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Evaluation of Round One of the Market Based Instrument Pilot Program

Submitted

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to the
National MBI Working Group

17 August 2005

Executive Summary

Round one of the Market Based Instrument (MBI) Pilot Program began in 2003 after an open call for proposals in 2002. In round one of the program 11 pilots were selected from locations in five different states. The pilots investigated the use of auctions (4), cap and trade approaches (3), offsets (2), a leverage fund (1) and conservation insurance (1). Using the interim and final reports of nine of these pilots, and an overview report by the National MBI Working Group, a number of important insights were obtained. These findings, given below, will assist in the delivery of the National Action Plan for Salinity and Water Quality.

- Auctions, cap and trade (for point sources) and offsets can be successfully used to address a wide variety of water quality, salinity and environmental problems in the Australian landscape;
- MBIs, especially auctions, can deliver large cost savings relative to traditional natural resource management;
- To effectively implement MBIs there needs to be very good bio-physical modelling at the farm or paddock level, and adequate monitoring and enforcement of landholders' actions;
- To generate cost savings MBIs require adequate testing and adaptation prior to implementation and well-developed communication strategies to maximise participation by landholders; and
- There is no one-size-fits all approach to environmental problems and MBIs will need to be tailored and adapted to particular circumstances.

Despite the successes of the round one pilot program in addressing key knowledge gaps about the use of MBIs for conservation purposes, a number of important issues

still need to be examined. Some of these knowledge gaps are best answered with a follow up set of pilots. Suggestions as to what might be the research priorities should there be a second round of pilots, and how these pilots might be conducted, are provided below.

- Research funding should focus on moving MBIs from the trial to implementation phase and of all the approaches, auctions offer the greatest potential;
- Another trial of offsets would be helpful to further explore the possibility of trading between non point and point sources and to provide a better understanding of the value of offset banks;
- Given the uncertainty associated with achieving environmental outcomes, some testing of the relative merits of price versus quantity based instruments is required;
- Priority should be given to testing whether a mix of MBIs offers a more cost-effective approach to conservation than a single MBI approach;
- A comparison is required on the merits of environmental quality and outcome-based rights and contracts versus input-based approaches that control landholders' actions;
- The choice of pilots in a second round should involve a 'natural' experimental design to provide information on how robust MBIs are to successful implementation by explicitly accounting for differences in landscapes and capabilities of local catchment and/or conservation authorities; and
- Funding should be provided to establish a technical committee to support future pilots, to improve the technical reporting from pilots, and to ensure they help answer the identified knowledge gaps in a timely manner.

Terms of Reference

1. Identify specific achievements and findings made in round one with respect to the objectives of the Market Based Instruments (MBI) Pilot Program that include:

(A) What national knowledge gaps are addressed and their strategic value to increase Australia's capacity to undertake MBIs?

(B) How does each pilot compare with traditional approaches to conservation and natural resource management?

2. Assess the broad class of MBI mechanisms funded under the Pilot Program with respect to the following criteria:

(A) Cost-effectiveness relative to alternatives.
(B) Ease of adoption and participation.
(C) Implementation status.
(D) Implications for regulatory and institutional frameworks.

3. Identify gaps in the Pilot Program that need to be addressed, and provide guidance for future research and implementation of MBIs.

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Part I: Key Findings and Achievements of the Pilots

In round one of the Market Based Instrument (MBI) Pilot Program, 11 projects were selected from over 50 proposals. Collectively these projects span five states: Western Australia (1), South Australia (2), Victoria (3), New South Wales (3) and Queensland (2), as shown in Figure 1. Seven of the projects involved field trials while four were primarily desktop studies in the form of workshops or laboratory experiments. In keeping with the priorities of the National Action Plan for Salinity and Water Quality, all but two of the projects focused on salinity and/or water quality issues associated with land use. A summary of the projects, their identification number, the type of mechanism to which each pilot belongs, a brief description of the natural resource management issue addressed and the pilot's purpose is provided in Table 1. Details of the funds allocated to the pilots are provided in Table 2.

Final reports are only available for five of the pilots with preliminary or milestone reports available for a further four pilots. Reports are not yet available for the leverage fund pilot or the conservation insurance pilot. Consequently, discussion of the achievements of the pilots is limited to four pilot auctions (multiple-outcome auction in Goulburn-Broken Vic; auction for landscape recovery in Avon, WA; auction for landscape corridors in Burdekin-Fitzroy, Qld; auction for biodiversity and water quality outcomes in SA), three 'cap and trade' pilots (net recharge credits in Coleambally irrigation area, NSW; cap and trade for salinity in laboratory experiments; recharge credit trade in Bet Bet, Vic), a pilot that evaluates a cap and trade and offset (offset trading in lower Fitzroy River using experimental workshops

and choice modelling) and an offset pilot (offset for point sources on the Murray-Darling Basin, NSW).

(A) National Knowledge Gaps and Strategic Value

The National Action Plan for Salinity and Water Quality is a major state and federal government initiative that aims to address important environmental challenges in terms of land use. As part of this initiative, governments wish to test and trial new ways and mechanisms to achieve the desired natural resource and environmental goals. Given that relatively few MBIs have had field trials in the salinity and water quality context in Australia, the round one pilots address a number of important knowledge gaps that will help in the delivery of environmental outcomes in a cost effective manner.

