

National Action Plan for Salinity and Water Quality

Social and Economic



Regional Natural Resource Management in Queensland

State-level Investment Project SE05

Round 1 Market Based Instruments Pilot Programs – Overview and Implications for Regional NRM Groups in Queensland



August 2006

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Queensland

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August 2006



The National Action Plan for Salinity and Water Quality (NAPSWQ) is a joint Australian and Queensland Government initiative that encourages governments and regional communities to work together to address salinity and water quality issues in priority catchments throughout Queensland. This document has been produced under the NAPSWQ using Australian and Queensland Government financial support.

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www.regionalnrm.qld.gov.au/research_sips/sips/social_economic/assistance.html

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1.0 Summary

Analysis of a national trial of different incentives that could be used to improve the way natural resources are managed has found that competitive tenders (auctions) are the most appropriate incentive for many NRM groups in Queensland.

The auction process works like this: Service providers, such as landholders, place a bid, which is the fee they would charge to provide a land management service like planting trees, fencing an area or protecting remnant vegetation. The service purchaser, such as a regional NRM group, assesses the competing bids and accepts the bids that deliver the best results for the lowest cost. The successful landholders receive an incentive to change their management and increase environmental benefits.

The national trial also considered other types of incentives, such as cap-and-trade schemes and offset schemes. However, these incentives were not as appropriate for NRM groups in Queensland, mainly because regional NRM groups do not have the regulatory powers necessary for such schemes.

In all, there were 11 trials held across Australia, two of which were in Queensland. The outcomes of the trials provide some directions to agencies and NRM groups about the potential use of new tools to improve environmental management.

The pilot project *Establishing east-west landscape linkage in the southern Desert Uplands (Central Queensland)* investigated the potential for establishing corridors of protected vegetation across the Desert Uplands through a competitive tender (auction). This trial was a success, and will continue into a second round. See the body of this report for more details.

The second Queensland pilot project, *Establishing the potential for offset trading in the lower Fitzroy River (Burdekin-Fitzroy, Queensland)*, explored the potential for improving water quality by allowing landholders to offset their polluting activities through an offset and cap-and-trade scheme. The trial found that there was the potential to introduce an offset scheme, but a cap-and-trade scheme was not viable due to the dominance of diffuse sources of pollution.

The national trial concluded that market-based incentives would play an important role in encouraging wise management of Australia's natural resources.

1.1 Purpose

This paper summarises Round 1 of the National Market-based Instruments (MBIs) pilot program and highlights the lessons relevant to Queensland's regional NRM groups. The paper includes:

- the background to the National MBI Pilot Program
- a brief discussion of market-based instruments and how they can be applied to address environmental issues
- a summary of Round 1 pilot programs
- conclusions and implications for regional NRM groups in Queensland.

1.2 Background

The National MBI Pilot Program was established to trial market-like approaches to managing natural resources and the environment. The aim of the pilot program was to increase Australia's capacity to use MBIs to improve the way natural resources are managed.

Eleven pilot projects were included in Round 1 of the program, which was funded under the National Action Plan for Salinity and Water Quality. This report summarises the key elements of the pilot projects, but regional NRM groups are encouraged to see the full reports and the evaluation of Round 1 on the National MBI website <<http://www.napswq.gov.au/index.html>> for detailed information.

1.3 What are Market-based Instruments?

Market-based instruments are schemes that use market-like approaches to encourage 'good behaviour', that is, changing management actions for improving natural resource management outcomes. MBIs have the potential to provide incentives to improve the condition of the land and waterways at a lower cost than many traditional policies and laws. MBIs can operate by altering market prices, setting a cap or altering quantities of a particular good, improving the way a market works, or creating a market where no market currently exists.

The MBI pilot program was developed for the purpose of casting light on some of the fundamental design and implementation issues associated with particular instruments and to test these on specific environmental and natural resource management problems.

