Selecting market-based incentives for natural resource management

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Helping Communities Helping Australia

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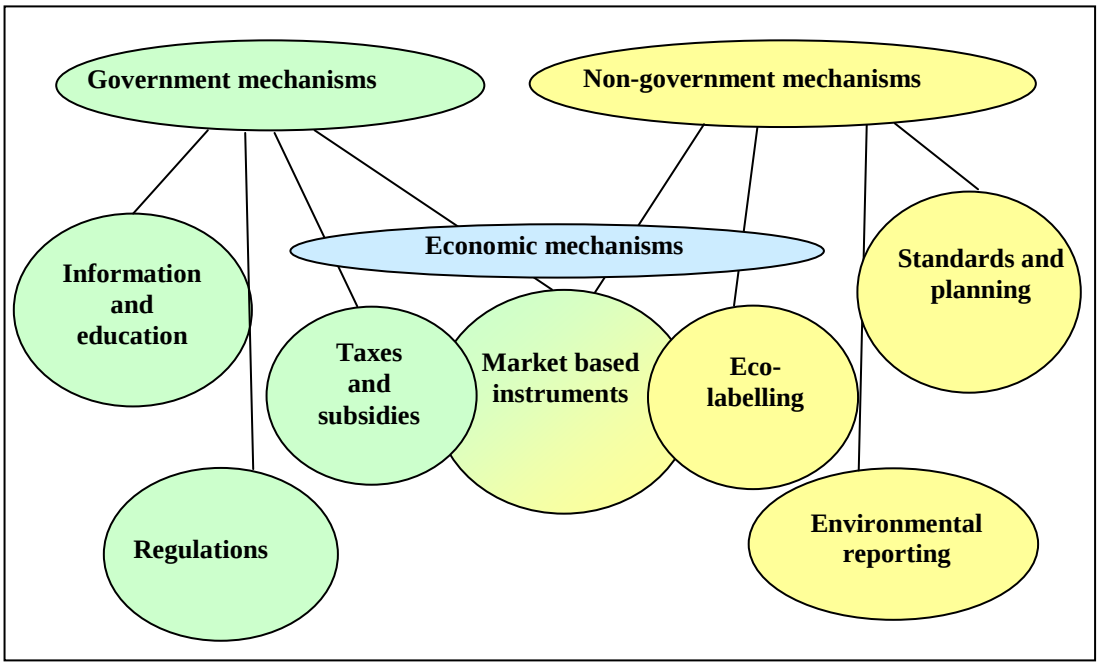
Executive summary

In Australia, there is increasing interest in ensuring that land, water and vegetation resources, under the control of private landholders, are appropriately managed. There are a range of methods and mechanisms that can be applied to help achieve improved natural resource management (NRM) outcomes. Some mechanisms, such as extension programs, regulations, and taxes and subsidies, are implemented by the government. Other mechanisms, such as eco-labelling, environmental reporting, and industry standards and management plans, are implemented by industry peak bodies and private organisations (Figure E.1).

Figure E.1 Mechanisms to improve NRM outcomes



Market-based instruments (MBIs) are mechanisms that can be applied by government or non-government organisations and overlap with other economic measures such as eco-labelling and taxes and subsidies.

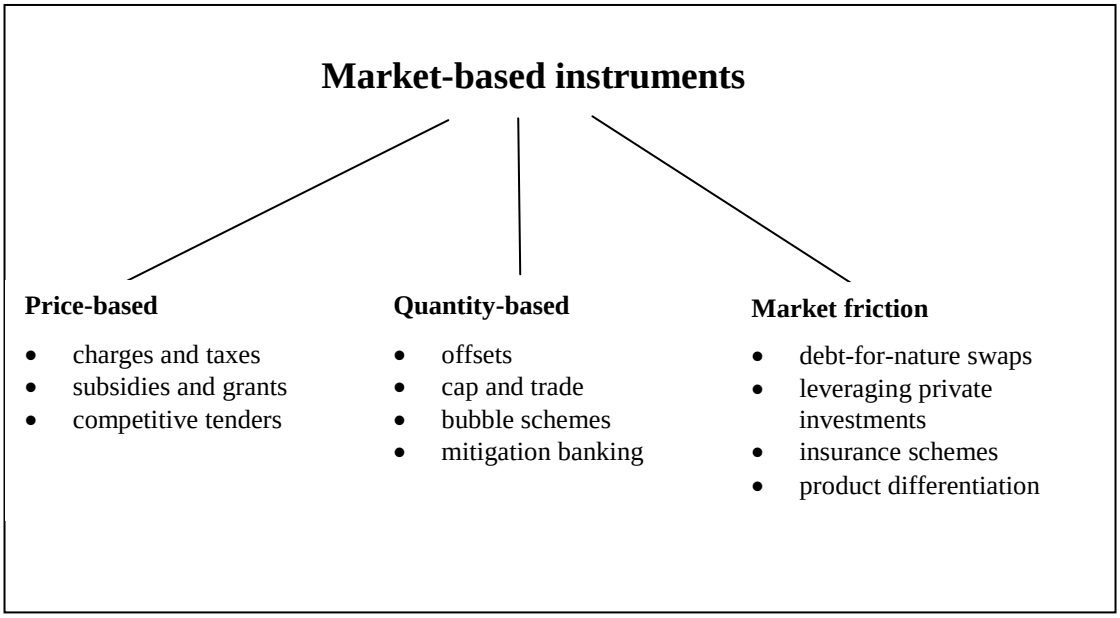
The use of MBIs provides better coordination of environmental management activities. These mechanisms allow the private costs of individual landholders to be revealed through the voluntary response of landholders to production and incentive signals. There are a number of other key benefits arising from the use of market-based mechanisms. The main advantages in relation to managing natural resources are that MBIs:

- allow for more flexibility of resource management;
- provide incentives to individuals and companies to minimise emissions or achieve natural resource outcomes;
- allow for specialised knowledge to be applied at the operational level to minimise emissions or achieve natural resource outcomes;
- achieve outcomes at lowest cost; and
- are more adaptable to changed conditions.

(Rolfe and McCosker 2003:10)

MBIs can be classified into three different groups; price-based, quantity-based and market friction mechanisms. Within each group (Figure E.2) a range of options exist that are discussed in this report.

Figure E.2 Market-based instruments discussed in this paper



Price-based instruments

Price-based approaches are designed to adjust the price or cost of either a polluting activity or a mitigating activity. Charges may be used to increase the cost of a polluting activity and so discourage its application. On the other hand, a subsidy may be used to reduce the cost of a mitigating activity and so encourage its use.

A competitive tender or auction is another price-based mechanism that can be used to encourage landholders and stakeholders to provide conservation actions and environmental outcomes alongside of normal production goals. Typically, public funding is allocated through an auction process to engage landholders in the provision of public goods. The key to the operation of competitive tenders is the selection of the most cost effective bids for funding.

Price-based mechanisms are relevant when:

- the quantity of service provided is not critical;
- it is appropriate to send broad price signals; and
- it is desirable to maintain the existing system of property rights.

Quantity-based instruments

Quantity-based measures usually involve the setting of an imposed limit or cap. Entities then trade amongst themselves to find the most cost-efficient ways of meeting the limit. The key concept is to: a) limit the quantity of something that in excess is damaging to the environment, e.g., polluting emissions or too much fishing effort, and b) provide an incentive for producers to reduce the costs of emissions by allowing them to trade amongst themselves to meet the cap.

To successfully create a new market, property rights must be:

- clearly defined;
- verifiable;
- enforceable;
- valuable; and
- transferable.

In addition there must be:

- low scientific uncertainty; and
- low sovereign risk. (Murtough et al. 2002:10)

A key issue is how to design a market trading mechanism in the absence of existing markets or information about how potential participants might trade between themselves. The type of information that is often required is detail about the following broad areas:

- the appropriate cap to be placed on the relevant activity;
- the variation in opportunity costs of meeting the cap requirements;
- the type of market trading mechanism that can be implemented;
- the number of potential participants in a market; and
- the transaction costs involved in operating the market.

While experience with new trading schemes in the Australian context is limited, a cautionary approach should be adopted and experience from examples in the US should be used for guidance. Van Bueren (2001:24) in his examination of some of the new environmental markets in the US identified the following points as recurring issues:

- enforceable caps are the key;
- start from scratch (rather than making changes to existing programs);
- understand the market potential (numbers of participants, cost differentials efficiency gains, etc.);
- involve stakeholders;
- keep trading rules simple; and
- get the science right.

Market friction instruments

Market friction measures generally work to improve the functioning of an existing market, but can involve developing a new market that interacts with a target market. They work by providing more information to the market or by encouraging private investment in activities that have better environmental outcomes. An example of a market friction instrument might be the provision of drought insurance, where the development and take-up of the new product has additional environmental benefits if stock are taken off pastures earlier than before. These mechanisms require considerable time and resources to attract private partnerships or develop new products. Most of these approaches are only at the scoping stage in Australia.

Implementation

While there are certain key criteria that can be applied to help determine which incentive mechanisms maybe more appropriate in a given situation, the process of selection is also very important. All stakeholders should be involved in the process of selection, design and implementation. Choosing an incentive mechanism that will meet the needs of all stakeholders and achieve the required NRM outcomes is not easy and in general:

- there is no “one size fits all”;
- there is no “right” method – different methods suit different situations;
- it may be more appropriate to use a mix of methods;
- some schemes are useful as “change inducers” and education tools;
- some schemes have more public benefits than others; and

- some schemes will suit the implementing authority better than others.

However, the process of considering and possibly trialing a particular method has significant benefits in terms of increased understanding of the environmental issues and the links between cause and effect.

Some incentives are more complex and require more resources to implement than others. A summary check list is provided in Table E.1 on the following page.

Table E.1 Considerations for implementing MBIs in the Burnett Mary Region

	Complexity	Resources required			Successful examples	New scheme management authority	Stakeholder familiarity	Environmental outcomes
		Admin	Technical expertise	Regulatory authority				
Quantity-based mechanisms								
Cap-and-trade	High	High	High	Yes	Yes	Yes	New	Known
Offsets	High	High	High	Yes	Yes	Yes	New	Part-known
Bubble schemes	High	High	High	Yes	Yes	Yes	New	Known
Mitigation banking	Medium/high	High	Medium/high	Yes	Overseas	Yes	New	Part-known
Price-based mechanisms								
Taxes and charges	Low	Medium	Low	Yes/ maybe	Yes	No	Known	Not known
Subsidies and grants	Low	Medium	Low	No	Yes	No	Known	Not known
Auctions	Medium/high	Medium	Medium/high	No	Yes	No	Part known	Part known
Market friction mechanisms								
Debt-for-nature swap	Medium/high	Medium/high	Medium/high	No	No	No	New	Part known
Private investment	Low/medium	Medium/high	Low	No	Overseas	No	New	Not known
Insurance	Low/medium	Medium/high	Low	No	Overseas	No	New	Not known
Eco-labeling	Low	High	Low	No	Overseas	Yes	Known	Not known

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1. Introduction

In Australia, there is increasing interest in ensuring that land, water and vegetation resources, under the control of private landholders, are appropriately managed. The development of natural resource management (NRM) plans by regional groups has formalised the identification of priority environmental issues and the setting of resource management targets to address these issues in a sustainable manner, i.e. without compromising social and economic outcomes. Achieving these targets has led to a consideration of the range of management and policy tools available, including the use of economic measures.