Collectively, the pilots provide a number of important findings that should help governments meet the goals of the National Action Plan for Salinity and Water Quality, but at a lower cost than traditional methods of delivery. The key findings of the round pilot are listed below.

Auctions, cap and trade (at least for point sources) and offsets can successfully be used to address a wide variety of water quality and salinity problems in the Australian landscape.

MBIs have the potential to deliver substantial cost savings. The pilots show that MBIs, and in particular auctions, have the ability to deliver very large savings relative

to traditional natural resource management. These savings arise from the ability to target funds to landholders in a way that maximises the environmental payoffs per dollar spent.

A necessary condition for the effective implementation of MBIs is adequate monitoring and enforcement of landholders' actions. Simply creating a market for conservation action is not sufficient, and considerable regulatory oversight is required to ensure desired environmental outcomes.

The success of cap and trade approaches depends critically on well-developed and functioning markets for discharges or conservation actions. In jurisdictions where there are few holders or property rights and 'thin' markets it will be difficult to effectively to implement 'cap and trade' mechanisms.

Effective MBIs require very good bio-physical modelling at a farm or paddock level. A key to the successful implementation of MBIs is an understanding of the cause and effect of conservation actions and environmental outcomes. Without such information it is not possible to design appropriate contracts for bush tenders, to establish effective cap and trade mechanisms or to set trading ratios between point and non-point sources with offsets. The information requirements of bio-physical models makes it difficult to develop MBIs that are defined in terms of ambient or environmental outcomes rather than the measurable actions or inputs of landholders.

The cost of initially establishing MBIs is substantial. Although MBIs, especially auctions, offer substantial savings in the delivery of environmental benefits, they are

initially expensive to establish. This is because of high initial set up costs in terms of bio-physical modelling, and the costs associated with communicating the purpose and method of MBI approaches with stakeholders.

Cap and trade mechanisms are difficult to apply for non-point sources. Quantity-based instruments, such as cap and trade mechanisms, require detailed measurements of discharges or environmental harm. In cases where the environmental harm cannot be linked back to an identifiable source or practice, the cap and trade approach is of very limited value.

Different environmental problems require different approaches. The pilots clearly show that there is no 'one size fits all' approach to salinity and water quality problems. A variety of mechanisms can be used and must be tailored to the catchments, landscapes and environmental problems. Some of the pilots also show the potential of using a mix of instruments.

Landholders are willing and able to be participants with MBIs. Many landholders have a sophisticated knowledge of landscapes and markets and are willing to try innovative approaches that generate individual payoffs. Auctions appear to be readily taken up by landholders as an alternative to existing approaches.

MBIs require well-developed communication strategies. The pilots show that there must be an effective communications strategy about the mechanisms and the benefits they deliver to ensure landholder participation.

MBIs need adequate testing prior to implementation. Although the theory behind MBIs is well developed, the details of how to apply the mechanisms must be adapted and tailored to the landscape, environmental problem, institutional capacity and other relevant local factors. The pilots show that the use of experimental economics in laboratories, workshops and field trials are all useful ways to test MBIs and to adapt them to particular circumstances.

(B) Comparison to Traditional Approaches

The key to the successful application of MBIs is that they recognise that landholders possess information, individually and collectively, that can be used to more effectively deliver desired environmental and natural resource management outcomes. By creating an opportunity to trade, be it salinity credits in a cap and trade mechanism or a bid or tender to undertake conservation actions, landholders reveal important information that allows for more cost-effective use of conservation funds. The MBI approach also provides dynamic incentives for landholders to address environmental problems.

Cap and Trade

In the case of a cap and trade system, landholders must not emit, discharge or recharge above a fixed amount or rate set by the regulator unless they purchase additional property rights to do so at the existing market price (United States Environmental Protection Agency 2003). Thus the price of the property right is a cost that provides a signal to control discharges. The cost savings in this approach is that landholders who face a high cost to meet their discharge targets can purchase the right

to discharge from landholders who meet their targets at a lower cost. The end result is that the desired cap is achieved, but at a lower cost than if all landholders were obliged to achieve a uniform target.

Traditionally, cap and trade mechanisms have been applied for point sources of pollution or discharge that are readily identified and can be monitored. The possibility also exists to define cap and trade rights in terms of ambient environmental measures. However, this is much more difficult as it requires measurements of ambient environmental effects at defined locations, and also an understanding of the cause and effect of landholders actions on the desired conservation benefits.

Several important requisites exist for cap and trade mechanism to be cost effective. These factors include one, landholders differ in terms of their costs of meeting their discharge targets, two, there is effective monitoring (and enforcement) such that landholders do not discharge more than they claim and ambient measures can be recorded accurately, three, there is a clear and understandable relationship between the amount discharged and the impact on the environment, four, the market for the right to discharge is competitive so that the price of the rights reflects the marginal cost of reducing discharges and five, the costs of trading rights are sufficiently low enough that it is worthwhile for most landholders to participate in the market. If any one of these criteria is not satisfied there is a real possibility for the cap and trade mechanism to not deliver on its potential.