1.4 The National MBI Pilot Program

The 11 Round 1 pilot projects were selected from an open call for proposals. The pilot projects addressed a range of environmental issues including dryland salinity, irrigation salinity, water quality and loss of biodiversity. The pilots covered the range of MBIs, including tradeable pollution permits, auctions, offset schemes, leveraging private funds and insurance markets. Pilots were located in Queensland, New South Wales, Victoria, South Australia and Western Australia. Figure 1 outlines the coverage of the MBI pilots.

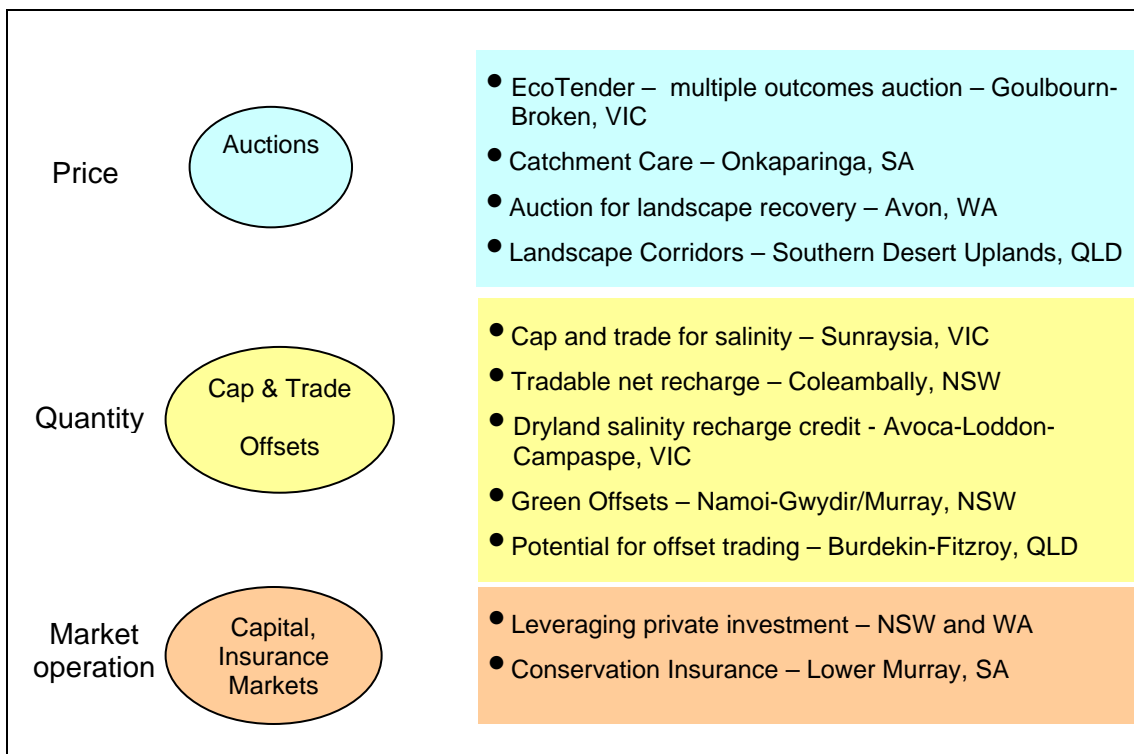


Figure 1. Coverage of Round 1 MBI Pilots

The following section provides an overview of the experiences from the MBI pilot auctions, cap-and-trade, and offset schemes, with an emphasis on lessons that might be relevant for regional NRM groups. Experience showed the most effective MBIs for Queensland were auctions. Although cap-and-trade and offset schemes are less suitable for Queensland’s regional NRM groups due to lack of regulatory power, they are reported to illustrate their potential.

2.0 Auctions

An auction can enable the purchaser of environmental benefits – such as increased biodiversity – to choose bids that provide the greatest benefits at least cost. This process may involve inviting landholders to submit bids nominating a management plan for their property and a price for undertaking this plan. The purchaser evaluates bids for the best ecological value for money. Auctions work best where there are differences in landholder costs for supplying environmental outcomes.