Economic policy instruments such as charges and subsides, and other policy instruments such as regulations and extension programs are familiar NRM tools, but have not always achieved the desired outcomes. There is a recognition that existing agri-environmental policies are failing to deliver satisfactory NRM outcomes (van Bueren 2001) or to provide a satisfactory return on public investment (Industry Commission 1997). This has led to the consideration of alternative policy mechanisms, such as market-based instruments (MBIs), which have the potential to produce more cost effective NRM outcomes.

There is a growing range of examples where new environmental markets are emerging and new market-based tools are being applied. There is even a website http://www.ecosystemmarketplace.net/ that tracks transactions, pricing trends, and buyers listings across 14 markets where ecosystem services are paid for.

The purpose of this document is to provide the Burnett Mary Regional Group with an overview of some of the new MBIs and to provide some guidance on the process of selection. However, given the new and innovative nature of MBIs, more information is needed before definite recommendations about specific mechanisms can be made. The focus in this paper is on new trading mechanisms and the use of competitive tenders.

There are two key drivers behind the increasing awareness of MBIs in Queensland. First, in 2003, following the success of the BushTender program in Victoria (see Section 3.5), the National Market-based Instruments Pilots Program (http://www.napswq.gov.au/mbi/index.html) was introduced. There were eleven pilot projects, each designed to explore and/or test the potential for different MBIs to be implemented in Australia. The pilots were completed in July 2005 and the findings are still being evaluated.

Second, also funded under the National Action Plan for Salinity and Water Quality, the State-level Investment Programs (SIPS) were introduced in Queensland. One of the programs in the Social and Economic SIP, SEO5, is aimed at "developing and trialing a toolkit of incentives and market based instruments for regional NRM". The SE05 program has produced a range of reports that examine the use of different economic incentives generally and the use of new MBIs in particular. There are also several reports that can help in the selection of an appropriate incentive mechanism. In particular they provide a practical guide to the selection of incentive mechanisms, "Choosing between incentive mechanisms for natural resource management. A practical guide for regional NRM bodies in Queensland". http://www.regionalnrm.qld.gov.au/planning/guidance/target%5fsocial%5fpdf/choosing%5fbetween%5fincentives.pdf. The document also provides some useful references for further reading.

The same project group has also developed a web-based database of existing incentive mechanisms for NRM provided by the Australian Government, the state, local governments, regional NRM groups and other non-government organisations. The database allows landholders and other interested parties to quickly identify what incentives for NRM are available in their region and for what types of NRM activities (http://www.regionalnrm.qld.gov.au/funding/incentives/index.html).

Other information presented on the SEO5 website includes:

- Incentive mechanisms guidelines;

- Competitive tenders for conservation contracts - A practical guide for regional NRM groups in Queensland; and
- Understanding social and economic influences on natural resource management decision-making.

Rather than repeat the information presented under the SEO5 program and in other literature, the focus in this report is on MBIs such as competitive tenders and trading schemes where new markets for ecosystem services are created that offer new and innovative approaches to achieving NRM outcomes.

The key idea of creating new markets and trading schemes is that instead of directly regulating resource use, governments create the environment where market-based systems can be used to create incentives for appropriate resource use. The key benefit of MBIs is that they allow flexibility in meeting environmental targets. Each landholder can adjust their production of environmental services according to the incentives they face, so that the level of environmental services can vary between landholders according to their individual circumstances.

Another important outcome is that better information is revealed by all participants in a scheme. For example, in terms of vegetation management, the Government and NRM groups tend to hold good information about the ecological values that make conservation important. On the other hand, individual land managers hold good information about the production tradeoffs involved in pursuing protection measures. The use of market-based mechanisms provides solutions to problems of uneven information. These mechanisms allow the private costs of individual landholders to be revealed through the voluntary response of landholders to production and incentive signals.

There are a number of other key benefits arising from the use of market-based mechanisms. The main advantages in relation to managing natural resources are that they:

- allow for more flexibility of resource management;
- provide incentives to individuals and companies to minimise emissions or achieve natural resource outcomes;
- allow for specialised knowledge to be applied at the operational level to minimise emissions or achieve natural resource outcomes;
- achieve outcomes at lowest cost; and
- are more adaptable to changed conditions.

(Rolfe and McCosker 2003:10)

A further advantage of market-based instruments is that they are sometimes more suited to implementation at the local or regional level. This is because the incentives that face resource users may be unique to a particular region, making it easier to introduce trading rules that do not create perverse outcomes. However, the same incentives may not be appropriate in other regions.

The report is organised as follows. In the next section a range of economic instruments are discussed, with a brief description of each. In the third section some of the new MBIs such as trading schemes and competitive tenders are outlined in more detail and practical examples are presented. In Section 4 the key criteria to select a particular mechanism are outlined and a summary is provided in the final section.

2. Economic policy instruments

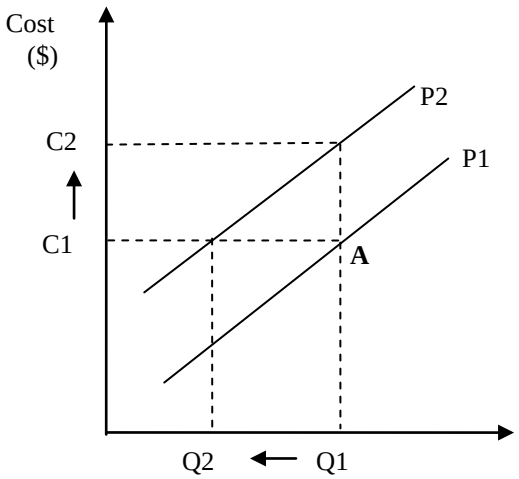
Economic instruments operate either through market processes or by providing financial incentives or disincentives. There are a number of economic tools that can be applied in natural resource management which are generally categorized as either price-based, quantity-based measures or market friction measures. Each is discussed in a separate section below.

2.1 Price-based measures

Price-based approaches are designed to adjust the price or cost of either a polluting activity (an activity that has a negative impact on the environment) or a mitigating activity (an activity that has a positive impact on the environment). There are two broad groups of price-based measures; charges and subsidies. Charges may be used to increase the cost of a polluting activity and so discourage its application. On the other hand, a subsidy may be used to reduce the cost of a mitigating activity and so encourage its use. The effect of these two measures from an economic perspective is illustrated in Figure 2.1.

Figure 2.1 The effect of a charge or subsidy

Charges



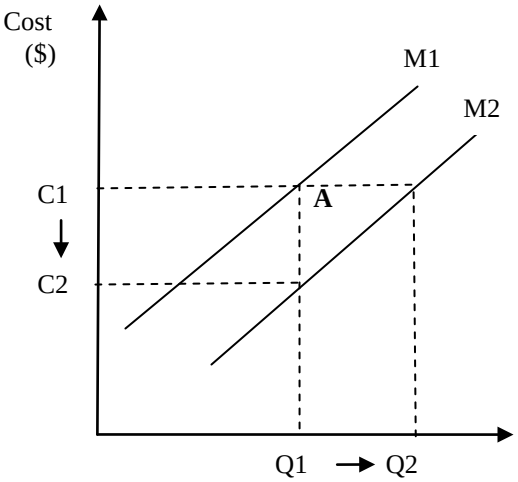
Quantity of **polluting** activity

(A) Effect of a charge or tax

In the diagram above, the line P1 represents the costs associated with a polluting activity. At point **A** there is a cost C1of a pollution level of Q1. If a tax or charge is imposed, it increases that cost to C2 for the same level of pollution. This means there is an incentive to reduce the level of pollution, unless the polluter can afford the extra costs. A level of pollution Q2 now costs the same as the previous level Q1.

An example might be the outflow from a factory being discharged into a river. There is the cost of the discharge process and an additional charge would increase that cost.

Subsidies



Quantity of **mitigating** activity

(B) Effect of a subsidy or grant

In the diagram above, the line M1 represents the costs associated with a mitigating activity. At point **A** there is a cost C1of a mitigation level of Q1. If a subsidy or grant is introduced, it reduces that cost to C2 for the same level of mitigation. This means there is an incentive to increase the level of mitigation. A level of mitigation Q2 now costs the same as the previous level Q1.

An example might be fencing off riparian areas. If the cost of fencing is subsidised, a greater area can be fenced for the same cost to the landholder.

2.1.1 Charges and taxes

By imposing a charge on the producer the cost of production would typically rise resulting in a reduction in the quantity of product produced and in emissions from production. The intention of this approach is to encourage polluters to seek improved pollution control and subsequently reduce their costs. Examples can include:

- effluent or emission charges;
- product charges/tax differentiation;
- administrative charges;
- user charges; and
- performance bonds.

Effluent or emission charges are fees levied by government per unit of pollutant emitted and ideally the rate of the tax per unit should be equal to the external cost of the pollution. Pollution charges focus on reducing environmentally damaging activity by influencing behaviour. The imposition of taxes on emissions creates an incentive to reduce emissions and thus save expenditure on taxes.

Product charges/ tax differentiation focus on the charging of a tax per unit output on products that are polluting or difficult to dispose of. Since this tax is based solely on final output levels there is no direct incentive to reduce the amount of pollution produced per unit and charges may not be linked to environmental damage in specific locations. Although product charges have not been widely applied in Australia, proposals have been considered for phosphorous in detergents and agricultural fertilisers to reduce nutrient loads in inland rivers (James 1997).

Tax differentiation is based on polluting products that are taxed more heavily than cleaner products. Tax differentiation has been used in Australia to reduce vehicle related emissions by encouraging the use of unleaded petrol and the purchase of vehicles that use the cleaner unleaded fuel. Differential taxes have been applied to recycled paper to conserve timber supplies, reduce waste disposal and litter, and encourage the reuse of paper (James 1997).

Administrative charges are not intended to change behaviour, but rather help finance the administrative costs of environmental programs. In the US, the Clean Air Act Amendment of 1990 allows states to tax regulated air pollutants to recover administrative costs of state programs and allow areas in extreme non-compliance to charge higher rates (Stavins 2001).

User charges are designed to fund environmental related services, such as waste treatment and/or disposal. They are based on the user pays principle so that those who benefit directly from specific environmental services are required to finance its provision.

Performance bonds generally consist of an upfront guarantee by developers, mining companies and the like to ensure that funds exist for environmental rehabilitation if environmental responsibilities are neglected.

Charges maybe popular with governments as they are revenue-raising, but are very unpopular with the general public. Using charges as an environmental policy instrument clearly establish the property rights for environmental protection with the public, i.e. the polluter does not have the right to pollute.

A charge will discourage polluting activities by increasing the cost of the action.

