental Trusts which will support environmental restoration, research and education programs.

The Waste Management Authority in January 1991 introduced the innovative Council Recycling Rebate Scheme which rewards Councils with a rebate of $17.50 for every tonne recycled, which is funded by a levy on waste generators. Structured this way, the scheme recognises both environmental externalities and intergenerational equity. For example, the replacement cost of Sydney's landfill systems with waste-to-energy technology would be about $500 million for council waste alone, and this is being recognised in the levy and rebate system. To better reflect the cost of replacement technology once the landfill capacity or the "commons" is depleted, consideration may need to be given to increasing this type of levy.

The fees for pollution control licences issued by SPCC are based on the volume of discharge only. Fees are pitched at a level which approximately recover administrative costs. Although licence fees were increased by 20 per cent in 1990/91, and will be increased a further 20 per cent in 1991/92, they are directed toward administrative cost recovery rather than being a

mechanism for pollution prevention, which means there is scope still to bring the economic instrument effect into greater play in this area.

5.3 Deposit-Refund Systems

In deposit-refund systems a deposit is paid on potentially polluting or recyclable products. The deposit is refunded when the product is returned and pollution thereby avoided, and additional opportunities are provided for recycling and reuse. The inherent rationality of the system is that it establishes the full cost of products by clarifying and incorporating disposal costs into the production function.

Deposit-refund systems have been used most extensively to encourage collection systems for beverage containers. In the United States, states with these have reported an 80-90 per cent return rate of containers using a deposit of 5-10 per cent per container (Moore *et al* 1990). A deposit-refund system for beverage containers has been established by legislation in South Australia, but reports on its success have been mixed. Other applications which have been suggested for the deposit-refund system include pesticide containers, tyres, batteries and small quantity hazardous wastes such as solvents.

5.4 Subsidies

The majority of OECD countries appear to provide financial assistance for some pollution control activities. Revenues raised from charges schemes may help to finance investment in pollution control equipment. Subsidies may be concealed in below cost charges for environmental services or take the form of grants, soft loans or special tax allowances. They tend to be used sparingly and with due consideration because they are theoretically inconsistent with the polluter pays principle (OECD 1990).

6. Lessons From the Use of Economic Instruments in the USA and Europe

The OECD has proposed five sets of criteria against which environmental policy instruments can be evaluated viz:

* environmental effectiveness;
* economic efficiency;
* equity with respect to distributional effects;

* administrative feasibility and costs; and
* acceptability by target groups.

6.1 Overview

While it is not intended to review the various instruments discussed above against these criteria, the preceding overview of Australian and overseas experience in the application of economic instruments to the achievement of environmental goals suggests a number of general conclusions:

* a combination of policy instruments, both economic and regulatory, is required to deal effectively with environmental pollution;
* despite the potential efficiencies to be derived from the use of economic instruments, there are relatively few examples of their adoption and fewer assessments of their broad long-term economic and environmental impact;
* the choice of instrument(s) for a particular environmental issue will vary and will require detailed consideration of environmental, economic and political factors in their selection;
* interest in moving towards more market based approaches is growing largely in response to the desire for efficiency and in the context of the emergence of difficult regional and global environmental threats; and
* the size of the market for tradeable permits will often dictate the effectiveness and efficiency of proposed programs. There clearly must be sufficient players to ensure efficient market interactions.

Based on experience to date the OECD has drafted some suggested fields of application of economic instruments (OECD 1991) as outlined below.

* **Water pollution** is amenable to emission, user and product charges. Marketable permits could be applied to point sources as well as combinations of point sources and non-point sources. Deposit-refund systems can play an indirect role by encouraging the return of pollutant containers and the recovery of the remnants of pollutants, such as pesticides, they contain.
* **Air pollution** may be addressed through the use of emission charges as a complement to or a substitute for regulation. Product charges

could be used as a proxy for emission charges in the case of diffuse pollution, for example, by placing a surcharge on fossil fuels. Marketable permits and deposit-refund systems also have applications, examples of the latter being deposit refunds on refrigerators and air conditioners containing CFCs.

* **Waste management** could benefit from the use of emission charges based on volume and/or toxicity of waste substances. Product charges and deposit-refund systems may also be considered.

* **Noise** control could be pursued through the use of charges on aircraft noise, road traffic noise and industrial and product noise sources.

6.2 Constraints on Utilization

One of the significant constraints on the wider adoption of economic instruments overseas has been the finding that a change from a regulatory to an incentive-based system redistributes wealth (OECD 1990). The imposition of emission charges which take account of social costs may be unfavourable to firms that already hold free-of-charge emission permits. Likewise, adoption of a system of TEPs where the permits are allocated initially by auction, rather than distributed without cost on the basis of existing emissions, involves cost increases to firms.

While the use of emission and user charges undoubtedly provides ongoing incentives to reduce pollution it may also have unintended and undesirable side effects. For example, the imposition of significant charges may have unpredictable effects on markets and impact on the international competitiveness of firms. Product charges on indigenous products may favour imported substitutes and affect national trade balances. High user charges on waste disposal can provide an incentive to dump illegally, thereby increasing the need for greater rigour in the command and control side of things.