Auctions can provide a cheaper and more efficient way for government or regional NRM groups to purchase environmental benefits than grants programs. An auction can take advantage of the difference in costs that different providers (e.g. landholders) incur in providing an environmental benefit. This enables the purchaser (e.g. regional NRM groups) of environmental benefits to get more ‘bang per buck’. For regional NRM groups, auctions can represent a cost-effective alternative to a grants program. An auction can exploit these differences and maximise the benefits. Auction pilots in Round 1 involved a first-price, price-discriminating process, where bidders did not know what other bids were submitted.

To evaluate the bids that may be submitted, a mechanism – or ‘metric’ – is needed to quantify benefits in each transaction. An environmental metric quantitatively converts land-use change or management action into an environmental benefit score, which is then used with information about bid price to rank bids (see Figure 2). Implicit in this process is the need for accurate biophysical information at the property level, so good science that can assess environmental benefit is essential.

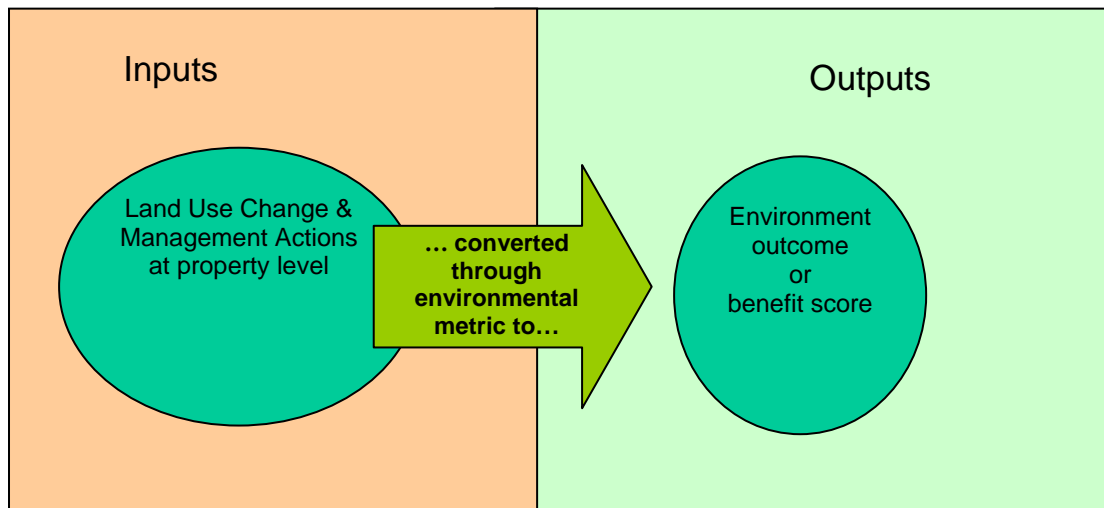


Figure 2. Metrics

Another key element in the auction process is bid assessment and selection. Typically, the government or other purchaser would assess bids by using an environmental benefits index, or similar metric based on the model. Figure 3 outlines how an environmental benefits index is typically calculated for ranking auction bids. The inherent significance of the site is combined with contribution of the management actions to determine the total benefits likely to accrue from the actions. This is then divided by the bid amount to determine benefits/\$. Those bids with a higher benefit per dollar score will be preferred.

A number of pilots have formalised metrics that express the goods and services generated. Across all pilots, metrics have been developed for water quality, biodiversity, carbon, surface water flows, nutrient transportation, irrigation salinity, stream bank and riverine quality and water table recharge. EcoTender used a metric to quantify multiple environmental outputs.

Environmental benefits indices were used in all of the auction trials except for the pilot located in the Avon River Basin of Western Australia, which compared an environmental benefits index approach with a systematic conservation planning approach.