The round one cap and trade pilots investigated a variety of issues that might affect their usefulness. In particular, the pilot in the Coleambally irrigation area tested a net

recharge scheme for salinity from essentially non-point sources. To create the property rights the investigators used a multi-layer groundwater flow and salt transport model (SWAGMAN) that was used to estimate paddock scale recharge rates. They found that the costs of establishing a non-point scheme were high. As a result the environmental costs associated with salinity also need to be large to be able to justify the regulatory and transactions costs of a cap and trade program. Another quantity-based trail was investigated using a recharge credit scheme in the upper Bet Bet catchment of Victoria. In this pilot, a mixed approach of cap and trade and incentive payments were provided to landholders. To encourage trading and further reductions in recharge, the scheme offered a 'bonus' payment to all landholders if the agreed recharge rate reduction for the area were achieved. This bonus was disbursed on the basis of each contracted landholders' contribution to the total area recharge reduction.

The Bet Bet recharge credit scheme shows that regulators can implement a number of innovations into a cap and trade scheme to increase trading and overcome the potential 'thin' market problem. A desktop pilot reports on the possibility of using cap and trade approaches undertaken in workshops and experiments with landholders in the Lower Fitzroy River of Queensland. The finding of this pilot was that a cap and trade scheme was not suitable for addressing water quality problems because of the lack of identifiable point sources to allow for cost-effective trading. The pilot also found that a cap and trade scheme for non-point sources is problematic because the bio-physical information is such that it would need to be based on riparian control measures rather than ambient measures, such as stream and nutrient flows.

Offsets

Two pilots examined how offsets might be used to address water quality problems. The potential for using offsets in the lower Fitzroy River was tested using laboratory experiments. The results from this pilot suggest that offsets may offer some cost advantages by allowing landholders to undertake developments that may be damaging, but only if they agree to fund offsetting conservation practices that more than compensate for the development. Such an approach would allow, for example, intensification of existing agriculture and industrial development without further increasing sediment flows in the Fitzroy River.

The potential for offsets to allow for possible increases in point sources of salinity, but with offsetting actions to reduce non-point sources, was also shown by a pilot using green offsets in New South Wales. In this pilot it was found that the transactions costs in establishing such a scheme are substantial, but that offsets also offer substantial cost savings. It would seem that offsets allow for the possibility of trading between point and non-point sources in ways that would be very difficult to implement with cap and trade mechanisms.

Auctions

By contrast to cap and trade approaches that are quantity instruments and set an allowable amount of discharge or environmental harm, auctions and tenders are price instruments that fix the cost of actions to prevent harm. Thus auctions do not, in general, directly control the amount of environmental harm mitigated by the conservation actions.

The earliest 'bush tenders' allowed landholders to bid for the right to undertake conservation measures to generate biodiversity benefits on their own land funded by the Victorian government (Stoneham et al. 2003). In such schemes, the regulator tries to maximise biodiversity payoffs from a fixed conservation budget. This is accomplished by encouraging landholders to bid to undertake actions (retain large trees, fencing exclude stock, etc.) that are then evaluated by the relevant authority. Bids are selected starting with those that generate the highest biodiversity benefits per bid until the fixed conservation budget is expended. In bush tenders, it may be desirable to withhold information about the biodiversity significance of landholders' properties to avoid strategic bidding that would reduce the tenders' cost effectiveness although providing such information may also increase the efficacy of subsequent management actions.

The potential exists to have auctions where the actions of the landholders are specified in specific environmental outcomes, such as the number of individual birds of a particular species on a property. An outcome rather than an input-based auction, however, transfers the risk of achieving environmental goals from the authority to the

landholders. Outcome-based approaches require a detailed understanding of the causes and effects of landholder practices, and must also account for natural variations that may be independent of the actions of landholders. An alternative, tried by the auction in the Onkaparinga catchment in South Australia, is to apply a risk assessment to sites based on their environmental value, and threats to this value. In this way, the amount of threat reduction is incorporated into a measure of environmental benefit, where the environmental benefit per dollar is used to select the winning bids. This allows the regulator to incorporate uncertainty and relate management actions to potential environmental outcomes.

Despite the potential benefits of auctions for conservation purposes, a number of key knowledge gaps exist in terms of their implementation. First, what information should be supplied to landholders prior to making their bids? Second, is the bio-physical modelling and monitoring sufficient to implement outcome-based conservation auctions, and how might the bio-physical modelling be improved for the appropriate spatial scales? Third, how can communication strategies and the nature of contracts with landholders affect participation and cost-effectiveness of conservation auctions? Fourth, to what extent does the type of auction (one price, discriminatory price, multiple round auctions, etc.) influence the effectiveness of the tendering process? Fifth, can auctions be used to address multiple outcomes (carbon sequestration, salinity, biodiversity, etc.)? Sixth, how might auctions be designed to generate landscape-scale effects, such as wildlife corridors, that link across landholders?

In round one of the MBI pilot program some useful steps were taken to answer some of these questions. In one pilot the focus was on developing wildlife corridors in the

desert uplands of the Burdekin-Fitzroy of Queensland using experimental economics and multiple rounds of bids. A two-stage process was tried where landholders first bid in terms of individual properties, then this information was subsequently revealed to all participants. In a second round, bidders were allowed to reduce their bid price and/or relocate the location of their own property's conservation area. Such an approach, at least in the laboratory experiments, was successful at generating landscape scale corridors.

