Ref: 98/233

Mr Ian Dundas
Committee Secretary
Standing Committee on Environment and Heritage
House of Representatives
Parliament House
CANBERRA ACT 2600

Dear Mr Dundas

In response to your letter of 5 April, I am pleased to enclosed ABARE's submission to the inquiry into public good conservation. A number of relevant ABARE publications have also been attached.

If you require additional information on any aspect of the submission, please contact Mr Colin Mues on (02) 6272 2027.

Yours sincerely,

Dr STEPHEN BEARE
Research Director
Natural Resources Directorate

23 May 2000

Enc: ABARE submission to the Inquiry into Public Good Conservation – Impact of Environmental Measures Imposed on Landholders.

ABARE Submission to the Inquiry into

Public Good Conservation – Impact of Environmental Measures Imposed on Landholders.

For the purposes of this inquiry, 'Public good conservation' refers to "…conservation activities undertaken by private landholders which bring environmental benefits to the community at large".

Some public good conservation activities can only be achieved at the expense of productive or consumptive uses of natural resources. Examples that fall in this category include vegetation clearing restrictions and the introduction of environmental flows. In these cases, identifying the outcomes that maximise the benefits from the use of our natural resources involves consideration of the tradeoffs between competing uses. Because of the problems associated with estimating the value of many public benefits, ABARE generally supports these decisions with threshold analysis whereby the opportunity cost of alternative resource uses becomes the focus of the decision.

Other public good conservation activities are complementary with private land uses. For example, investment in capital works which treat and/or prevent resource degradation problems often provide direct benefits to the landholder as well as generating public conservation benefits. With respect to these types of public goods, the issues confronting decision makers relate to the appropriate level and delivery of incentives to encourage landholders to make private land use decisions that also generate public conservation benefits.

This submission is structured to provide information and advice on different aspects of these issues. An overview of analytical techniques that can be used to compare alternative resource uses is first provided. This is followed by a summary of some ABARE research which estimated threshold values for different case studies for use in the decision making process. The final section of the submission presents some data on private expenditures on land care works, discusses cost sharing principles, and the incentives provided by government for private investment in such works.

Analysis techniques

Benefit cost analysis

Benefit cost analysis is an evaluation tool that can be used to identify viable investments and to rank alternative investment decisions. Benefit cost analysis involves the consideration of all costs and benefits, whether they are directly traded in markets or whether they are non-market values.

However, there are several problems with the use of benefit cost analysis for actions that involve environmental and conservation issues. It can be quite complex to identify all the goods, services and amenities associated with conservation activities. In addition to the primary benefits and costs, there are likely to be secondary effects that would need to be valued. For example, providing water for environmental flows may also contribute to secondary benefits such as mitigating instream salinity levels or improving the quality of drinking water.

Furthermore, the valuation of non-market effects of alternative courses of action has always posed problems, even since the development of a variety of techniques.

Notwithstanding the problems, a set of guidelines have been produced to assist decision makers incorporate non-market values into their decisions on the management of dryland salinity (Treadwell and Short 1997). These guidelines take a stepwise approach to the collection of information emphasising the need for decision makers to carefully consider how much information is required to reach a valid decision and whether it is feasible and cost effective to acquire that information.

Treadwell and Short (1997) suggest that if at least some of the public good benefits have not been estimated and included directly into the benefit cost framework, whether because of concerns about cost or reliability of estimates using non-market valuation, then the non-market values need to be incorporated in the analysis in a different way. Rather than a complete benefit cost analysis, a decision can be supported by a threshold analysis.

Threshold analysis

Threshold analysis is a form of partial benefit cost analysis which presents estimates of the quantifiable net benefits in conjunction with information on the nature of the non-quantifiable (non-market) benefits or costs. The application of threshold analysis in decision making is summarised in figure 1.

Figure 1: Use of threshold analysis in decision making

		Non-quantifiable (non-market) effects	
		Positive	*Negative*
Quantifiable net benefits	*Positive*	I: Support proposed action	II: Weigh up tradeoffs before proceeding
	Negative	III: Weigh up tradeoffs before proceeding	IV: Reject proposed action

Where the quantifiable benefits and costs of a proposed course of action are, on balance, positive and the non-quantifiable effects are also thought to be positive (quadrant I in figure 1) then decision makers can confidently conclude the proposal will lead to an improvement in social welfare. The preferred course of action would be to support the proposal. Conversely, where the quantifiable and non-quantifiable net benefits are both negative (quadrant IV) then the proposal should be rejected.