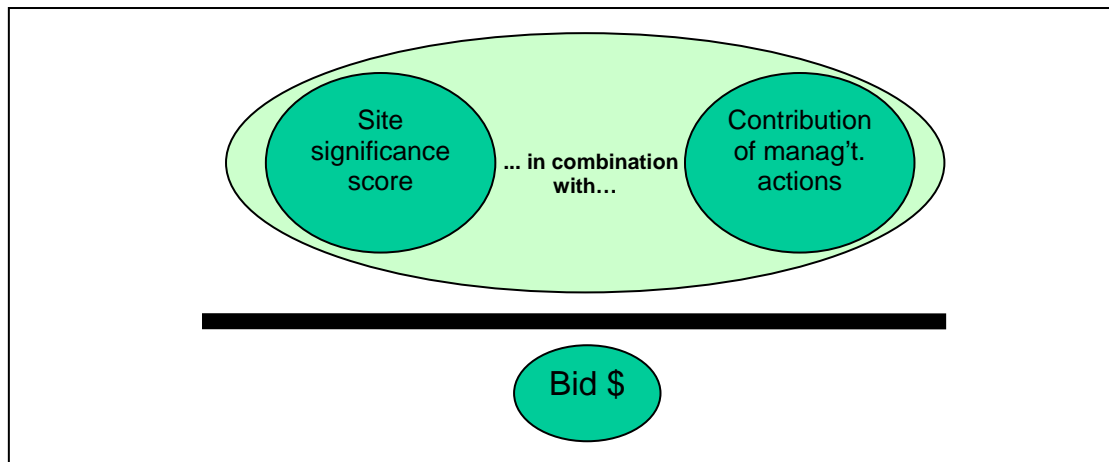


Figure 3. Typical Environmental Benefits Index

Four pilot projects trialled the use of auctions: EcoTender (multiple outcomes auction) in Victoria; Catchment Care in the Onkaparinga Catchment of South Australia; Auction for landscape recovery in the Avon River basin in Western Australia; and Landscape Corridors in the southern Desert Uplands of Queensland. Each is summarised below.

2.1 EcoTender: Auction for multiple environmental outcomes (VIC)

EcoTender was a particularly significant pilot because it sought to maximise a number of environmental benefits from a single investment (i.e. maximise 'joint bang for buck'). The pilot involved trialling an auction to compare the costs involved in purchasing multiple environmental benefits with a fixed-price scheme such as a grant. It recognised that a single land-use change could have multiple benefits.

The environmental outcomes targeted improvement in biodiversity, salinity, water quality, water quantity and the potential for carbon sequestration. Moreover, since auctions for environmental goods require site visits, it would be more economical to visit each site once rather than re-visiting properties for each benefit.

Each EcoTender contract was based on landholders being paid to do work that improved the environment.

A summary of methodology for this pilot is outlined below:

- EcoTender used a sophisticated biophysical model. A catchment modelling framework was developed to estimate multiple environmental effects and represent these spatially.
- Two types of contracts were used in EcoTender: one was for management of remnant vegetation; and one for revegetation. Contract lengths were five and ten years, respectively. Contract payments were spread over time with relatively large payments (25% of contract) made at the start and completion of the contract, with the remaining payments distributed evenly

over the period. This provided a strong incentive for landholders to complete the contract.

- Bids were selected on a cost-effective, value-for-money basis, with bids selected until the \$500,000 budget was exhausted. All bids provided biodiversity benefits, 72% provided aquatic function benefits, while only 8% provided salinity benefits.
- Of the 50 bids submitted from 21 farms, totalling \$835,000, 31 were accepted representing 62% of the total bids. Successful bids covered a total area of 259 ha (revegetation 76ha, native vegetation management 183 ha), 70% of the total area offered (Eigenraam *et al.* 2006).

Auctions rely on sound, scientific biophysical modelling, especially when multiple environmental benefits are concerned. Regional NRM groups considering auctions would need to have access to detailed modelling for their region. Further details on the EcoTender pilot can be found in the final report by Eigenraam *et al.* (2006).