In Western Australia, an auction was piloted for landscape recovery of land affected by dryland salinity. This particular study quantified the factors that might be constraining participation by landholders in auctions and examined the effect of contract design. It also undertook a trial of an algorithm that assisted those running the auction to assess the complementarity of the tenders so as to maximise the environmental benefits from the bids.

Part II: Evaluation of MBI Mechanisms

MBIs work on the principle that policies that induce people to make decisions in their own best interest are often more effective than those that exhort or force individuals to act in a particular way. MBI mechanisms represent a decentralised approach to conservation in that landholders, based on their own financial interests, determine the desired reduction in environmental harm. This avoids the problem of a 'one size fits all' strategy that is unlikely to be cost effective with heterogeneous landholders. It also leaves the decisions about how to best achieve a particular environmental goal at a farm or paddock level with the most qualified person to make this decision, the landholder.

Four criteria are used to assess the broad class of MBI instruments tested in the pilots:

1. Cost effectiveness relative to alternatives,
2. Ease of adoption and participation,
3. Implementation status, and
4. Implications for regulatory and institutional frameworks.

The following assessment, based on the four criteria above, is limited to cap and trade mechanisms, offsets and auctions because reports on the leverage fund and conservation insurance pilots are not yet available.

(A) Cost Effectiveness

One of the principal reasons for using MBIs is that they can potentially be more cost effective that traditional natural resource approaches. In other words, they achieve a

greater set of environmental benefits for a given budget. The trial of MBIs in the round one pilot program was, in part, a response to a concern that existing conservation approaches have not been cost efficient in delivering on-the-ground environmental outcomes.

The cost effectiveness of MBIs depends on a number of important characteristics that include the desired environmental benefit, the landscape where they are applied, differences in conservation costs between landholders, the institutional structure and also the capacity of state and regional authorities. Another important consideration in terms of costs is the uncertainty associated with the cost of undertaking conservation actions, and uncertainty over how these actions determine the level of discharge and environmental harm. Cap and trade mechanisms provide certainty over the level of environmental harm, assuming there are well-defined point sources with measurable discharges. However, at least until the rights are traded, it leaves the regulator uncertain as to the costs of meeting these defined target allocations. By contrast, an auction or price instrument provides certainty over the cost of conservation, but the impact on environmental outcomes is left uncertain. Depending on the type of uncertainty, it can be shown that price (or quantity) instruments are preferred (Weitzman 1974).

Economic theory suggests that management actions that have a persistent or long-term effect on the environment and where current actions have only a small impact on the cumulative impact, such as dryland salinity, the expected payoffs with a price instrument is likely to be substantially higher than with a cap and trade mechanism (Pizer 2002). The benefits of a price-based approach are likely to be even greater if

the comparison is made to a quantity-based instrument that is measured by ambient environmental quality rather by point source discharges.

Cap and Trade

Cap and trade mechanisms create property rights that did not previously exist in terms of the right to discharge or to affect an environmental amenity. Provided the rights are secure and transferable, and the costs of trading the rights are low relative to the potential gains from trade, then every unit of discharge or defined impact on the environment imposes a cost on the landholder. This is true even if the landholder chooses not to buy or lease such rights because the price of the right represents an opportunity cost to the landholder. In other words, a landholder who uses the rights assigned to him/her could have sold or leased them to someone else at the market price for the right, but by foregoing this trade he/she loses out on this potential revenue. As a result, this creates an incentive to limit the discharge or environmental impact that helps generate long-term efficiency gains.

Transferability of the right also generates cost reductions because landholders with a high cost of mitigation can purchase credits or rights from low cost producers. Such trades lower overall conservation costs because the landholders best able to undertake conservation, at least from a cost perspective, are the ones that actually do the mitigation. Thus, well functioning and competitive markets are of critical importance to cap and trade mechanisms, and are required to ensure the costs of transacting and exchanging the rights are low relative to the gains from trade.

Empirical evidence exists that well functioning cap and trade programs can result in substantial cost savings in meeting desired mitigation. The best-known cap and trade program is in sulphur dioxide credits for coal-fired electric utilities in the United States. This program allows holders of the rights to decide how best to meet their pollution obligations, and has reduced compliance costs by about 50% relative to previous approaches (United States Environmental Protection Agency 2001). A key feature of this program is a cap that declines over time that encourages trades and provides an incentive for holders of the rights to undertake mitigation so as to meet their individual obligations. Realisation of large cost savings in meeting conservation goals in Australia requires that the rights are well defined and adequately enforced and monitored, that the market is sufficiently large enough to allow competitive trading, and that the trading rules are sufficiently flexible and easy to understand to ensure low trading costs.

Auctions

Auctions provide a mechanism to allocate scarce funds for conservation and natural resource management in a cost-effective way. This is accomplished by allowing landholders to bid for contracts that generate payments, but in return for undertaking desired conservation practices. By ensuring that the allocated funds are allocated or targeted to bids with the highest payoff in terms of conservation benefits, the conservation budget achieves a better set of outcomes for the same cost than if all landholders were given identical payments.

The potential savings from auctions or bush tenders are substantial. For example, in one of the first bush tenders in Victoria it was found that to generate the same amount

of biodiversity benefits a fixed price payment to landholders would be almost seven times more expensive than an auction (Stoneham et al. 2003). Very large savings were also identified in the pilot projects. In particular, the trial auction for landscape recovery for dryland salinity in Western Australia found it would be about three times more expensive to achieve the same conservation benefits if landholders were all paid a fixed amount to undertake the conservation practices. In a comparison between an auction-based system undertaken in the Onkaparinga catchment of South Australia and the existing management approaches, it was found that the auction was between 23 and 34% more cost effective in delivering conservation benefits. Overall, the pilot auctions indicate that, if landholder contracts are properly designed and enforced, they offer a major improvement in cost effectiveness over traditional regulatory approaches.