Setting charges at the optimum level for efficiency and to provide the desired environmental outcome is also difficult. The charges can be adjusted if the initial level is found to be incorrect, however the resulting uncertainty impacts on the investment planning of industry, especially sectors with long investment cycles.

The uncertainty and unpredictability of market-based approaches in the wider context of business planning and long term investment programs has also been raised as a significant concern of industry. The successful implementation of TEP programs is subject to a number of further con-

straints related to the industry structure of polluting firms and other enterprises. The United States experience suggests that it is most likely to be effective where there exist a manageable number of polluters of reasonable size. Where there are too few participants involved, trading is unlikely to occur. Where there are many smaller firms involved, trading may be deterred by high transaction costs and the burden of monitoring costs. Where there is a limited number of participants there may be the danger of one firm acquiring all the permits, thereby effectively creating a monopoly (Treasury 1990).

Finally, the introduction for environment protection of market-based measures which are based on the creation of property rights has also raised fundamental philosophical issues for some environmentalists who do not believe it is legitimate to create and trade in emission rights. Allowing firms to trade emission rights is seen as signalling that decisions about trade-offs between economics and environmental quality can be left to the polluters. For this reason the green movement, at least in the United States, is opposed to, or very suspicious of, TEP programs (Hahn 1990). They prefer an inalienable rights approach to a property rights approach.

7. Establishing The Environment Protection Authority in a Property Rights Environment

The rationale for the New South Wales Environmental Protection Authority is:

* to ensure improved service to the community, industry and government in achieving a balanced approach toward environmental protection and economic development of the state;
* to promote a streamlined and rationalised environmental protection framework that provides certainty to the community, industry and government; and
* to consolidate the current disparate system of environmental control over chemicals, toxic substances and hazardous substances.

As noted earlier, the development of the EPA in the early 1990's provides a unique opportunity to consider and apply market-based approaches to environment protection in areas that have traditionally been put in the "too hard" basket. Innovative programs such as those created by a property rights approach must encompass the certainty and predictability that industry and the community both demand and deserve. Goal posts need to be carefully set after an appropriate consultation process with major

interested parties and the community. And they must stay in place for the contracted period. At the same time, the levels of performance implied by the goal posts need to be improved over time, as technology and the economy permit.

Beyond the goal posts are guideposts, and these can be presented as four propositions:

1. The imperative for integrating economic and environmental decisions has become clearer.

The concepts of ecological and economic sustainability recognise the mutual dependence of the environment and the economy. Strong economies are clearly necessary to ensure effective environmental programs. But at the same time, a clean environment is a fundamentally important concept to economic development.

Industry, technology and the environment have traditionally been pitted against each other. But it is the mutually supportive approaches that are gaining importance. To maintain public credibility and confidence and fairness to industry, these will need to be set in the context of an efficient regulatory program which establishes the boundaries within which those market-based efforts operate.

The EPA will be focused to foster awareness and research programs to assist in bringing industry and government together to solve problems economically. A good example is the short-listed New South Wales Co-operative Research Centre (CRC) on Waste Management and Pollution Control which is sponsored by a wide range of university, business and government enterprises, including the University of New South Wales, University of Western Sydney, BHP, ICI, Memtec, the Water Board, the Waste Management Authority and the SPCC.

The EPA will also be required to build its skills in both economics and ecology. A new environmental economics unit is part of the new organisational plan, and this will help develop innovative programs to take advantage of the property rights and market-based concepts, and improving economic and environmental evaluative techniques.

2. Pollution prevention and waste minimisation are key strategies for both environmentally and economically sound policies.

Environmental protection efforts, in the past, have primarily focused on media-specific pollution control and "end of pipe" solutions, and there were good reasons for that. Although often disparaged, these programs have resulted in significant reductions in discharge of pollutants. However, further gains in control will undoubtedly be much more costly and difficult

to achieve.

Relying exclusively on "command and control" regulatory approaches such as enforcing regulatory standards through inspections, only goes so far and quickly encounters diminishing returns. It is virtually impossible to police compliance of every generator at all times and enforcement is complicated by diffuse or non-point sources which do not respond to the traditional enforcement model.

From the point of view of both efficiency and effectiveness, pollution prevention and waste minimisation hold a substantial key to future gains in environmental protection and offer significant benefits to many sectors of society not available through traditional pollution control approaches. These include:

* Economic benefits in the form of reducing the costs of waste management, compliance, liability and remediation; increasing operating efficiencies; and creating markets for sale or reuse of wastes, and

* Reduced health and ecological risks including reducing health care costs; avoiding simply shifting pollutants among environmental media; reducing risks of exposure to toxic substances and reducing the need for transportation, treatment and disposal of wastes.