2.2 Catchment Care: Developing an auction process for biodiversity gains and water quality outcomes (Onkaparinga catchment, South Australia)

Catchment Care was designed to get a better return on the Onkaparinga Catchment Water Management Board's investment in on-ground NRM. Catchment Care compared an auction for biodiversity and water quality services with the Board's previous fixed-price scheme.

The methodology used in this pilot consisted of the following:

- The metric used was based on environmental value, threat, and threat reduction expected from proposed management actions.
- A risk analysis framework was established to score, rank, and select bids that offered the greatest benefits for biodiversity and water quality based on available funds and involved the following process as outlined in Bryan *et al.*, (2005, p.15). Environmental benefits for bid selection involved consideration of environmental values in combination with threats to those values to arrive at a risk factor, as well as consideration of the contribution of management actions to threat reduction. An environmental benefit score was then calculated for each bid by multiplying the impact of each proposal by the area over which the action was to be conducted.
- Cost effectiveness of bids was calculated by dividing the environmental benefits by the price. Bids were ranked according to cost effectiveness and selected until the \$150,000 funding limit was exhausted, resulting in the funding of 17 bids.

The auction process enabled landholders who were able to supply environmental benefits at low cost to do so. However, the more expensive

bids to provide environmental benefits were not awarded contracts. The pilot did not allow for the subsequent follow up with unsuccessful bidders who had proposed more expensive environmental benefits. In so doing, the interest generated in the auction process and benefits of on-ground land use change was lost (Bryan *et al.* 2005).

In this pilot, landholders entered into a three-year contract with the Board and were required to maintain rehabilitated or protected areas in perpetuity.

Results from the Catchment Care pilot demonstrated that moving from a devolved grants scheme to an auction process is likely to cost a minimum of about \$100,000 upfront for design and administration, but that the auction would yield efficiencies of between 23% and 34% once in place when compared against the Onkaparinga Catchment Water Management Board's previous grant scheme.

2.3 Auction for landscape recovery (northeastern wheat belt of the Avon River Basin, Western Australia)

The Auction for Landscape Recovery was a multi-disciplinary project that involved an auction in a highly biodiverse landscape threatened by salinity and the effects of large-scale land clearing.

Bids were assessed on how changes in the way a property was managed would affect salinity, riverine health and biodiversity, and carbon contribution. For example, bids to plant trees were evaluated for their impact on biodiversity, salinity, and water quality and quantity.

The methodology involved:

- Running the pilot over two rounds as a simple sealed-bid, price discriminating auction, with a total of \$200,000 available to private landholders submitting single, multiple or joint tenders for on-ground works focussed on biodiversity conservation actions.
- Testing two methods of tender evaluation: environmental benefits index and systematic conservation planning.
- Evaluating tenders through a metric of biodiversity complementarity¹ within a systematic conservation planning framework.
- Evaluating bids through two different metrics: the environmental benefits index and a systematic conservation planning approach.

The project revealed that sufficient time and resources need to be available so that the environmental benefits index can be developed for local or regional situations. The project findings suggested that testing of the relevant metric prior to site assessment and tender evaluation was advisable. The Auction for Landscape Recovery was successful in creating a competitive market where

¹ Complementarity is the marginal gain each project provides to increase the biodiversity protection of ecosystems when evaluated against land known currently to exist in protected areas such as nature reserves (Gole *et al.* 2005).

landholders tendered to provide biodiversity conservation services, and revealed that although upfront administrative costs were high, it was two to three times more efficient than a fixed-price scheme (Gole *et al.* 2005).

One of the key claims contributing to the success of the project was the work done by community support officers employed by the Auction for Landscape Recovery and the involvement of a non-government organisation. A relatively high number of participants had already been involved in programs such as Landcare, suggesting that a degree of prior experience or human capacity was also required to facilitate participation (Gole *et al.* 2005).

2.4 Establishing east-west landscape linkage in the southern Desert Uplands (Central Queensland)

The aim of this pilot was to investigate the potential for using competitive tenders to establish protected vegetation corridors across the central-western Queensland Desert Uplands region. A conservation auction encouraged landholders to maintain vegetation corridors on their properties in return for payments. Landholders normally submit auction bids independently but this pilot was different as landholders had to work together to establish corridors across their properties.