Offsets

A pilot was implemented to assess the effectiveness of offsets to manage salt loads of rivers in the Murray-Darling basin and regional New South Wales. The pilot included three important point sources of salinity: a coal mine, spa baths and a paper mill. In terms of cost savings, the coal mine has undertaken a series of offset works to reduce the export of salt loadings that include revegetation with trees, sowing perennial pastures and changing grazing regimes on 250 hectares of land that it owns near the mine. Such offset activities and changes in land management practices are estimated to cost some $1.3 million, but would allow the mine to avoid installing a desalinisation plan at a capital cost of about $15 million and that would incur an estimated annual operating cost of $6 million per year.

(B) Ease of Adoption and Participation

MBIs differ considerably in terms of their ease of adoption and the participation that they can engender. Overall, the pilots indicate that one, the more diffuse (and thus more difficult to measure) is the source of environmental harm, two, the greater is the risk imposed on landholders and, three, the greater is the uncertainty over the bio-physical linkages of conservation actions, the lower will be the rate of adoption and participation. Thus, auctions in which landholders are contracted to meet defined actions or management practices are more likely to be taken up than a cap and trade scheme which imposes penalties for non-compliance, and that is based on ambient measures of environmental quality rather than measurable discharges.

Auctions also lend themselves to existing practices of paying for conservation actions, but in a much more targeted and cost-effective way. By contrast, cap and trade and quantity-based approaches are more novel, and are likely to be viewed less favourably by landholders as they impose a constraint on current practice without an upfront compensatory payment. However, the potential exists to use a mix of instruments. For example, a pilot recharge credit-trading scheme in the Bet Bet catchment of Victoria tested whether financial payments encourage trading and participation in a cap and trade program.

The auction for landscape recovery in Western Australia specifically investigated the factors that might affect participation by landholders. Based on a survey of landholders they found that a key factor explaining participation by landholders is their Landcare-based experience. The results of this pilot also emphasise the role of

the contract design, and the obligations imposed on landholders, when bidding in a conservation auction.

(C) **Implementation Status**

An important objective of the pilot program was to identify which class of MBIs can be implemented in a more comprehensive way. The pilots clearly show that auctions are ready to be applied over much larger areas and in a variety landscapes. Auctions have delivered substantial cost savings over fixed price approaches and have generated active participation within the pilots. They also more readily fit into existing regulatory approaches of paying for conservation improvements, and involve the least risk for landholders. It suggests that auction-based approaches for conservation are ready for much larger field trials and implementation, and this should be a priority in future MBI research funding.

Despite the successful implementation of cap and trade mechanisms for well-defined point sources and commodities, such as water, the nature of cap and trade mechanisms are that they are not well suited to addressing problems that arise from diffuse sources. Thus problems of water quality, such as salinity, that arise primarily from many and diffuse sources cannot be readily controlled by an instrument that requires certain and defined units of measurement for successful implementation. Some of these problems can be mitigated with better scientific understanding and bio-physical modelling, but at present the difficulties of assigning rights across multiple non-point sources suggest that offsets, or other alternatives, may be preferred to cap and trade approaches. Further study is required as to what types of environmental

goods and services are suitable for a cap and trade approach, and the cost effectiveness of such approaches compared to price-based approaches.

Offsets offer an alternative to cap and trade mechanisms where there may be 'thin' markets and considerable uncertainty over the impact of non-point sources on the environment. A desktop study examined the potential for offset trading in the lower Fitzroy River in Queensland while salinity offsets were tested in the Murray-Darling basin. Their findings indicate that offsets are worthy of further investigation. Probably the biggest potential for offsets is to allow development to occur with recognised point sources, but to offset these with remedial actions elsewhere to control non-point sources. Such transactions may also be facilitated by the creation of offset 'banks' where remedial action is undertaken to reduce non point sources, and new point sources are only permitted to discharge if there is an equal or greater offset in the bank. Such offset approaches are worthy of further study and trial, but are probably not yet ready for direct implementation

(D) Implications for Regulatory and Institutional Frameworks

Australian natural resource management authorities differ a great deal in their financial resources, human capacity and linkages with landholders. In many jurisdictions, authorities work with landholders in voluntary conservation programs and assist in the delivery of programs. These activities, however, demand a different skill set, and also regulatory oversight, than is required to establish successful MBIs. This does not mean local catchment authorities or other regulatory bodies are unable to implement MBIs, but it does impose an important constraint on the use of MBIs.

Moreover, MBIs require good bio-physical modelling at a farm, or even paddock level, and a regular system of monitoring of landholder actions. This suggests that if MBIs are to be widely adopted in terms of environmental management there will need to be a corresponding change in the nature of how natural resource management is delivered. In particular, it implies the need for 'deconcentration' of both resources and responsibilities to a local level and substantial capacity building.