While charges act to discourage damaging environmental activities, it is difficult to determine the correct level of the charge to be imposed, and their implementation does not guarantee any particular environmental outcome. For example, if a charge was placed on the emissions of waste water from a factory, the operators have the option to:

- absorb the additional costs and possibly pass them on to the end user;
- improve technology and alter the production process; and/or
- reduce the level of emissions, but not necessarily enough to produce an environmental improvement; it might just slow down the rate of environmental decline.

It is also difficult is to establish what exactly will be charged and how will it be measured. The cost of designing an appropriate charge requires information about the cause and effect of an action, and the costs of abatement. This information is not always and/or readily available and charges are often set at a uniform level rather than being tailored to a specific situation. This can affect the cost efficiency and effectiveness of the measure. Taxes also tend to be very "sticky", because political pressures generally make it difficult to adjust them.

2.1.2 Subsidies and grants

Subsidies are used to encourage activities that benefit the environment, because they reduce the associated costs. However, as with charges, they do not ensure a particular environmental outcome. The property rights associated with a subsidy are switched around, compared with a charge. Instead of the property rights being attached to the act of pollution, they are attached to the act of mitigation, or the provision of an environmental service. This means the property rights are with the provider.

A subsidy will encourage mitigating activities by reducing the cost of the action.

Examples of different types of subsidies include:

- direct subsidies for waste reduction;
- grants (stewardship payments);
- soft loans; and
- tax allowances.

Direct subsidies for waste reduction typically involve government payment of subsidies to polluting firms for the reduction of their emissions. Rather than impose an effluent charge, a similar level of emission reduction could be attained if the government compensates firms to reduce their emissions costs.

Alternatively, government subsidy reform can achieve significant environmental improvement simply through removing or reforming existing government subsidies on environmental damaging activities. Subsidy reductions on water, energy and fertilisers for example can result in more efficient use of resources and a subsequent reduction in pollution while subsidy reforms can be used to encourage the adoption of more environmentally desirable practices (Bishop and Vorhies 1998).

Grants are a form of financial assistance contingent upon the adoption of pollution abatement measures. In general, grants are paid in lump sum payments rather than recurring permit payments.

Devolved grants have been widely used by NRM groups to encourage landholders to achieve better environmental outcomes. However, they are a fixed price scheme and do not allow for the bio-physical variation between farms and socio-economic differences between land managers. This variation means that cost of providing a particular mitigating action and the environmental outcomes of that action vary from one farm to another.

Stewardship payments have been used widely in the UK and are being implemented by some NRM groups in Queensland. They are a type of grant payment that rewards landholders for providing environmental services. Unlike the devolved grant system, not all landholders are paid the same amount for a given service. Payments can vary, depending on the environmental services provided, but the same payment may be made to provide a particular service without taking into account the different environmental outcomes associated with different properties or the difference in management costs of providing the service.

Soft loans centre on the provision of low interest rate loans for the installation of pollution reducing equipment.

Tax allowances effectively provide for the accelerated depreciation of capital purchased for pollution abatement and can include tax exemptions for the adoption of certain abatement measures.

In general, subsidies do not provide efficient environmental outcomes because:

- subsidies tend to be related to production inputs and actions rather than to the environmental outcome of interest;
- neither price nor quantity of the final output of the firm is directly altered;
- potentially, the increased net profit to the firm may increase the output of the pollution related product;
- they may provide financial incentive to previously non-polluting firms to commence polluting or for existing polluters to expand waste output to gain ongoing subsidy payments following reductions;
- they provide little incentive for the adoption of less environmentally intrusive activities; and
- they may provide perverse incentives, e.g., subsidising the cost of irrigation water may lead to overuse.

2.1.3 Auction/competitive tender

A competitive tender or auction is a mechanism that can be used to encourage landholders and stakeholders to provide conservation actions and environmental outcomes alongside of normal production goals. They can also be used to encourage provision of conservation actions which may reduce production. The key to the operation of competitive tenders is the selection of the most cost effective bids for funding.

Why paying landholders for ecosystem services may be cost effective

In 1997, the city government of New York realised that changing agricultural practices meant that it would need to act to preserve the quality of the city's drinking water. One way to have done this would have been to install new water-filtration plants, but that would have cost $4-6 billion up front, together with annual running costs of $250 million. Instead, the government is paying to preserve the rural nature of the Catskill Mountains from which New York gets most of its water. It is spending $250 million on buying land to prevent development, and paying farmers $100 million a year to minimise water pollution.

... Several other American cities, following in New York's footsteps, have calculated that every dollar invested in environmental protection would save anywhere from $7.50 to $200 on the cost of what would otherwise have to be spent on filtration and water treatment facilities.

Source: "Are you being served?" The Economist Apr 21st 2005

The following table outlines each of the mechanisms discussed above and how they might be applied in the Burnett Mary region.

Table 2.1 Examples of price-based mechanisms for the Burnett Mary

Mechanism	Source	Example
Charges and taxes		Taxes and charges are a familiar mechanism to implement but do require the necessary regulatory authority. Charges are more effectively applied on point source emissions rather than non-point or diffuse sources, because they are easier to monitor and enforce.
	Point source	A charge could be imposed on the emissions from a sewerage treatment plant based on specified water quality targets.
	Diffuse source	Because it is hard to monitor the outputs from diffuse sources a charge could be imposed on certain inputs that are associated with negative environmental outcomes. For example an extra charge could be placed on the use of water above a specified allocation.
Subsidies and grants		Providing a subsidy or grant is far more popular than imposing a charge. However, monitoring is still important and penalties for non-compliance should be considered.
	Point source	Industrial plants could be provided with a rebate for implementing emission abatement technology. Landholders could be given a grant to preserve areas on their property with high cultural heritage values.
	Diffuse source	Stewardship schemes could allow landholders to conserve areas on their property with high environmental values.
Auctions / competitive tenders		Auctions will operate effectively in a situation where there are real cost differences in providing the environmental service.
	Point source	An auction process might be used in a specifically defined area, so what might be diffuse sources at the regional level can now defined as point sources. For example, a target could be set to mange riparian areas in a specified manner on a particular stretch of river. An auction could be held with landholders bidding to provide the service. The lowest cost bidders would be rewarded.
	Diffuse source	A competitive tender may be run to provide biodiversity outcomes. Landholders might bid for payments to retain a minimum ground cover while be continuing to graze areas on their property.

2.2 Quantity-based measures

Quantity-based measures usually involve the setting of an imposed limit or cap. Entities then trade amongst themselves to find the most cost-efficient ways of meeting the limit. Trading permits provide government with the option of fixing the level of emissions/pollution deemed acceptable. This is accompanied by the allocation of a fixed number of permits to pollute amongst the sources along with the provision to trade permits in order to meet compliance.

The key concept is to: a) limit the quantity of something that in excess is damaging to the environment, e.g., polluting emissions or too much fishing effort, and b) provide an incentive for producers to reduce the costs of emissions by allowing them to trade amongst themselves to meet the cap.

Different types of quantity-based measures include:

- cap-and-trade;
- offsets;
- bubble schemes; and
- mitigation banking.

2.2.1 Cap-and-trade

In a cap-and-trade scheme, a new market is created that can limit the use of a resource that is currently being overused or it can limit the emissions of a particular pollutant. For example in a situation where too much water is being extracted from a river, a cap can be placed on the quantity of water allocations. If somebody wants to use more water than they have been allocated, or a new person comes who has no allocation, then they must buy some of the allocation from somebody else. The same system may be used in an area that has been over-fished. A cap can be placed on the quantity of fishing licences and any person who wants to expand or wants to be a new entrant will have to buy a licence from somebody willing to sell theirs.

In a cap-and-trade emissions scheme the cap is placed on the total quantity of pollution. The polluters are then given the right to emit a certain quantity, but the total emissions will always remain below the cap. If somebody wants to emit more pollution than they have a licence for, then they must buy the right to pollute from somebody who has spare capacity.

Determining the level at which to set the cap requires expert scientific advice and advice is also required to determine the trading rules. For example, some limits may need to be placed on the timing or the aggregation of emissions (too many emissions at the same time – or too many emissions in the same place) and these can be written into the trading rules. The cap can be reduced over time to ensure further environmental improvements are made. The trading part of the scheme provides an incentive for participants to find new and innovative ways of reducing their level of emissions so they emit less (reducing their cost of emissions), and can sell surplus entitlements.

2.2.2 Offsets

Offset schemes allow a polluting activity in one place to be offset by a mitigating activity somewhere else. The underlying concept is one of “no net impact”. Once a regulation is imposed that restricts the level of polluting activity at one source, the operator has the choice of either incurring the costs of complying themselves or paying others to offset their actions. There is potential for these schemes to operate where:

- the cost of mitigating environmental damage in one place is very high, and might deter further development; and
- the costs of a mitigating action are much lower somewhere else.

2.2.3 Bubble schemes

Under a bubble scheme the regulatory authority sets an aggregate discharge load limit or cap on a group of point source dischargers and allows the dischargers to determine how the cap will be met. There is a range of ways that cooperative arrangements can be determined and /or penalties are distributed within the group.

2.2.4 Mitigation banking

Rather than have direct trades as in an offset scheme, mitigation banking works by allowing mitigation credits to be stored or banked. For example, a developer might want to develop a particular area for new residential housing that includes some area of wetlands. Given the necessary regulatory environment, the developer might be able to buy mitigation credits from the bank, such as the same area of wetlands conserved at another site.

Mitigation banking generally involves the banking of a conservation area rather than rather than a specific activity. It also means that the conservation status of the mitigating credit must be assured in perpetuity to offset the original loss.

2.2.5 Summary

Trading schemes can be open or closed. Open trading programs involve the establishment of a emissions baseline and credits can be generated for emission reductions below that baseline. Credits can be banked, traded or used to meet discharge compliance. These schemes, such as offset programs, are designed to allow for economic growth whilst maintaining or improving environmental quality. It is more cost effective for an operator with the lowest cost of abatement to implement the abatement measure. In the absence of mandatory caps, such systems offer operational flexibility and environmental quality improvements. Closed trading systems, on the other hand, are typified by bubble programs and cap-and-trade arrangements. Under such a system a cap is placed on the total emissions or total usage of a resource in a specific area and is mandated by law. Participants in a these programs are permitted to trade discharge levels or use permits (licenses) provided the collective discharge/ use level remains below the cap.

Mitigation banking may fall into either an open or closed category, depending on the regulatory nature of the imposed limit (i.e., mandated by law or a voluntary condition).

The different trading schemes are not mutually exclusive and a cap-and-trade scheme may operate with an additional provision for credits or offsets (see the last example in Section 3.2). It is also be a means of incorporating a broader range of participants in a scheme.

All quantity based trading measures have six key design components.

1. Some form of regulation is required that limits an activity. It must be possible to monitor and enforce the regulation.
2. The level at which particular limits are set must be determined and based on expert scientific advice.
3. The rules of trade need to be specified and need to incorporate scientific advice.
4. Trading entitlements need to be determined – who can trade? Conditions need to be established for current participants and possible new entrants. If the current allocation exceeds the limit some method (such as a ballot) is needed to determine initial entitlements.
5. Trading ratios need to be determined for offset schemes and trading equivalence for mitigation banking.
6. A new organisation will need to be established to administer the system.