The pilot was run as a series of experimental 'games' (Rolfe *et al.* 2005). The aim was to retain an east-west vegetation corridor. Bids were assessed according to their effect on biodiversity and degree of interconnectedness of the protected landscapes. Analysis of the results demonstrated that this process could work in practice.

The methodology for this pilot involved the following:

- creating a series of dummy properties which were allocated to participants in a workshop setting.
- participants designing a vegetation corridor across their dummy property using their knowledge of the region, and identifying what annual payment they would need to enter into a five-year conservation agreement.
- evaluating bids using a simple metric based on environmental benefits.
- designing experimental workshops to test different bidding processes when landholders bid individually and cooperatively.

As the participants became more familiar with the process, competitive pressure caused the average bids to fall, while the amount of biodiversity credits that could be purchased for a fixed allocation rose (Rolfe *et al.* 2005). Substantial statistical evidence also indicated that bids became successively more cost-efficient (Windle *et al.* 2005). Results from this pilot also revealed that transaction and administration costs associated with a corridor-auction process may be high due to landholders' limited knowledge of the process and general reluctance to be involved in something new (Rolfe *et al.* 2005).

The Landscape Linkages Project is being implemented across the Desert Uplands region using the process outlined above and is being funded by

Burdekin Dry Tropics NRM group. The auction will have two bidding rounds. After the first round, the spatial layout of all bids will be on display so that bidders have the opportunity to realign their bid area in the second round to connect with adjoining areas. A second bidding round will also enable bidders to make their bid more competitive. Round 1 tenders open in the beginning of August and close mid September, with Round 2 bids to be conducted in mid October 2006.

3.0 Cap-and-Trade Schemes

Three national MBI pilots have also explored the potential for applying cap-and-trade schemes to improve natural resource management. Cap-and-trade schemes establish a market for trading an environmental good or pollutant. There are three components to this type of market creation (Australian Government 2004, p.7):

1. A monitorable and enforceable quantity cap is placed on the market that limits the quantity of resource used or allowable emission in a defined area
2. Entitlements are defined and distributed among the users
3. A market is created for trading of entitlements.

Cap-and-trade schemes can reveal “options for low cost pollution abatement or natural resource management by encouraging greater change by those for whom change is relatively cheap. Any excess change can then be on-sold to those for whom change is relatively expensive.” (Australian Government 2004, p.7)

The quantity cap and trading rules are essential components of a cap-and-trade scheme. It is important that the cap and entitlements are based on robust scientific information.

Markets are created through individuals facing different costs of compliance being able to trade entitlements to maximise their returns and minimise the cost of meeting the cap.

Cap-and-trade schemes are most easily applied to point-source problems where good science is available and can be applied to setting the cap and defining the trading rules. Where the science is not well developed or the problems cannot easily be converted to point-source problems (e.g. through a suitable metric), then a cap-and-trade solution is unlikely to be accepted or to be efficient.

Cap-and-trade mechanisms are very complex to administer and involve regulatory limitations in applying a cap and the defining of property rights (such as pollution permits) that can be exchanged. Some broad conclusions from the program are that cap-and-trade schemes are complicated and take time to develop and implement in terms of regulating for the cap, defining the property rights and in securing market exchanges. Stakeholder acceptance of such mechanisms and the science behind them is crucial to their success as are transaction costs if trades are to occur. As the implementation of such schemes would effectively require a significant alteration in the property rights

and regulatory regime, coupled with providing appropriate authority to bodies to administer, these schemes are unsuitable for Queensland regional NRM groups.

To date, three pilots have been completed. A brief summary of these is provided below.

3.1 Cap and trade for salinity: Property rights and private abatement activities, a laboratory experiment (Lower Murray, Victoria/South Australia)

This pilot tested the possibility of creating a market for salt separate from that of water to achieve salinity targets in the Murray system. The pilot used an experimental economics approach, which modelled a trading regime as an alternative to the tax levied on water trading that currently funds programs to address salinity.