Given existing approaches to resource management, auctions are a much closer fit to current regulatory practice because they involve payments to landholders for defined conservation actions. By contrast, cap and trade mechanisms for the environment, such as salinity recharge credits, are a new approach altogether. It suggests that auctions will be easier to introduce from a regulatory perspective than a cap and trade approach, offsets, leverage funds or conservation insurance.

Part III: Knowledge Gaps and Implications for Future MBI Research

Despite the successes of the round one pilot program in addressing key knowledge gaps about the use of MBIs for conservation purposes, a number of important issues still need to be examined. Some of these knowledge gaps are best answered with a follow up set of pilots. Suggestions as to what might be the research priorities should there be a second round of pilots, and how these pilots might be conducted, are provided below.

A key question for the National Action Plan on Salinity and Water Quality is to determine what approaches are appropriate for resolving widespread salinity, water quality, environmental and land-use problems. This can only be answered if MBIs are taken out of experiments and trials and implemented on the ground in a variety of circumstances. A second round pilot could facilitate this implementation by targeting funding to MBIs that were successful in achieving cost-effective environmental outcomes in the round one pilots, and expanding their coverage and use.

(A) Auctions

Of the five approaches (auctions, cap and trade, offsets, conservation insurance and leverage funds) piloted in the first round, auctions appear to offer the greatest potential for cost savings, offer the lowest risk to landholders, and most readily fit in to existing institutional arrangements and practice. It would be very helpful for policy makers to test auctions at a much larger spatial scale, and also to explicitly control for differences in landscapes, capabilities of local catchment management authorities and different environmental problems. This is important because if there is to be wide

spread use of auctions they will need to be tested in a wide variety of conditions and circumstances.

A key knowledge gap in the use of auctions is whether they can be utilised for a combination of environmental outcomes such as biodiversity and salinity, or whether separate auctions are required for each environmental issue. Another important question is whether it is possible, or even desirable, to specify contracts with landholders defined by environmental outcomes rather than management actions. A second pilot offers scope to address these important knowledge gaps.

(B) Offsets

The round one pilot program suggests that a standard cap and trade approach is difficult to apply for non-point sources. However, offsets were shown to offer the possibility of controlling non-point pollution sources while allowing some development of point sources. Given the importance of non-point sources for salinity, it would be helpful to include at least one field trial of an offset for conservation purposes that explicitly includes non-point sources. It would also be useful to explore how offset banks might be utilised to reduce the transactions costs of trading between point and non-point sources.

(C) Prices versus Quantities

A key issue in the first round was to evaluate the cost effectiveness of MBIs relative to traditional conservation and natural resource management approaches. The pilots show there are clear cost advantages with some MBIs, especially auctions, but it is not clear what is the relative cost effectiveness of different classes of MBIs. Economic

theory suggests that price-based approaches (such as auctions) will be preferred over quantity-based approaches (such as cap and trade or offsets) where there is uncertainty and the environmental impacts are cumulative, such as with dryland salinity. It would be helpful if experiments were used to test the efficacy of price versus quantity-based approaches under uncertainty. Such information would be very useful in comparing MBIs and would provide a clearer understanding as to which MBIs are appropriate to apply, and under what circumstances.

(D) Management Actions versus Outcome-based MBIs

A key issue in the implementation of MBIs is whether landholders have rights or contracts over their actions, or whether the contracts are defined over environmental or natural resource management outcomes. Delineating rights in terms of management actions reduces the risk to landholders, but at the possible cost that the actions do not deliver the desired environmental benefits. It is also possible that other actions of landholders not delineated by a contract or rights may counteract the benefits of the desired management actions. Further research as to whether outcome-based approaches are appropriate for MBIs, and under what circumstances, would be helpful. It would also be useful to research the payoffs associated with using a mix of input and outcome-based contracts and also the possibility of including risks and threats to environmental values when selecting bids for conservation auctions.

(E) Mixed Approaches

In a future round of pilots it would useful to further the test the efficacy of mixing price and quantity instruments to resolve or mitigate environmental problems. This research would be helpful because it is likely that a mix of instruments can deliver a

better set of outcomes, perhaps at a lower overall cost, than one instrument alone. For example, it may be possible to mix price and quantity-based instruments, such as auctions and offsets, to address a range of environmental problems.

(F) Selecting Pilots and Experimental Design

To be able to implement MBIs on a larger landscape scale there is a real need to evaluate their effectiveness in a wide variety of situations. Such an evaluation could be built into a second round of pilots using experimental design. For example, explicit consideration could be given to undertaking field trials of auctions with catchment management authorities that have different resources and capabilities, and in various landscapes. This would provide information about how robust MBIs are to implementation under different circumstances. To facilitate such an experimental design, an appropriately qualified selection panel that includes economists with experience in the research and application of MBIs, as well as knowledgeable scientists with substantial bio-physical field experience, would be helpful.

(G) Reporting and Communication

A key issue in improving natural resource management outcomes with MBIs is reporting and communicating the insights from MBI trials. A priority in any future pilots is that the investigators provide information in a timely manner that is of immediate use to policy makers. This could include quantification of the cost-effectiveness of the MBI relative to existing approaches and MBI alternatives, strategies for implementation beyond the current trial, informational requirements to implement MBIs, and estimation of the transactions costs of participants in the trial. To facilitate this reporting, it would be helpful if all pilots were required to provide

specific information at given intervals to both a management and a technical committee.