A trading program that is based on trades occurring between point sources alone is relatively simple to design. However the inclusion of non-point sources introduces complexities. This is partly because of the scientific uncertainty of quantifying non-point source load reductions against point source load reductions, and partly because of the difficulty and expense of monitoring non-point source reductions. It is also because non-point sources are often more difficult to control than point source emissions, for two main reasons. First, non-point source emissions generally occur over large areas at relatively low concentrations and as a consequence are difficult to identify and quantify. Second, emissions are usually attributable to a large number of property owners that ensures the logistics of any approach are complex.

The following table outlines each of the mechanisms discussed above and how they might be applied in the Burnett Mary region.

Table 2.2 Examples of quantity-control mechanisms for the Burnett Mary

Mechanism	Source	Example
Cap-and-trade	Between point sources only	Particular point source emitters such as sewerage treatment plants might trade credits with industrial emitters.
	Between diffuse sources only	A cap might be placed on landholder use of natural resources, permits allocated and trade allowed. Examples might include: • % of riparian area that has to be fenced off • % of farm land to be covered by BMP • % of ground cover on farm • kgs/ha of fertiliser use on farming areas
	Between both point and diffuse sources	Diffuse sources (eg landholders) may be able to provide credits for inclusion in trading system involving point sources.
Offsets	Between point sources only	Particular point source emitters such as sewerage treatment plants might negotiate offsets from other individual emitters – may be particularly applicable in the case of new developments.
	Between diffuse sources only	Proponents of developments that have additional water quality impacts may be required to source offsets – e.g. an area of new farming land may have to offset with a grass filter strip.
	Between both point and diffuse sources	Particular point source emitters such as sewerage treatment plants might negotiate offsets from landholders who might provide grass filter strips/riparian buffers or other mitigation activities.
Bubble scheme	Between point sources only	A limited group of point source emitters might be covered in a bubble program and have to negotiate how they will jointly meet a target.
Mitigation banking	Between point sources only	Both buyers and sellers of mitigation credits may come from a variety of sources such as industry, residential development or agriculture. A developer may need to buy wetland credits from another source to mitigate the impacts of a new residential development.

2.3 Market friction measures

Market friction measures generally work to improve the functioning of an existing market, but can involve developing a new market that interacts with a target market. They work by providing more information to the market or by encouraging private investment in activities that have better environmental outcomes.

Different types of market friction measures include:

- debt-for-conservation swaps;
- leveraging eco-investments;
- conservation insurance schemes; and
- product differentiation – eco-labeling.

2.3.1 Debt-for-conservation swaps

In debt-for-conservation swaps, a new market is created to target landholders with high debt levels. These landholders might be unable to implement conservation practices because of the financial pressures associated with the burden of debt repayments. This measure currently

operates at an international level, where some developing countries may have part of their international debt retired in return for implementing national conservation programs. To

function effectively, debt-for-nature swaps need banks to be involved, as they will need to provide debt relief in some form. However, it is difficult to distinguish between landholders with debt that is causing financial pressure and landholders with debt as a normal business operation. These schemes have yet to be trialed in Australia.

2.3.1 Leveraging private eco-investment

Underpinning this measure is the idea that many land management activities that have positive environmental outcomes may also have a commercial benefit (e.g., farm forestry). This provides rationale for leveraging private investment funds that can be used to complement public investments. Commercial benefits may include: productivity, market access, environmentally friendly produce, and public perceptions. Types of project capital could include seed capital, startup funds, early expansion, or development capital. The potential for such a mechanism is still being explored in Australia (one of the National Pilot MBI projects) and there are no schemes currently operating.

2.3.2 Conservation insurance schemes

Some land mangers may be reluctant to change their current practices because of the perceived risks and uncertainty. Most cannot afford production and therefore income losses and there is some potential to develop insurance schemes that might target yield risk, finance risk or revenue risk. Such schemes do operate overseas, often with some level of government subsidy, but there are currently no examples in Australia. The potential for such a scheme to operate in South Australia has been explored as one the National Pilot MBIs.

2.3.3 Product differentiation – eco-labelling

Product differentiation or eco-labeling provides consumers with additional information that distinguishes one product from another and increases its value. For example, some consumers are prepared to pay more for organic produce or for something that has met specified environmental standards in the production process. Eco-labelling has been popular and commercially successful in some European countries such as France, Finland and Germany. One of the difficulties of eco-labelling is establishing a set of certification standards that are recognized and trusted by consumers in the state, national or international market.

In Queensland, the Department of Primary Industries EcoRange project is investigating the potential of Environmental Management Systems (EMS) to be developed into a market-orientated environmental certification for rangeland pastoral industries (http://www.dpi.qld.gov.au/sheep/5225.html).

The following table outlines each of the mechanisms discussed above and how they might be applied in the Burnett Mary region.

Table 2.3 Examples of market friction mechanisms for the Burnett Mary

Mechanism	Private partnership required	Example
Debt-for-nature swaps	The involvement of local banks is important for such a scheme to work. Otherwise funds would need to be provided to the banks by the funding agency.	Landholders with high levels of debt could be granted an interest free period in return for protecting areas of high conservation significance on their property or providing some prescribed ecosystem service.
Leveraging private eco-investment	Large national/multinational companies need to be lobbied that do not necessarily operate in the region.	A portfolio of different projects, with identified commercial and environmental benefits might be developed to attract private investment. For example, mixed species native timber plantations might be planted.
Conservation Insurance	Partnership with private insurance companies is essential.	For example, a new scheme might involve reductions in fertilizer use. There may be some risk associated with greater than anticipated yield reductions. An appropriate insurance policy could reduce the risk to the landholder of implementing the new scheme.
Eco-labeling	A recognized certification body must be established and a set of uniform standards developed.	Environmental management systems (EMS) could be further developed as an eco-label. Some form of regionally specific eco-labeling could be focused on produce sold in local markets.

3. New market-based mechanisms for consideration

Several different types of MBI have been trialed and evaluated under the National MBI Pilots program. While some of the pilots involved implementation, some only examined the potential for implementation. Other pilots explored design issues for different MBIs. At this stage, given the experience both here in Australia and overseas, there is more potential for successful implementation of some mechanisms than others. In this section, further information is provided on new MBIs that have potential for implementation in the Burnett Mary region, i.e. they already have "runs on the board". They have passed the scoping stage and have been implemented successfully either in Australia or overseas.

3.1 Cap-and-trade programs

The cap-and-trade mechanism is the most complex of quantity-based measures. Under a cap-and-trade system a cap is placed on the total emissions of a targeted pollutant. The cap level can be determined by past emission levels of that pollutant, or calculated through modeling predictions of future emissions, or a combination of both. Tradeable permits would then be allocated to the sources of the targeted pollutant. Permits are often awarded according to past emission levels (grandfathering), but may also be awarded on a competitive basis or through other means.

Since the cap is equivalent to the total number of allocated permits, a market is created where one source is able to reduce emissions below their allocated cap and sell excess permits to other sources that are unable to reduce emissions as cost effectively. The variation in opportunity costs of reducing emissions creates the incentive to trade. Environmental improvements can be made over time by further tightening standards and reducing the level at which the cap is set. This type of mechanism provides flexibility and reduces the costs of abatement by allowing dischargers the option of improving there own operations or financing the same by other dischargers.

One of the primary benefits of a cap-and-trade arrangement is the certainty that the specific environmental goal will be achieved. However this requires strict enforcement of the cap which entails strict emissions monitoring requirements, and automatic penalties for any violations.

One very successful cap-and-trade program in Australia is the Hunter River Salinity Trading Scheme in New South Wales, which is outlined below. Through trading, the overall costs of saline water management are minimised while compliance with scheme rules guarantees that water quality goals are never compromised by discharges.

Cap-and-Trade – NSW

The Hunter River Salinity Trading Scheme (http://hrs1.epa.nsw.gov.au/) is an example of how a well designed market mechanism can be a cost effective means of achieving environmental outcomes. The objective of the scheme is to manage saline water discharges so as to minimise impacts on irrigation, other water uses, and on the aquatic ecosystems of the Hunter River catchment.

Through the use of an online trading and tracking platform the scheme has succeeded in dramatically reducing the number of days per year that salinity is measured at above targeted levels.

The scheme addresses **point source emissions** and twenty-two dischargers (including coal mines and power stations) hold a total of 1,000 salinity credits, each entitling the holder to discharge 1/1000 of each high flow day's total allowable discharge or sell the credit to another participating facility over the Scheme's web site. During low flow conditions no discharges are allowed and during flood conditions discharges are unrestricted.

Two-hundred of the 1,000 credits expire every two years and 200 new credits are auctioned to the highest bidders. This mechanism will reveal the true market price and also enables the entry of new industry to the market. Auctioning assures that the credits will be held by those who value them the most. In April of 2004 the first round of new credits were auctioned off raising a total of $101,467 with an average credit price of $507. These credits are good for ten years.
(http://ecosystemmarketplace.net/pages/marketwatch.backgrounder.php?market_id=7&is_aggregate=0 - accessed 24th Oct 2005).

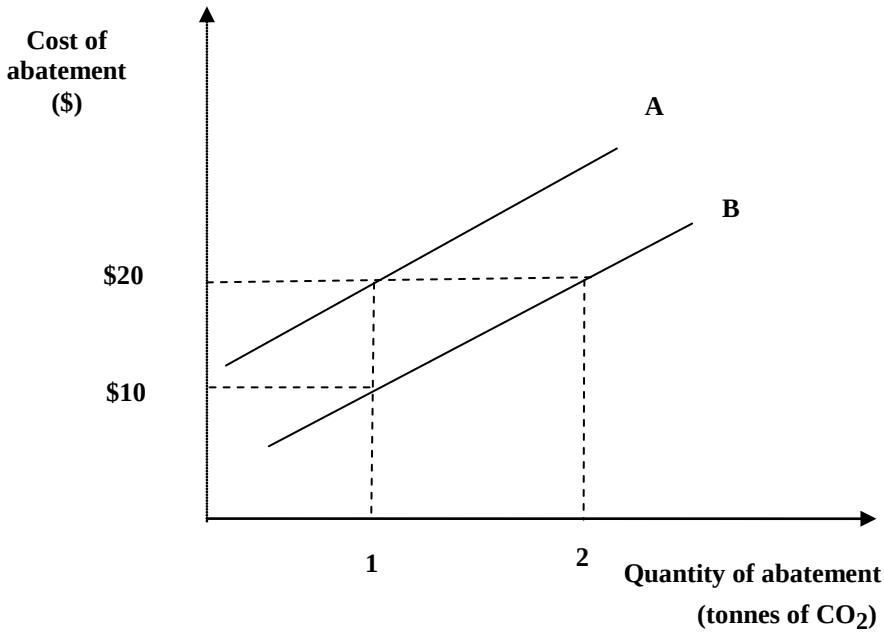
3.2 Offset programs

Offset programs are designed to create incentives to reduce existing sources of emissions. The incentive for engaging in offsets are rules that specify a 'no net increase in emissions', including those from new development. The basic concept of this type of program is to allow industries to offset any increase in their emissions by providing a reduction in pollution elsewhere. An onsite impact incurred by one source may be offset by undertaking mitigating actions or equivalent environmental improvements at another site. Trading ratios will need to be determined so that the environmental impacts of the polluting activity at one site can be equated to the environmental benefits of the mitigating activity (offset). Usually, trading ratios are set so the offset will achieve a greater pollution reduction to account for the uncertainty of environmental outcomes of the offset.