However, in other cases the decision maker will need to trade off one set of benefits against another set of costs to decide on the preferred option. In the situation depicted in quadrant III the non-quantifiable benefits would have to be sufficiently important to outweigh the net costs associated with the quantifiable outcomes of the project for it to lead to an improvement in social welfare. If this were thought to be the case, the project should be supported. Conversely, in quadrant II the non-quantifiable costs would have to be considered to be less than the quantified net benefits for the proposal to gain the support of the decision maker.

Furthermore, threshold analysis can also assist decisions about alternative courses of action that lead to the same outcome. For example, if two options are expected to result in the same non-quantifiable benefits then the option with the greatest quantified net benefits (or smallest net cost) should be preferred.

Threshold analysis has been applied to various conservation issues in recent ABARE research. Case studies in which the principles of threshold analysis have been applied have covered conservation measures such as environmental flows, land clearing, salinity and rabbit control. The results of these studies are summarised in the following section.

Case studies

Environmental flows

ABARE has undertaken several pieces of research examining the costs of environmental flows along regulated river systems and river flow access restrictions along unregulated systems. Based on models integrating the economic, agronomic and hydrologic aspects of surface water flows, the research provides indications of the opportunity costs of flows to meet environmental targets. The quantified opportunity costs represent the threshold value the environmental benefits of the environmental flows would have to exceed for social welfare to be increased.

Williams River valley and Bega catchment

River flow access restrictions proposed by the New South Wales Healthy Rivers Commission for the Williams River valley were examined in Brennan (1997). The study examined the impact of three alternative access rules on the income of irrigated dairy farms: a base case where irrigators always have access to irrigation water in low flow events; zero access when flows are at the 80^{th} percentile; and restricted access to flows between the 80^{th} and 90^{th} percentiles, with zero access beyond the 90^{th} percentile.

The agricultural costs of the river flow access restrictions at the valley level are shown in table 1. The aggregate losses in annual cash income represent the opportunity cost, or threshold value, of introducing river flow access restrictions to preserve minimum natural flows to support riverine ecosystems.

1 **Williams River valley: loss in annual cash income**

Access rule	Valley level costs
90^{th} percentile	$60 170
80^{th} percentile	$302 500

Source: Brennan (1997).

River flow access rules proposed by the Healthy Rivers Commission for three subcatchments in the Bega catchment were examined in Lim-Applegate and McClintock (1999). Four alternative scenarios were examined in which water was shared between irrigators and the environment in proportions that depended on natural flows. The river flow access scenarios are described in table 2a.

The loss in annual dairy farm cash income at the subcatchment and catchment levels are shown in table 2b.

2a River flow access scenarios, Bega catchment

	Natural flow condition **a**	Irrigator access to natural flow %
Base		
	Available flow	100
Likely		
	flow < 5th percentile 5th percentile ≤ flow < 20th percentile 20th percentile ≤ flow	0 50 100
Lenient		
	flow < 2nd percentile 2nd percentile ≤ flow < 10th percentile 10th percentile ≤ flow	0 50 100
Stringent		
	flow < 5th percentile 5th percentile ≤ flow < 20th percentile 20th percentile ≤ flow	0 30 100

a For example, the 5th percentile of natural flows is that flow for which 5 per cent of flows are less than that amount.
Source: Lim-Applegate and McClintock, 1999.

2b Bega catchment: loss in annual cash income

Access rule	Bemboka	Tantawangalo	Brogo	Total
Lenient	7,510	1,050	580	9,140
Likely	11,540	4,960	1,440	17,940
Stringent	16,120	5,440	2,340	23,900

Source: Lim-Applegate and McClintock, 1999.

Both the Williams River and Bega catchment studies provide information about the thresholds above which the perceived or expected benefits of the access restrictions must exceed if implementation is to be of overall benefit to the community.

Snowy River

The opportunity costs of introducing environmental flows to the Snowy River were examined in Scoccimarro, Beare, and Brennan (1997). The study focussed on the quantifiable opportunity costs and as such included estimates of the impacts on power generators and consumers as well as the lower threshold of costs to irrigators. Other effects such as trade-offs with increases in greenhouse gas emissions, due to increased coal-fired electricity generation and reductions in water security to irrigators were discussed but not quantified.

Four scenarios were examined: a base case; returning 10 per cent of the natural headwater flow to the Snowy River; 25 per cent of the natural headwater flow to the Snowy River; and returning 25 per cent of the natural headwater flows to the Snowy River and other major headwaters of the Snowy Mountains Scheme.