(H) Technical Support, Review and Advice

A great deal of experience has been developed in the first round of the MBI pilot program by the investigators and also the individuals involved in managing the pilots. It would be very helpful if some of this experience could be utilised in further research of MBIs, and eventually through to implementation. To this end, funding should be provided to establish a technical committee to support future pilots. Such a committee would provide technical advice and also help overcome some of the pitfalls of previous trials. As part of this process, investigators in future pilots would have to provide technical progress reports at key stages of their trials. Such reports should be peer-reviewed by the technical committee to ensure the pilots achieve their full potential in addressing knowledge gaps, and do so in a timely manner.

Another reporting issue is to ensure that the knowledge gained from the pilots is disseminated widely, and to the appropriate audiences. This would be facilitated if all pilots had a defined communication strategy and could, for instance, involve detailed progress reports for the technical committee, implementation details for management authorities, and general information that could be part of a web site that details lessons learned for landholders and the general public.

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Table 1: Description of Round One MBI Pilots

Pilot Name, Lead Organisation & Region	MBI	NRM Issues Investigated	Brief Description
Multiple-outcome auction of land use change (DPI Victoria) Goulburn-Broken Vic. **ID20 Interim Report Available**	Auction	Biodiversity Salinity Water Quality Carbon	Extension of the BushTender auction approach to include salinity, water quality, water quantity and biodiversity in a field pilot. Involved developing and implementing the Catchment Management Framework Model. Designed to address the *missing market for environmental goods*.
Tradeable net recharge contracts in Coleambally Irrigation Area (CSIRO Sustainable Ecosystems Canberra) Lachlan-Murrumbidgee NSW **ID33 Interim Report Available**	Cap & trade	Salinity	Research, economic modelling and experiments with landholders conducted to assess the potential effectiveness of trading schemes for managing salinity in the Coleambally irrigation area with support of Coleambally Irrigation Cooperative. Designed to address the *missing salinity market*.
Creating positive land use change with a Natural Resource Management Leverage Fund (Greening Australia) Lachlan-Murrumbidgee, NSW/South Coast **ID46 No Report Available**	Interaction with Leverage Fund	Salinity Water Quality Biodiversity Carbon	A field pilot to investigate a fund that leverages private sector investment to deliver natural resource management outcomes and private returns to investors. Allows comparison between leverage fund and multiple outcome auction to achieve the same end. Designed to address *an inefficient capital market* and a *missing market for environmental goods*.
Auction for landscape recovery (WWF Australia) Avon, WA **ID21 Interim Report Available**	Auction	Salinity Biodiversity	Field pilot to assess an auction providing incentives for diffuse source salinity and biodiversity outcomes where bids are assessed based on the progress that they make towards achieving a regional biodiversity target considering the impact that other bids have on these targets (sub-additivity is accounted for). Designed to address *the missing market for environmental goods*.
Adoption of New Land Management Practices through Conservation Insurance (Dept Water, Land & Biodiversity Conservation) Lower Murray SA **ID8 No Report Available**	Interaction with Insurance Market	Wind Erosion	Desktop study of the use of insurance as a means of supporting changes in farming practices in the Mallee cropping regions. Conditions under which such a scheme may be successful were investigated and the need for and role of government involvement is also examined. Designed to assess potential *missing insurance market* to address increased yield risk faced by those who adopt conservation farming systems.

Cap and trade* for Salinity: Property Rights and Private Abatement Activities, a Laboratory *Experiment Market (DPI Vic) Lower Murray, Vic/SA **ID10 Final Report Available**	Cap & trade	Salinity	This pilot uses experimental economics to examine a tax/levy system. It investigates the use of experiments to test a cap and trade approach to the salinity problem and the use of experimental economics in policy design. Designed to address *missing market for salinity*.
***Catchment Care* – Developing an *auction* process for biodiversity gains and water quality outcomes** (Onkaparinga CWMB) Mt Lofty-Kangaroo Island SA **ID26 Final Report Available**	Auction	Water Quality Biodiversity	Field pilot tests auction tool for use by regional natural resource management bodies. Also tests how measures for 'risk reduction' and actions that cross property boundaries can be included in assessing bids. Designed to address *missing market for environmental goods*.
***Green Offsets* for Sustainable Regional Development** (NSW EPA) Namoi-Gwydir/Macquarie-Castlereagh/Murray NSW **ID16 Final Report Available**	Offsets	Salinity	Pilot involves three field-based salinity offset schemes. Point source polluters are able to offset their salt emissions into stressed rivers in the Murray Darling Basin by investing in works that reduce salinity from diffuse sources. Designed to address *missing market for salinity*.
Establishing East-West Landscape Corridors in the Southern Desert Uplands (Desert Uplands Build-up & Devt Comm.) Burdekin-Fitzroy Qld **ID18 Final Report Available**	Auction	Biodiversity	Uses experimental workshops (with landholders) to investigate the design of auctions to create biodiversity corridors. Uses payments distributed via an auction mechanism and accounts for the interdependence between bids (super-additivity problem). Designed to address *missing market for biodiversity*.
Establishing the potential for offset trading in the lower Fitzroy River (Central Queensland University) Burdekin-Fitzroy Qld **ID53 Final Report Available**	Offsets/ Cap & trade	Salinity	Uses experimental workshops with landholders and choice modelling to examine how a salinity trading scheme might work in new and developing irrigation areas in the Fitzroy River. Designed to address *missing market for salinity*.
Recharge Credit Trade in Bet Bet (CSIRO Land and Water) Avoca-Loddon-Campaspe Vic **ID57 Interim Report Available**	Cap & trade	Salinity	Uses landholder experiments and a field pilot to investigate a credit trading approach to diffuse sources of dryland salinity. Involves investigating the use of group incentives to achieve individual targets where trading credits is allowed. Designed to address *missing market for salinity*.