Any new developments, i.e. new sources or expanding sources are required to offset their emission increases by purchasing credits from existing sources. As with cap-and-trade mechanism, the scheme allows flexibility – you can reduce your own emissions or pay somebody else to do it, and provides cost reductions – if your own costs are too high, it will cost you less to pay someone else who has lower costs of abatement to provide the reductions. This is illustrated in Figure 2.2.

Offset schemes provide for economic growth in allowing industry to expand operations as required without incurring an increase in overall pollution. An offset program enables trading to occur between enterprises and even between different sectors without the establishment of a full trading market.

Figure 2.2 Cost reductions in offset schemes



Assume there are two producers, **A** and **B**. **A** has high costs of abatement compared with **B**. It costs **A** $20 to abate one tonne of carbon dioxide emissions but it only costs **B** $10 per tonne. It is cheaper for **A** to pay **B** (anything below $20/tonne) than to reduce emissions by one tonne themselves. **B** benefits from the scheme by being able to sell their ability to reduce emissions at a lower cost. There is a direct incentive to find new and innovative ways of reducing the costs of abatement.

The USEPA has projected the annual cost savings to be achieved through water quality trading to be as high as US $900 million per year.

The potential applications and gains from offset programs are anticipated to increase as pollution reduction from licensed point sources becomes more expensive. For example nitrogen and phosphorous reduction in a typical urban coastal catchment along Australia's east coast can cost up to $10,000 per kilogram but utilising an offset trading program between emitters in the region would see these costs reduced to $200 per kilogram (O'Sullivan 2002).

A review of the Minnesota River water pollution trading programs in the US is provided below.

Point source / non point source offset trading - US

Minnesota River Basin Pollution Trading

Trading in the Minnesota River Basin was initiated following the establishment of Total Maximum Daily Loads (TMDL) and the need by two significant firms to expand operations. The two firms, Rahr Malting Company and the Southern Minnesota Sugar Beet Company (SMSBC) were effectively unable to expand operations and meet TMDL requirements. Rahr was able to negotiate to offset all projected nutrient emissions (phosphours and nitrogen) through implementing pollution control measures purchased from non-point sources.

Non-point source controls employed to generate reductions include streambank stabilisation, cattle exclusion, wetland restoration, and cover cropping. Trading credit evaluation procedures are detailed in the permit for each of these remedial practices. A unique feature of the Minnesota River trades is the fact that each of the point sources has set up a trust fund devoted to financing its participation in trading and to achieving the required nutrient load reductions.

Both trading projects in the Minnesota River Basin employ a trading ratio greater than or equal to 2:1 (i.e., two units reduced for one unit used in compliance). This ensures equivalence and additionality of load reduction and helps take into account the many uncertainties that exist in converting non-point source loads into point source loads.

To date, five major trades involving substantial remedial construction work and hundreds of trades involving cover cropping on individual farm fields have taken place in the basin.

While the cost savings of these programs are unknown the increase in production would not have been possible without the offset function.

Source: Mark S. Kieser and "Andrew" Feng Fang **"**Water Quality Trading in the United States. An Overview" http://ecosystemmarketplace.net/pages/article.news.php?component_id=3954&component_version_id=5596&language_id=12 accessed 24th Oct 2005

In some cases, an offset scheme may be integrated into a cap-and-trade scheme which can expand the number of participants in a scheme while improving the cost efficiencies in achieving the required environmental outcomes. Such a combination is a feature of the carbon trading scheme in New South Wales.

Cap-and-trade with offsets – NSW

The New South Wales Greenhouse Gas Abatement Scheme commenced on January 1st 2003 and remains in force until 2012. The scheme aims to reduce greenhouse gas emissions from the NSW electricity sector by 5% per capita between 2003 and 2007, and then maintain the reduced level until at least 2012. This creates an estimated potential market of over 10 million tonnes CO2e in offsets by 2005, rising to 20 million tones by 2012.

The scheme imposes mandatory greenhouse gas benchmarks on all NSW electricity retailers and certain other parties, and includes a penalty of $10.50 per tonne of excess CO2 emissions over the benchmarks. However, since the penalties are not tax deductible, but offset purchases are, the effective price could be as high as 15/tCO2e. About two dozen NSW energy providers are regulated under the scheme. In addition there are about ten other companies, mostly from the steel, aluminum and paper industries, that have elected to participate.

The unit traded is called a New South Wales Greenhouse Abatement Certificate (NGAC), which represents the abatement of one tonne of CO2e associated with the consumption of electricity in NSW. NGACs are transferable certificates.

Credits from carbon sequestration are allowed in the system, whether coming from permanent forests, commercial timber forestry operations, or sustainable forest management. The forest must be located in New South Wales, or another State with a similar scheme, and meet the sinks regulations in the Kyoto Protocol (e.g., only afforestation and reforestation activities are eligible, and the land must not have been forested prior to 1990).

To be eligible to apply for accreditation as a NGAC provider, a forest manager must: own or control the carbon sequestration rights associated with the land; be able to demonstrate that the carbon sequestration achieved by the forest project will be maintained for 100 years; have appropriate procedures in place to manage risks such as fire, disease or climate variability; and, maintain adequate records. NGACs can only be generated by sequestration that occurs from 2003 onwards.

As of February 2005, over 10 million greenhouse abatement certificates have been registered in just over two years of the Scheme's operation. During 2004, more than fifty separate deals traded 5 million certificates, with prices ranging from $10 to $14 per tCO2e.

As of February 2005, two of the 127 accredited projects involved carbon sequestration; these were for planting Mallee Eucalypt trees in "corridors" on cereal cropland by CO2 Australia, and for plantations established by State Forests NSW, respectively. Origin Energy, the first buyer, purchased the carbon credits associated with 6,500 hectares of the Oil Mallee project land.

http://ecosystemmarketplace.net/pages/marketwatch.backgrounder.php?market_id=14&is_aggregate=1 (accessed 24th Oct 2005)

3.3 Bubble schemes

Under a bubble scheme the regulatory authority sets an aggregate discharge load limit or cap on a discharger or group of point source dischargers and allows the dischargers to determine how the cap will be met. The scheme is normally applied to a small group of emitters. The following case study review of a bubble scheme employed in the Hawkesbury-Nepean river system in Australia provides some insight into how these operate.

Bubble scheme - NSW

South Creek Bubble Licensing Scheme

On 1 July 1996 the New South Wales EPA in conjunction with Sydney Water introduced a small, self-contained, emissions trading scheme in the South Creek area of the Hawkesbury–Nepean River. This 'bubble' scheme allows the three participating sewage treatment systems to adjust their individual discharges, provided the total pollutant load limit for the scheme is not exceeded. This enables efforts to reduce pollution to be focused where the costs are lowest.

The load limits mandated under the bubble scheme require an 83% reduction in total phosphorus and a 50% reduction in total nitrogen by 2004 when compared to a 'business as usual' scenario. Annual load limits restrict overall discharge loads but additional regulations control the maximum concentrations for each sewage treatment plant.
http://www.environment.nsw.gov.au/licensing/bubble.htm accessed 25th Oct 2005.

Bubble schemes have the potential to incorporate a range of different cooperative agreements within the bubble group. A range of liability agreements are also available. For example, if the group does not meet the target because of one individual, how will the penalty be distributed? Very clear rules need to be established and agreed upon.

3.4 Mitigation banking

There is potential for mitigation banking to be applied in a variety of scenarios. As the name suggests, credits in the form of environmental mitigating activities can be "banked" and then bought by a polluter who needs to reduce the environmental impact of their activity. It can also be seen as a form of offset trading.

In the US clean Water Act makes provision for the use of compensatory mitigation to offset unavoidable damage to wetlands and other aquatic resources. The principal of compensatory mitigation or offsets has been applied to wetlands since the early 1980s but it is only recently that credit banking has officially been recognized and promoted as a valid means of meeting the Clean Water Act requirement of 'no net loss' in wetlands function.

Wetland mitigation banking - US

In 2001, a development company Newdunn Associates LLP, and its contractors, failed to obtain state and federal permits before it began digging ditches and filling wetlands on the 43-acre property it owns. The property included approximately 38 acres of wetlands, 26 acres of which were filled.

These actions led to lawsuits in state and federal courts, which have been resolved by the lodging of the consent decree. Under the federal consent decree, Newdunn is required to completely restore the wetlands impacted on site. Newdunn will also pay a $250,000 fine-$150,000 of which will go to Virginia for environmental improvement projects and will purchase six **mitigation bank credits** to mitigate for the loss of wetlands during the length of the litigation.

Source: US Fed News "Virginia Developer Agrees To Restore Destroyed Wetlands" September 29, 2005.

3.5 Auction/competitive tender

Competitive tenders or auctions are a price-based mechanism rather than quantity-based. Unlike charges and subsidies, auctions do not just influence the market through a price change, they also create a new market for the environmental service being auctioned.

A competitive tender is a mechanism that can be used to encourage landholders and stakeholders to provide conservation actions alongside of normal production goals. It can also be used to encourage provision of conservation actions which may reduce production. The key to the operation of competitive tenders is the selection of the most cost effective bids for funding.

At first glance, a conservation tender looks quite similar to a devolved grant process. Landholders need to be approached and asked if they would be prepared to perform certain management actions in return for an incentive payment. With devolved grants, payments tend to be fixed, once-off payments for prescribed actions. With competitive tenders, the payment level and the management actions are much more flexible, with landholders able to specify what they are prepared to do for a certain level of funding. Where funding is for on-going management activities, then payments tend to be made at regular intervals rather than as lump sums.

Competitive tenders are used to select the most cost-effective options for achieving biodiversity and conservation outcomes. This is done by considering all the submissions from landholders in a single process, and comparing what could be achieved by the proposal (the conservation and biodiversity outcomes) against the amount of payments to landholders. The process is really a single-round auction process, where the bids come in and then are selected up to an available level of funding.

Competitive tender – Example from Victoria

The first practical application of a conservation tender in Australia has been the **BushTender** trial in Victoria, where landholders entered bids to conserve patches of native bushland on their farms. Bids were assessed against the predicted environmental outcomes (assessed with a biodiversity score multiplied by a management input score), and the most cost-effective bids were selected. The results showed that for a budget of around $400,000, a fixed-price scheme would have given an agency approximately 25% less biodiversity than provided in the auction trial. Because of the rising cost of bids submitted by landholders, a budget of almost seven times the trial budget would have been required to achieve the same biodiversity outcomes (Stoneham et al. 2003).

In a competitive tender, the most cost effective bids are accepted. This means that more conservation units or outcomes can be purchased per dollar of public investment than under a fixed price grant scheme, where there is no discrimination between landholders on the basis of costs of provision.