The pilot has added to the knowledge of ways to test alternative policy mechanisms “in the laboratory” before implementing in the field.

3.2 Tradable net recharge contracts in Coleambally Irrigation Area (Lachlan-Murrumbidgee, NSW)

This pilot investigated the potential application of a cap-and trade-approach to manage net recharge in the Coleambally Irrigation Area using experimental economic modelling. It involved the use of tradeable recharge credits to manage the problem of salinity and waterlogging caused by excessive irrigation use. The pilot explored the possibility of assigning irrigators’ rights to contribute net recharge based on water supply contracts held with the Coleambally Irrigation Cooperative Ltd (CICL).

The project assessed potential benefits from establishing a market for salinity as compared to uniform regulatory approaches. Economic modelling and experiments with landholders assessed the potential effectiveness of trading schemes for managing salinity in the region. The modelling indicated that salinity currently imposes relatively low costs on irrigators, representing only a reduction in annual agricultural income by about 8.5% over 20 years under current operating conditions. With the introduction of a new cap or reduction in allowable recharge, it was estimated that income levels would reduce by about 1% over 20 years. Hence, this pilot indicated that the benefits from trading in a market for salinity were unlikely to justify the costs. Despite this, the pilot provided valuable lessons on the use of experimental economics to investigate the development of MBIs, has estimated the significance of the environmental problem and confirmed the value of biophysical investigations. It has also provided insights on the appropriateness of the current policy regime and the potential of the broader use of such instruments.

3.3 Dryland Salinity Credit Trade (upper Bet Bet subcatchment, Loddon River, Victoria)

This pilot investigated a dryland salinity credit trade trial. The aim of the trial was to establish a cap or target for groundwater recharge volumes for each trial participant. Participants could meet their obligations through credits for managing their land to decrease recharge volumes or by buying credits from other participants.

Experimental economics was used to test the potential of collective “social payments” as an incentive to reduce recharge volumes (Connor *et al.* 2006, p.7). Under this arrangement, additional bonus payments are to be paid to participants if they achieve a pre-specified level at the end of the three-year contract.

The findings from this pilot suggested that collective performance payments have good potential where participation in voluntary incentive schemes is low and where environmental action is a high priority. Whether the pilot could be extended to other settings would be dependent on the level of social cohesion in that community.

4.0 Offset Schemes

The main use of natural resource management offsets is as an “off-site action that counterbalances a polluting or environmentally degrading activity on-site” (Australian Government 2004, p.8). Where all cost-effective mitigation and prevention measures have been pursued, offsets offer the possibility of improving the environment at a reduced cost by offsetting the remaining impacts elsewhere. An offset scheme grants permission to undertake activities such as increasing production and producing emissions, provided the firm also takes action such that total environmental impact (e.g. nutrient or salt load emissions into a river) either improve or remain unchanged. Hence, offset schemes help achieve the simultaneous goal of economic development and environmental protection. (NMBIWG 2005)

Two projects have examined offset mechanisms, one managing salt loads in stressed rivers in NSW and one exploring the potential supply of offset actions by landholders to improve water quality in Queensland. A summary of the offset pilots is provided below.

4.1 Green offsets for sustainable regional development (Namoi-Gwydir, Macquarie-Castlereagh/Murray, NSW)

The NSW pilot investigated the use of offsets at three sites to demonstrate how they could facilitate economic expansion without adding to salt loads in the Murray-Darling Basin (DEC 2005).

Of the three sites, only the Ulan Coal Mine had been significantly implemented. Mine operations consisted of pumping saline groundwater from an aquifer to prevent infiltration into the underground mine. The saline groundwater was discharged into Ulan Creek but due to community concerns and environmental impacts, the mine was ordered to cease discharging into the creek.