Source: Draft Overview Report of the MBI Pilot Program, Round One (National MBI Working Group)

Figure 1: Location of Round One MBI Pilots (Source: Draft Overview Report MBI Pilot Program)

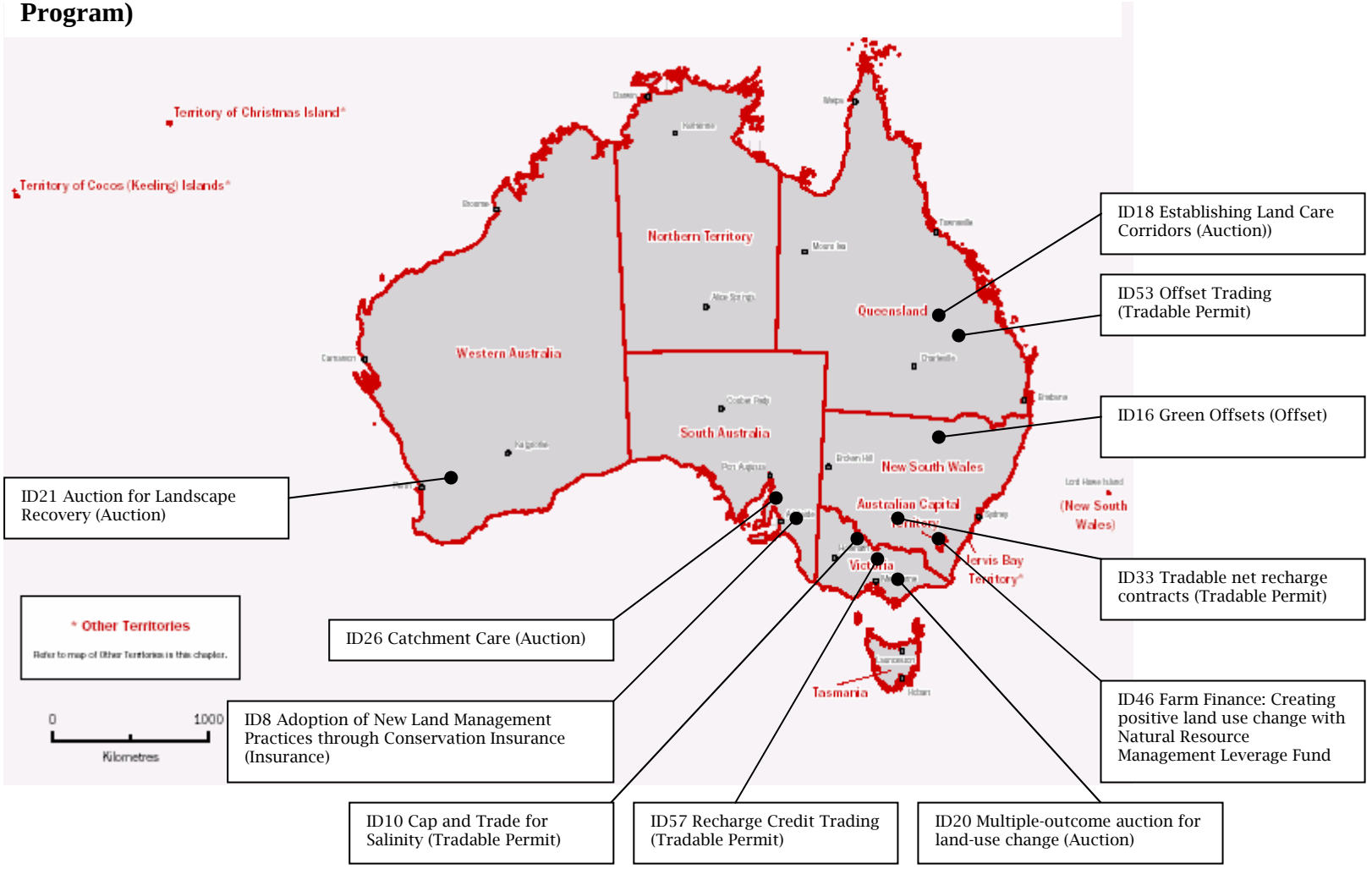

Table 2: Funding and Natural Resource Management Focus of Round One MBI Pilots

	Method		***NRM focus***				***Funding***
MBI type	**Field pilot**	**Experiment/ workshop**	**Salinity**	**Water quality**	**Biodiversity**	**Carbon**	**(% total)**
Auction	4	1	✓	✓	✓	✓	33
Cap and Trade	1	3	✓	✓			17
Offset	1		✓				12
Risk market*	1						2
Leverage	1		✓	✓	✓	✓	36
Total	7	4					100

* The risk market pilot's focus was primarily wind erosion

Source: Draft Overview Report of the MBI Pilot Program, Round One (National MBI Working Group)