A major platform of the new EPA will be the incorporation of strong pollution prevention and waste minimisation philosophies. This will include transferring the waste planning and regulatory functions currently implemented by the Waste Management Authority and the SPCC into the EPA, and expanding these functions statewide. The EPA will take a wholistic approach to ensure that waste generated by premises is minimised. A "cradle to grave approach" towards waste management is important, to put the responsibility and accountability squarely on the waste generator. This is a key premise in defining property rights and effectively defining accountability.

3. A combination of regulatory and market-based approaches is necessary to ensure effective and efficient environment protection.

With the evolution of environmental management, we have been able to better recognise the successes and failures of the purely regulatory "command and control" approach. The expanding costs of pollution control, the increasing complexity of regulatory regimes and the failure of regulation to foster technology innovation has launched us into the pursuit of a new armory of tools to create innovative and creative environmental protection programs.

The traditional regulatory approaches provide the opportunity to fix long term quality objectives, performance standards and targets, which provide the certainty that industry and the community desire. Economic instruments, on the other hand, provide opportunities of employing the most cost effective solutions to achieve those standards.

In New South Wales, the Government has concentrated on getting the basis of the regulatory process established. This has included the three tiered enforcement structure under the Environmental Offences and Penalties Act as well as the focus on licences that reflect "prosecutable reality". The new legislation, which will be brought in over the next year for the EPA, will provide an opportunity to streamline and consolidate that regulatory framework.

But what has been and still is missing are the economic instruments. The EPA should address this deficiency by developing new market-based programs tailored to the conditions in New South Wales. Working in a property rights environment involves enterprises instituting principles of duty of care and accepting responsibility and being accountable for the wider impact of operations. Crucial is the development of a good information base, for rational economic decision making, as well as sensible environmental judgement, is only possile with good data. Certainly the paucity of proper data on ambient environmental quality of many of the regions and localities in the state will need to be addressed as a matter of priority.

Practicality is the operative concept in fostering property rights concepts for environmental issues. A complex interaction of factors exists in dealing with environmental issues including those often unattributable events related to diffuse source pollution. As a result, in setting up the EPA the use of pilot programs is being considered to allow careful testing of the functions and operation of market-based approaches. There are some necessary prerequisites for practical market-based programs to operate and these are yet to be developed. They include the use of "protection of the environment plans" (PEP's) and ambient quality objectives which will provide for the necessary targets or benchmarks within which tradeable programs operate. They also require effective monitoring programs to assess key environmental quality objectives.

4. Integrated pollution control is a necessity

Future environmental protection strategies must recognise the interconnectedness of the environment and ensure that multi-media and cross-media approaches are developed.

It is becoming increasingly clear that market-based approaches relate not just to one environmental medium but require decision making that takes into account the interaction between water, air and land. We know, for example, that a policy decision to limit discharges to water will have implications for other environmental media - reducing the options for disposal to those affecting the air (through incineration) or land (through land disposal), or some form of reuse.

The EPA will be pursuing this integrated philosophy through such means as waste minimisation and instituting an integrated schedule of premises for approvals and licences.

8. Conclusion

The Discussion Paper published last July on the establishment of the EPA raised the use of market mechanisms for public comment. While a number of submissions endorsed their potential use, a number expressed concern. In general, support was given to processes which might provide incentives to reduce the creation of pollution in an economically rational manner. The responses have been summarised in the Information Paper on the EPA which was published in January 1991.

The concerns come from two perspectives. The first is a philosophical concern at using the market to control pollution. Some fear this implicitly accepts the creation of pollution and allows trading and profitmaking from pollution. A second concern lies with the scope for price mechanisms to affect the competitiveness of industry, particularly for exporters to be affected by increasing costs. Economic mechanisms are, in general, seen as novel and potentially unpredictable and caution is advocated by this group.

The overwhelming response, however, was that the design and use of economic mechanisms would require significant consultation with industry, the community and other government departments to ensure that they operate efficiently and effectively. Clearly, the design of programs so that they are not just exercises in increasing bureaucracy, with little environmental or economic gain, is critical.

The EPA will be examining alternative mechanisms, ranging through methods to correct market distortions (where prices better reflect the full costs), establishing administrative charges to recover costs of administration of schemes for regulating pollution, to examining the use of policy incentives such as load-based licence fees or levies such as the $80 special environmental levy currently paid to the Water Board, or financial assurances such as performance bonds. Another fundamental program to be

implemented by the EPA, either alone or in conjunction with a national EPA, will be the setting of standards or a ceiling on total concentration of pollutants or emissions from which systems of tradeable quotas or permits would then evolve.

While the experience in using economic instruments in environmental protection in Australia is limited, there is a lot to be learned from the successes and difficulties experienced overseas. There are, however, vital differences between Australian and overseas economies which make essential that we clearly understand our own conditions and circumstances.

A two pronged program will be pursued by the EPA. First, there must continue the work on streamlining the regulatory provisions to give some certainty and stability to environmental protection programs. Second, we must strive to create market-based solutions in conjunction with the regulatory mechanisms to maximise efficiency and innovation. With this approach the establishment of the new Environment Protection Authority in New South Wales gives us a real opportunity for achieving the type of balance and impact in environment protection for sustainable development that has sometimes eluded us in the past.

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