Competitive tenders can be more cost effective and efficient than fixed payment grants.

There are several key advantages to using competitive tenders.

- they are more flexible than devolved grants;
- they are better at encouraging landholders to achieve certain outcomes;
- they are flexible and allow landholders to decide how they might achieve a required output;
- they encourage further innovation in land management to reduce the cost of meeting targets;
- they are more efficient; and
- they provide funding bodies with better evidence that money is being allocated wisely.

Another advantage of a competitive tender is that they can be used in a range of different scenarios as evidenced in the two examples from the US below.

Swine Buyout Program - US

In the US in North Carolina, the Swine Buyout Program was introduced after the devasting effects of Hurricane Floyd in 1999, when farmers lost thousands of hogs and millions of gallons of sewerage spilled from waste holding lagoons into the river system. The program's objectives are to remove high-risk swine production operations from the 100-year floodplain and to mitigate potential hazard from

future floods while retaining the land for agricultural use. Swine producers submit bids for the amounts they are willing to accept to permit a permanent conservation easement on their property and bids are assessed on their water quality outcomes. Competition has been high and 81 applications were received in the first phase, with only 14 being accepted. (http://www.enr.state.nc.us/newsrels/20020124_DSWCswineProgram.html accessed 4th Feb 2005). The third phase has recently been announced (Daily News – Jacksonville, NC January 3rd 2005).

Drought Protection Scheme - US

In southwest Georgia a severe drought resulted in the Flint River Drought Protection scheme where farmers were paid not to irrigate. Farmers were asked to submit a sealed bid of up to $150 per acre of irrigated land. Bids were accepted, beginning with the lowest, until an adequate amount of land had been taken out of irrigation. The first auction under the Flint River Drought Protection Act was held in 2001 As a result, more than 33,000 acres of Lower Flint River Basin farmland were not irrigated that otherwise would have been. It was estimated that more than 130 million gallons of water per day were saved.http://interests.caes.uga.edu/drought/articles/FRdrought030502.htm accessed 4th Feb 2005)

4. Decision criteria for selecting a MBI

There are several guidelines in the literature that outline considerations and decision criteria to help select an MBI. The SEO5 program was designed for the purpose and supplies a range of supporting documents http://www.regionalnrm.qld.gov.au/planning/state_wide/nap/se05.html.

Robinson and Ryan (2002) provide a useful list of consideration relevant to the selection from the broad range of economic incentives and this is presented in Table 4.1 below.

Table 4.1 Consideration for choice of economic instrument

Consideration	Comments
Tenure	Land ownership significantly affects instrument design. If the issue being addressed is largely on freehold land then it is likely to attract compensation. For State controlled land, access and maintenance issues must be given more attention.
Diffuse/point source problem	Most tradeable permit or load-based licensing systems require accurate monitoring and are most amenable to point source discharges.
Single issue multiple benefits	Instruments such as carbon trading address single issues with discreet benefits such as limiting climate change. Where a problem (such as water quality) has multiple solutions or the solution (such as riparian vegetation) has multiple benefits. It is best dealt with through a combination of instruments or through flexible instruments such as Environmental Management Systems, which can incorporate a range of management actions.
Available information	Design of market-based instruments generally requires reliable data on sustainable yields/limits and the operation of markets instruments requires information on issues such as compliance costs. Regulation and financial incentive may be preferable in information poor environments.

Consideration	Comments
Proportional cost of tool	Charges, bonds and permit prices can have limited effect on management practices if they represent a relatively small proportion of the total costs for a firm or individual.
Intended environmental outcome	Ideally, clear, science-based quality or quantity standards should be stipulated from the outset and the instrument should respond proportionally to the achievement of those standards.
Efficiency gains	Efficiency gains refer to the improvement in resource use over time as a consequence of the implementation of economic instruments to regulate emissions or product use. Water trading is regarded as leading to efficiency gains as entitlements tend to move to producers with the highest marginal returns. The criterion is difficult to assess if base-line environmental conditions or returns on investment in abatement technology are not readily available.
Ongoing incentives	Economic instruments such as permit systems, that provide the incentive for perpetual self management of the emissions by industry are generally superior to those that are dependent on limited funding arrangements or require intensive administration and enforcement.
Timing	When environmental degradation is imminent, instruments that are readily available are preferable to those that may take some time to implement. However, implementation of an instrument without due consideration of its impacts may also create problems.
Flexibility	Some instruments may need to be responsive to ongoing scientific research and monitoring information to confirm their effectiveness and to facilitate any necessary adjustments.
Equity aspects	Economic instruments can have equity considerations that should be addressed or acknowledged in their implementation. Examples include: (a) Charges for 'public rights' e.g., access to National Parks etc; (b) Differential treatment of similar entities e.g., targeting properties for economic incentives while neighbours are denied funds; (c) Flat charges or levies which act aggressively, impacting most on those less able to pay; and (d) Charges/subsidies leading to industry restructuring e.g. cost recovery for water or prohibitively large discharge license fees.
Transaction costs	For market-based incentives impediments to locating and forming agreements with buyers and sellers and government intervention in trading can create high transaction costs, reducing their efficiency.
Community acceptance	A perception of legitimacy on the part of the community is an important requirement for economic instruments to be effective. For example, community support for environmental levies can evaporate if they are seen merely as a method for increasing general revenue. Emissions caps and trading rules also require legitimacy and certainty to gain market acceptance and induce trade.
Administrative feasibility and costs	Financial instruments should not cost more to administer than equivalent command and control regulations and established market instruments should theoretically have low enforcement and administrative costs. None the less, costs and management of the instruments should be kept within the capacity of the administering authority. As such, complex emissions trading schemes may be inappropriate for small local governments.

Source: Robinson and Ryan (2002:6)

The key criteria for price-based and quantity-based mechanisms are outlined below. Market friction mechanisms are not covered in this section as they are more focused on developing partnerships with private companies. The potential for market-friction methods is still being explored and key decision criteria have not yet been developed.

4.1 Key criteria for price-based schemes

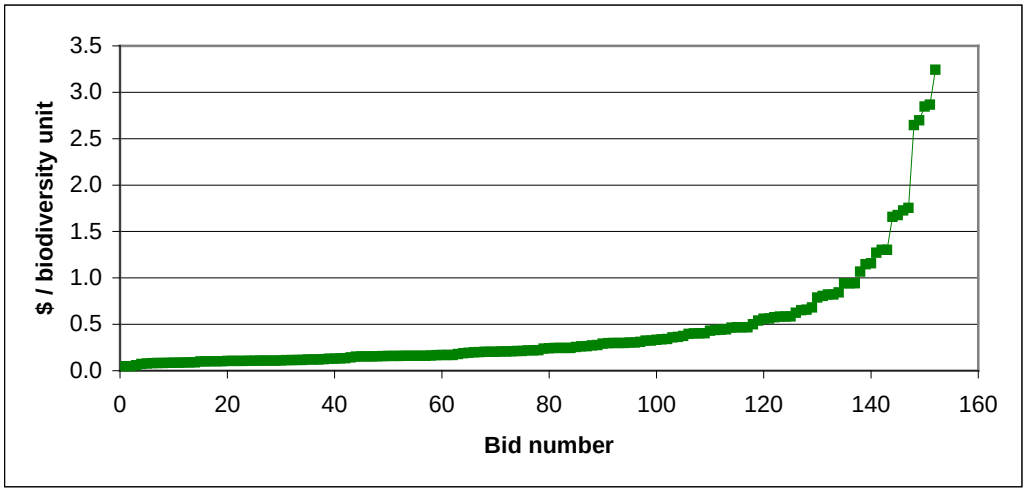
Price-based mechanism are relevant when:

1. **The quantity of service provided is not critical.** The aim is not to achieve a precise environmental target and general improvements in environmental condition are sufficient.
2. **It is appropriate to send broad price signals.** Providing grants or imposing charges provides a clear signal that an activity is or is not in the public interest. Currently some price signals are sending the wrong message, i.e., subsidising coal powered energy makes it harder for renewable energy sources to be price competitive.
3. **It is desirable to maintain the existing system of property rights.** Creating new markets means property rights might have to be redefined. For example, landholders have the right to manage their riparian areas as they wish. A new water quality trading scheme could be imposed that required all riparian areas to be fenced, and so change the allocation of property rights. In a price-based approach, landholders could be given a grant to improve riparian management, and would still retain their right to mange riparian areas as they wish.
4. **Signals may need to be adjusted to take account of new information or other factors.** Price signals may need to be changed for a number of reasons. New scientific information might mean that charges or subsidies should be refocused in different areas, or should target different activities. In addition, public opinion may influence the acceptability of particular price signals. For example, should landholders be charged for producing nitrogen emissions or rewarded for reducing emissions. In Europe, public perceptions have a strong influence in this debate.

4.1.2 Selecting a competitive tender mechanism

The main reason to use a competitive tender is that under the right circumstances, it is more cost effective than a fixed price grant scheme. In a competitive pricing scheme, funds are allocated to those landholders that can provide the conservation service at the least cost. Evidence from trials and workshops has shown that in a competitive tender there will be a range of relatively low cost bids, but only up to a certain point, after which bids become more expensive and less cost effective. This is illustrated in the diagram below where the first 100 to 120 bids are relatively low cost, but after this point, the relative cost of bids rapidly increases. In a competitive tender it is the low cost bids that provide the most cost effective outcomes.

Figure 4.1 Relative bid values in a competitive tender



There is one main condition that must prevail to successfully run a competitive tender for conservation contracts on private land. There must be variation in the costs of provision of conservation services between landholders.

A competitive tender process will only work if the costs of achieving the desired conservation outcomes vary between participants. This will ensure that there is sufficient variation in the bid submissions, which in turn ensures an efficient outcome because the process selects the least costs bids to achieve a specified outcome.

To successfully run a competitive tender there must be variation in the costs of provision of conservation services between landholders.

More information has to be collected in running a competitive tender compared to a devolved grant process. First, information has to be collected from landholders about the amount of funding they need to perform certain actions. Second, information has to be collected about the potential biodiversity and conservation outcomes, and these have to be summarised and measured in some form (through the use of a measuring standard known as a 'metric').

While competitive tenders may involve slightly more work than a devolved grant process, there may be little difference in the engagement with landholders. There will still need to be an awareness campaign, there will still be an application process, and there will still be an assessment process. For landholders, there will be little difference in presentation between a simple competitive tender and a devolved grant process (more complex competitive tenders have more differences).

A competitive tender is the MBI that several NRM groups have decided to trial as a new and innovative incentive scheme. This is probably due to a variety of reasons including the following:

- There are several advantages as outlined in Section 3.5.
- The success and publicity of the BushTender trial in Victoria.[1]
- Although competitive tenders are complex and require expert advice, it is possible to design a relatively simple process at a reasonable cost. At first glance, a conservation tender looks quite similar to a devolved grant process.
- As the process is trialled in different parts of Queensland the learnings can be disseminated across regions. As the process becomes more familiar to all stakeholders, the costs of implementation are likely to reduce.
- There is a comprehensive range of material including step-by-step guidelines, template documents, bid assessment tools and template contracts, readily available on the Internet. These have been purposefully designed for use by NRM groups in Queensland[2]. (Henceforth these are referred to as the SE05 guidelines).