The mine operators considered different options to address the salt levels, including desalination. However, due to cost constraints and waste management issues, the operator decided to establish a large dam to store low-salt-content water from the underground mine. Water with higher salt content was used for dust suppression in the open cut mine. The stored water was used for irrigation of a variety of pastures on around 250 hectares of land owned by the mine, which represented the off-site offset action. The pastures were sold as animal feed and helped pay for the irrigation scheme.

This project revealed that offset actions were considerably less costly than other options, including desalination. The offset has cost the company about \$1.34 million to date, with ongoing operation and maintenance totalling \$93,500 per year. A desalination plant would have cost about \$15 million to build and \$6 million a year to run. This represents a net present value saving of approximately \$91 million² (DEC 2005).

4.2 Establishing the potential for offset trading in the lower Fitzroy River (Burdekin-Fitzroy, Queensland)

The Queensland pilot explored the potential for landholders in Queensland's Fitzroy River catchment to offset their impact on water quality. This project used choice-modelling and experimental auctions to measure landholders' willingness to mitigate their impact on water quality. A component of this pilot also involved undertaking a desktop review of the potential for introducing a cap-and-trade scheme in the Lower Fitzroy River.

On the potential for introducing offset trading, the pilot noted that such a scheme could be viable, but that further investigations were needed. Rolfe and Windle (2005) indicated that current regulations governing point source emitters need adjusting. This could allow the use of offset schemes and help determine trading rules.

The pilot also concluded that a cap-and-trade scheme was not viable at the current time due to the many and diverse sources of water pollution. Most emitters were spread across the Fitzroy basin, making "the determination and implementation of a cap problematic" (Rolfe and Windle 2005, p.27). Moreover, the large amount of scientific information required that relates changes in land management to environmental conditions was difficult and costly to obtain.

Although the pilot revealed that limited opportunities were available in the basin to implement quantity-based mechanisms, introducing price-based mechanisms such as an auction or competitive tender might be possible. (Rolfe and Windle 2005)

² This is based on the assumption that costs continue for 20 years, at a discount rate of 7%.

5.0 Implications for regional NRM bodies

The National Market Based Instruments Working Group (2005) concluded that MBIs would continue to play an important role in natural resource management. Evidence from the trials suggests that MBIs can deliver ecosystem services at a lower cost than existing programs. In particular, the development of appropriate environmental metrics has the potential to target investment.

Overall, Queensland's regional NRM groups have limited capacity to apply the full range of MBIs, particularly those where property rights need to be modified, such as in cap-and-trade and offset schemes. Nevertheless, the knowledge gained from the MBI program can help them explore the possibility of delivering incentive schemes through auctions rather than fixed-price devolved grants.

The main lessons for Queensland's regional NRM groups are:

- It is critical that a robust biophysical model grounded by scientific evidence is developed to improve the use of metrics for NRM incentive programs. The metric needs to be able to define the environmental good in ways that are transparent, replicable and acceptable.
- Auctions need to take into account site-specific issues, especially in the design of metrics. Sufficient time and resources should be allocated to develop and properly test relevant metrics.
- Issues related to private-public benefits in land-use change and land management need to be carefully considered (i.e. to pay for actions for which the landholder does not already have an obligation).
- Good planning and engagement to educate landholders about the auction process is critical to address impediments to tender uptake and participation, and to minimise the associated transaction costs. This may include the use of experimental economics workshops to test policy mechanisms prior to implementation in the field.
- Competitive tenders (auctions) are generally more costly to establish than fixed-price grant schemes, but once in place can be more cost-effective (NMBIWG, 2005)
- Careful consideration needs to be given to issues in the design of contracts and to the monitoring and enforcement of those contracts

The National MBI pilots have provided insights into the creation of markets for the environment. In particular, the auction approach provides new flexibility for Queensland's regional NRM groups to target and deliver their incentives programs and implement their NRM plans. While regional groups are encouraged to make contact with individual pilot proponents, they should seek further information on the trials, including final reports, from the National MBI website: <http://www.napswg.gov.au/mbi/round1/index.html>.

6.0 Recommended Readings

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