More conservation services can be purchased in a competitive pricing scheme than a fixed price scheme.

Although a competitive tender incentive mechanism has certain advantages, it is a complex mechanism and there are certain pitfalls and risks associated with the process. The guidelines on how to run a tender process provide details of how to run a simple competitive tender and where more complex issues need to be addressed, direction from an expert will be required.

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[1] http://www.dse.vic.gov.au/DSE/nrence.nsf/LinkView/15F9D8C40FE51BE64A256A72007E12DC8062D358172E420C4A256DEA0012F71C).

[2] http://www.regionalnrm.qld.gov.au/planning/state_wide/nap/se05_conserv_tenders.html

Because the competitive tender mechanism is new to landholders, it might be difficult to find a large enough group willing to participate in the process. In general the following conditions should apply:

- Competitive systems work better with more participants. Ideally there should be more than 15 bidders in a tender.
- Competition can be effective with smaller numbers, but there should be at least eight active bidders. (Windle and Rolfe 2005)

4.2 Key criteria for quantity-based trading schemes

Quantity-based MBIs involve the creation of new markets for ecosystem services. There are some criteria that need to be considered for specific trading mechanisms and these are outlined below. However, there are some general considerations that apply to all trading schemes and these are outlined in Table 4.2.

Table 4.2 Desirable property right characteristics for creating markets

Property right characteristic	Description
1. Clearly defined	Nature and extent of the property right is unambiguous.
2. Verifiable	Use of the property right can be measured at reasonable cost.
3. Enforceable	Ownership of the property right can be enforced at reasonable cost.
4. Valuable	There are parties who are willing to purchase the property right.
5. Transferable	Ownership of the property right can be transferred to another party at reasonable cost.
6. Low scientific uncertainty*	Use of the property right has a clear relationship with cause and effect.
7. Low sovereign risk*	Future government decisions are unlikely to significantly reduce the property right's value.

Source: Murtough et al. (2002:10)

[a] Low in the sense that it does not prevent a market from forming. Moderate levels of risk and uncertainty are not necessarily insurmountable barriers to the operation of a market.

Given the lack of emissions trading schemes in Australia, the following outline of criteria for emissions trading schemes is based on evidence from the US. These criteria are reviewed and discussed in detail in O'Dea and Rolfe (2005).

4.2.1 Criteria for an emissions trading program

The United States Environmental Protection Agency[3] list the existence of the following factors as requirements for an effective emissions trading program:

1. **There is an identifiable catchment.** This establishes the geographic scope of market.
2. **There are significant and sufficient point sources**. This is necessary to avoid thin markets and failure problems
3. **Total Maximum Load Allowances (TMLAs) have been established**. A cap needs to be set on a scientific basis.

[3] See http://www.epa.gov/owow/watershed/framwork.html (accessed October 2004).

4. **There are accurate and sufficient data**. This ensures that emissions can be measured to establish a basis for trading.
5. **The concentration-based discharge limitations must be met**. This avoids 'hotspots' developing in particular areas.
6. **There is a large difference in treatment costs across dischargers**. This ensures there is enough variation in opportunity costs to make trading attractive.
7. **The Total Discharge Permit (TDP) system must be accepted by the community and regulatory agency**. This ensures political economy support for trading system.
8. **An adequate institutional structure must be in place**. This ensures that the institutions needed for setting a cap and establishing a trading system exist.
9. **There must be adequate compliance incentives and enforcement mechanisms**. This ensures participants do not face perverse incentives to subvert the trading system.

While the decision criteria are likely to apply to all quantity-based mechanisms to some extent, there will be some variation in their importance between the different mechanisms. For example, while the number of market participants (Criteria 3) is very important in the success of a cap-and-trade program, bubble programs can be run with a very small number of participants. Offset programs may also be characterized by only a small number of sellers or buyers. Acceptance of the TDP system (Criteria 7) is particularly important for a cap-and-trade mechanism where it is often politically difficult to impose a cap, but may be a much smaller issue for other mechanisms.

4.2.2 Criteria for a cap-and-trade program

The USEPA (2003) list the following items as key considerations used in determining the viability of a cap-and-trade program for a particular situation:

1. **Is flexibility appropriate?**
2. **Do sources have different control costs?**
3. **Are there sufficient sources?**
4. **Is there adequate authority?**
5. **Are there adequate political and market institution?**
6. **Are measurement capabilities sufficiently accurate and consistent?**

Each of these key items is considered in turn.

1. Is flexibility appropriate?

A cap-and-trade program is based on the notion that regulators do not need to direct the type or location of specific emission reductions within a region, rather they set the overall target and allow the market to determine where the most cost-effective reductions will be made. However in at least some situations the location of the required emission reductions will be significant. In situations where pollutant emissions are not uniformly distributed the potential exists for the creation of "hotspots" whereby pollutants become concentrated in one particular area. The more a pollutant is uniformly dispersed over a large geographical area the more appropriate it is to use a cap-and-trade program. If such a potential for "hotspots" does exist it may be necessary to limit the flexibility of the cap-and-trade program by limiting emissions of specific sources or limiting trading. However the USEPA (2003) suggest that if a potential trading program requires too many such restrictions to prevent the occurrence of "hotspots" then a more conventional regulatory approach may be more appropriate.

2. Do sources have different control costs?
Where emission sources have different costs for the reduction of emissions, the sources with high marginal abatement costs have an incentive to buy allowances from those sources with a low marginal abatement cost. The variation in opportunity costs provides the incentives to trade. However in a situation where sources have comparable marginal abatement costs, there is little incentive for trading to occur and the viability of a cap-and-trade program would be doubtful.

3. Are there sufficient sources?
Cap-and-trade programs require enough sources to create an active market for allowances. A small number of potential participants will limit the potential for trading even if there are cost-effective trading opportunities. When thin markets (few participants) occur, participants are more likely to hoard additional allowances because of concerns that allowances may not be available from the market when required. However the greater the number of sources the more complex and costly the cap-and-trade program becomes to establish and operate.

4. Is there adequate authority?
It is important to consider whether the relevant government entity has sufficient jurisdiction over the geographical area intended for the cap-and-trade program. If, for example, the region for the potential trading program involves more than one jurisdiction it is important that the program maintains consistency in key design elements.

Another issue is who will have the capacity to enforce compliance provisions and penalties throughout the trading region: the central government or a coalition of local governments?

5. Are there adequate political and market institutions?

The USEPA (2003) stipulate that for the trading component of a cap-and-trade program to work a country must have the same institutions and incentives in place as those required for any type of market function including:

- a developed system of private contracts and property rights;
- a private sector that makes business decisions based on the desire to lower costs and raise profits; and
- a government culture that allows private businesses to make decisions about how to achieve objectives with minimum intervention.

6. Are measurement capabilities sufficiently accurate and consistent?
Policy makers also need to consider whether sources covered by the program can measure emissions with sufficient accuracy and consistency to support the cap-and-trade policy tool. As cap-and-trade programs are essentially performance-based any inaccuracies in emission measurements will result in potential exploitation of the cap.

4.3 Testing the key criteria for a trading scheme in the Burnett Mary

The USEPA selection criteria outlined in the previous section will now be applied to the Burnett Mary region to determine the suitability of a cap-and-trade scheme. Three tables are presented depending on whether point or diffuse source emitters are considered. These tables, along with the material presented in the previous section was developed by O'Dea and Rolfe (2005) in relation to the potential for water quality trading in the Fitzroy basin. However, the information is applicable to any emission trading scheme and the tables modified for the Burnett Mary region.

Table 4.3 The suitability of a point to point source cap-and-trade mechanism

Key Consideration	Assessment	Reason
Is flexibility appropriate?	Some	Some different types of mitigation strategies available
Do sources have different control costs?	Yes	Wide variation in opportunity costs
Are there sufficient sources?	Perhaps	There may only be a small number of emitters
Is there adequate authority?	Yes	Already strong control mechanisms
Are there adequate political and market institutions?	Perhaps	State government using incentives to reduce emissions from sewerage treatment plants
Are measurement capabilities sufficiently accurate and consistent?	Yes	Technology exists to provide accurate measurements

Table 4.4 The suitability of a diffuse to diffuse source cap-and-trade mechanism

Key Consideration	Assessment	Reason
Is flexibility appropriate?	Yes	Many different types of mitigation strategies available
Do sources have different control costs?	Some	Variation in opportunity costs may be limited in agriculture
Are there sufficient sources?	Yes	Large number of emitters
Is there adequate authority?	No	Setting of a cap may be problematic
Are there adequate political and market institutions?	Perhaps	May be issues with property rights for landholders
Are measurement capabilities sufficiently accurate and consistent?	No/perhaps	Little ability to measure many impacts at farm level, although increasing potential with remote sensing tools

Table 4.5 The suitability of a point to diffuse source cap-and-trade mechanism

Key Consideration	Assessment	Reason
Is flexibility appropriate?	Yes	Many different types of mitigation strategies available
Do sources have different control costs?	Some	Variation in opportunity costs may be limited in agriculture
Are there sufficient sources?	Perhaps	Maybe a small number of point emitters
Is there adequate authority?	Yes	Possible to set caps for point sources
Are there adequate political and market institutions?	Perhaps	State government using incentives to reduce emissions from sewerage treatment plants
Are measurement capabilities sufficiently accurate and consistent?	No/perhaps	Little ability to measure many impacts at farm level, although increasing potential with remote sensing tools

The use of a cap-and-trade scheme for **point sources** is probably unviable in the Burnett Mary region because currently, there are a limited number of existing point sources (and measurable emissions), and a reduction in point source emissions alone is not going to result in a significant environmental improvements.

A cap-and-trade mechanism for **diffuse sources** only may also be unsuitable. While there are a large number of potential participants prepared to supply mitigation actions, any attempts to impose a cap and create demand would be at odds with current perceptions of property rights. There would be considerable resistance to the imposition of a cap. As well, measurement and monitoring difficulties would make the operation of a scheme difficult, and there may not be enough variation in opportunity costs to generate large trading gains.

A cap-and-trade mechanism that involved both **point and diffuse sources** has more promise because of the potentially large number of diffuse sources that might be willing to supply mitigation actions, and the potential variation in opportunity costs of mitigation actions between the different sectors. However, if there are a limited number of point source emitters, this will also restrict the opportunities for this type of cap-and-trade mechanism to operate.

4.4 The process of selecting an MBI

MBIs are tool or mechanism to achieve better environmental outcomes. The sections above have outlined key criteria that should be considered in the selection of an MBI. However, the process of selection is also very important. To successfully implement an MBI both the organisers (NRM groups) and the primary stakeholders need to work together through all stages of development and implementation. There must be a shared expectation of the desired/required outcomes and of the methods/mechanisms used to achieve them. Well designed consultation is an important element in the assessment of alternatives and the selection of a suitable and acceptable incentive scheme.

The following factors should be considered.

- **Cooperation and communication** - all stakeholders, including authorizing and implementing agencies, individuals and groups, must be involved in the development and delivery of the incentive mechanism/s. This will help overcome potential problems such as:
    - opposition from different individuals/interest groups;
    - domination by certain individuals/interest groups; and
    - dispute over perceived property rights.

- Programs need to be **flexible** and **tailored** to regional specific circumstances. This should include the recognition of community values and social diversity.
- It is important to have **clear objectives.** There may be some opposition from certain interest groups and clear policy objectives are needed to remain focused on the required NRM outcomes.
- **Selecting an instrument.** An in-depth knowledge of the final instrument design is not required in the initial selection process – this can be developed later. However, sufficient information is required for stakeholders to understand how the different mechanisms will operate and how they will be affected.
- **Selecting the right mix.** Where more than one incentive measure is considered, careful consideration needs to be given to the interaction of different approaches. For example, there may be a need for one mechanism to complement another (i.e, a regulation is required to implement a quantity-based mechanism).
- **Valuing existing approaches.** Considering new approaches to NRM does not mean that existing mechanisms are no longer valid. New approaches provide new opportunities.

5. Summary

The different MBIs that can be used to achieve improved NRM outcomes have been outlined in the sections above. Most NRM managers are familiar with the more traditional mechanisms such as subsidies/grants and taxes/charges and emphasis has been placed on some of the new MBIs that are being developed and considered in Australia. More detail is provided on competitive tenders and new trading schemes, and their suitability for the Burnett Mary region has been examined.

There is potential for a trading scheme to be implemented to improve environmental outcomes in the Burnett Mary region. Possible mechanisms include cap-and-trade, offsets, bubble schemes and mitigation banking. All schemes basically involve enterprises trading with each other to meet some externally-imposed cap. Implementation of these schemes necessitates agreement from the required regulatory authority.

One of the key issues that will determine the suitability of a trading scheme in the Burnett Mary is the extent of point source polluters and whether or not they are covered under existing regulations. A review of trading mechanisms suitable for the Fitzroy basin (O'Dea and Rolfe 2005) found the use of a cap-and-trade scheme for point sources is currently unviable because there are a limited number of existing point sources. One of the few point source emitters are three sewerage treatment plants. However, it is expected that the State Government will share the cost of sewerage treatment plant upgrades with Local Government Authorities under the Local Governing Bodies' Capital Works Subsidy Scheme. This means that another policy instrument is already being used to achieve improvements. A similar situation is likely to apply in the Burnett Mary region.

While an examination of the key criteria for a cap-and-trade scheme in Section 4.3 suggests that a cap-and-trade scheme may not be currently viable, there are more opportunities for **offset programs** and **mitigation banking** schemes to be trialed. Opportunities for offsets/banking credits between **point source** polluters are again limited by the small number of potential participants available. However, if there are major new industrial or intensive agriculture developments in the region, there may be more opportunity to use offsets as a way of reallocating available point source discharges.

Offsets/banking credits between **diffuse sources** may also be unrealistic because of current institutional structures (perceptions of property rights), as well as monitoring and enforcement issues. However there may be some potential for offsets/credits to be used in particular circumstances, particularly where new developments are occurring. For example the development of new farming areas that may increase sediment runoff could be offset with requirements to establish grass filters or riparian buffer strips. These might occur within a property (falling under a property planning process) or between properties (where offsets might need to be traded).

There is greater potential for offsets/credits between **point and diffuse sources** to be designed. These would involve industry/urban sources purchasing offsets from agricultural and other diffuse sources. Point sources such as sewerage treatment plants might purchase offsets and generate substantial savings in mitigation costs without incurring the transaction costs of a cap-and-trade mechanism. New residential developments may need to mitigate the environmental damage of development by buying mitigation credits at another location. An example from the US indicates that it may be possible to introduce offset programs even in cases where only a small number of point source emitters exist (O'Dea and Rolfe 2005).

There may also be some opportunities to introduce bubble programs over point sources in the Burnett Mary. Trading would allow point sources the freedom to determine where and how reductions are made while still meeting the cap requirement.

The relatively small number of point source emitters, the size of contribution of the agricultural sector and the potentially low costs of mitigation from agriculture means that any trading mechanism should include landholders in the Burnett Mary region.

A key issue is how to design a market trading mechanism in the absence of existing markets or information about how potential participants might trade between themselves. The type of information that is often required is detail about the following broad areas:

- the appropriate cap to be placed on the relevant activity;
- the variation in opportunity costs of meeting the cap requirements;
- the type of market trading mechanism that can be implemented;
- the number of potential participants in a market, and
- the transaction costs involved in operating the market.

An examination of the potential for a water quality trading to be implemented in the Fitzroy basin (Rolfe and Windle 2005), where conditions are similar to those in the Burnett Mary, concludes there are three main factors that appear to indicate such a trading scheme may be currently unviable:

- there are not enough point sources for trade;
- there are measurement and monitoring difficulties; and
- there is likely to be limited political will to impose a cap.

While experience with new trading schemes in the Australian context is limited, a cautionary approach should be adopted and experience from examples in the US should be used for guidance. Van Bueren (2001:24) in his examination of some of the new environmental markets in the US identified the following points as recurring issues:

1. Enforceable caps are the key;
2. Start from scratch (rather than making changes to existing programs);
3. Understand the market potential (numbers of participants, cost differentials, efficiency gains, etc.);
4. Involve stakeholders;
5. Keep trading rules simple; and
6. Get the science right.

Given the potential limitations associated with the introduction of a new trading scheme, it would appear that the use of a competitive tender mechanism has the most potential for application in the Burnett Mary. A competitive tender mechanism can be implemented to address a wide range of environmental issues, particularly in the agricultural sector that is the dominant source of diffuse emissions. A competitive tender can also operate with a small number of participants; ideally there should be more than 15 active bidders in a tender process, but they can operate with as few as eight bidders.

Implementing a tender requires careful consideration of a number of factors which are set out in the SEO5 guidelines. It is possible to implement complex versions but these require considerable resources and expertise. On the other hand, the mechanism can be applied in a more simplified version, where some expertise will be required, particularly in establishing the metric or measurements that underpin the assessment of the environmental services being offered in the tender and used to determine and compare the relative bid values. However, improved information and access to GIS databases is facilitating the assessment of individual property bids.

Competitive tenders have other key advantages. First, they can be run over very limited time periods and with very specific groups. This can be particularly useful when the target is to make a once-off change in behaviour. Second, they are consistent with existing property rights, management systems and political structures. This makes them easy to implement and organize, particularly in comparison to quantity-based mechanisms. Third, they are useful mechanisms to introduce NRM groups and landholders the use of MBIs and the concept of trading in some way for environmental services.

Choosing an incentive mechanism that will meet the needs of all stakeholders and achieve the required NRM outcomes is not easy and the process of selection is as important as the selection criteria. In general:

- there is no "one size fits all";
- there is no "right" method – different methods suit different situations;
- some schemes are useful as "change inducers" and education tools;
- it may be more appropriate to use a mix of methods;
- some schemes have more public benefits than others; and
- some schemes will suit the implementing authority better than others.

The process of considering and possibly trialing a particular method has significant benefits in terms of increased understanding of the environmental issues and the links between cause and effect. There is a direct two-way learning process with landholders and other producers getting a better understanding of the environmental improvements that the public most value (NRM targets) and the actions they can provide to achieve these. On the other hand, the implementers (NRM groups) get a clear understanding of the impact this might have on producers and costs it might incur.

There are increasing applications of MBIs across Queensland and Australia as governments, NRM groups and landholders experiment with new ways of maintaining and enhancing the environment. As further trials occur, MBIs are likely to become a more recognized mechanism for engaging with landholders in regional areas.

References

Bishop, J and Vorhies, F. 1998, *Market-Based Instruments for Global Environmental Benefit and Local Sustainable Development-Lessons From Recent Developing Country Experiences*, Research proposal for the Ring for Sustainable Development and the IUCN Commission Environmental, Economic and Social Policy (CEESP) http://www.biodiversityeconomics.org/applications/library_documents/lib_document.rm?document_id=218&section_id=18.

Industry Commission 1997, *A Full Repairing Lease: Inquiry into Ecologically Sustainable Land Management*, Industry commission, Canberra.

James, D. 1997, *Economic Incentives Australian Experience with Economic Instruments for Environmental Management*, Environmental Economics Research Paper No.5, Consultancy report commissioned by Environment Australia, Commonwealth of Australia, Canberra. http://www.deh.gov.au/pcepd/economics/incentives/index.html.

Murtough, G., Aretino, B, and Matysek, A. 2002, *Creating Markets for Ecosystem Services*, Productivity Commission Staff Research Paper, AusInfo, Canberra.

O'Dea, G. and Rolfe, J. 2005, *How Viable are Cap-and-Trade Mechanisms in Addressing Water Quality Issues in the Lower Fitzroy*, Establishing the Potential for Offset Trading in the Lower Fitzroy River Research Report No 4, Central Queensland University, Rockhampton.

O'Sullivan, D. 2002, *Creating Market for Nutrients and Other Pollutants Coast to Coast 2002*, Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management [Online] Date Accessed 04/05/04 URL: www.coastal.crc.org.au/coast2coast2002/proceedings/Theme2/Creating-markets-nutrients-other-water-pollutants.pdf.

Robinson, J. and Ryan, S. 2002, *A Review of Economic Instruments for Environmental Management in Queensland*, CRC for Coastal Zone, Estuary and Water Management http://www.coastal.crc.org.au/pdf/economic_instruments.pdf

Rolfe, J.C. and McCosker, J. 2003, *Overview of the Issues in Planning a Corridor Tender Process*, Establishing East-West Landscape Linkage in the Southern Desert Uplands Research Report No 1, Qld Environmental Protection Agency Central Queensland University. Emerald.

Rolfe, J. and Windle, J. 2005, *Final Report for MBI Project 53*, Establishing The Potential for Offset Trading in the Lower Fitzroy River Research Report No 6, Central Queensland University, Rockhampton.

Stavins, R.N. 2001, *Experience with Market-Based Environmental Policy Instruments*, Discussion Paper 01-58 Resources for the Future Washington DC. www.rff.org/rff/Documents/RFF-DP-01-58.pdf

Stoneham, G., Chaudhri, V., Ha, A., and Strappazzon, L. 2003, "Auctions for conservation contracts: an empirical examination of Victoria's BushTender trial", *Australian Journal of Agricultural and Resource Economics* 47(4): 477-500.

USEPA 2003, *Tools of the Trade: A Guide to Designing and Operating a Cap-and-Trade Program for Pollution Control*, [Online] Date Accessed: 19/07/2004 URL: www.epa.gov/airmarkets/international/tools.pdf.

van Bueren, M. 2001, *Emerging Markets for Environmental Services. Implications and Opportunities for Resource Management in Australia*, RIRDC publication No 01/162 , Canberra.

Windle, J. and Rolfe, J. 2005, *Competitive Tenders for Conservation Contracts. A practical guide for regional NRM groups in Queensland*, Report prepared for the Queensland Department of Natural Resources and Mines, Brisbane. http://www.regionalnrm.qld.gov.au/planning/state_wide/nap/se05_conserv_tenders.html.