The annual impact of introducing environmental flows along the Snowy River, and other major headwaters of the Scheme, was dominated by losses incurred in the power market. The quantified opportunity costs, or threshold value, ranged from $20.8 million to $77.5 million per year, depending on the environmental flow scenario examined (table 3).

3 Annual impact of environmental flows from the Snowy Scheme

	10% Snowy only	**25% Snowy only**	**25% all rivers**
Cost			
Net power market impact ($m)	18.37	44.86	70.93
Reduction in irrigated agriculture ($m)	2.42	6.59	6.59
Total – threshold value ($m)	*20.8*	*51.45*	*77.55*
Environmental flow (GL)	83.29	204.14	349.3
Total annual cost ($/ML)	250	252	222

Source: Scoccimarro, Beare and Brennan (1997)

The quantifiable opportunity costs, or threshold values, make tradeoffs associated with the perceived benefits of environmental flows explicit. However, considering other tradeoffs including the environmental needs of the Snowy and the Murray and Murrumbidgee catchments, are also part of the decision process.

Murrumbidgee Irrigation Area and Districts

The cost of alternative environmental flow options for agricultural users in the MIA and Districts was examined by McClintock and Topp (2000). The Indicative flow rules proposed by the NSW Water Reform Policy and Technical Committee and the alternative flow recommendations proposed by the Murrumbidgee River Management Committee (MRMC) were compared against a base case. In table 4 the aggregate annual decline in regional gross margins are shown.

4 MIA and Districts aggregate annual gross margin

	Gross margin ($m)	Outcome compared with base ($m)
Base	72.75	
MRMC	72.15	- 0.59
Indicative	71.39	- 1.19

Within the MIA and districts, the costs to agriculture associated with environmental flows were estimated to have been halved under the MRMC rules compared to the indicative flow rules. However, a substantial cost of nearly $600 000 a year remains. This constitutes an investment in the environment of the middle Murrumbidgee region of around $8 million to $10 million in net present value. Consequently, the expected or perceived benefits of the environmental flows would have to at least exceed this threshold, particularly as the costs represent only a portion of the water users along the Murrumbidgee River.

Land clearing restrictions

An economic assessment of the costs of proposed changes to land clearing restrictions in Queensland was recently undertaken by ABARE (2000). The analysis estimated the threshold values for the biodiversity benefits that would be generated by clearing restrictions based on the costs of forgone agricultural production and an assumed economic cost of greenhouse gas emissions from clearing activities.

The agricultural cost of land clearing restrictions was estimated to be around $240 million in net present value, subject to several qualifications, such as the area of land estimated to be economic to clear in the absence of restrictions. However, taking account of the greenhouse gas emission costs of land clearing, the opportunity costs, or threshold value of restrictions were estimated to decline to about $151 million in present value terms since considerably less area would offer a positive return to society from clearing. In the study, the economic cost of greenhouse gas emissions from clearing was assumed to be $15 per tonne ($CO_2$ equivalents).

Salinity management

In the second half of 1999, the Murray Darling Basin Commission approached ABARE to develop a modelling framework within which salinity mitigation options, such as land use change and engineering interventions, could be assessed. The products of the project are designed to provide the MDBC with a basin scale assessment tool to understand the biophysical and economic impacts of alternative strategies to manage salinity. It is intended that the model will provide estimates of these impacts for the 16 catchments included in the Murray Darling Basin Salinity Audit in addition to South Australia. Although this model is still in the development phase, it is designed to underpin decisions about salinity mitigation options with estimates of threshold values.

The model integrates economic models of landuse with a representation of hydrogeological processes in each catchment (Bell and Klijn 2000). The hydrogeological component was developed in cooperation with CSIRO hydrologists and incorporates the relationships between rainfall, evapotranspiration and surface water runoff, the effect of landuse change on groundwater recharge and discharge rates and the processes governing salt accumulation in streams and soil.

In the agro-economic component of the model, landuse is allocated to maximise economic return from the use of agricultural land and irrigation water. Incorporated in this component is the relationship between yield loss and salinity for each agricultural activity.

The cost to agriculture of no policy intervention to address salinity is compared with the costs or benefits of policy intervention to meet salinity targets. Outputs from the model include changes in predicted salt loads and concentrations, the area of high water tables, and the estimated costs to agricultural production of managing salinity through landuse change and engineering interventions.

Preliminary results show that the distribution of benefits and costs from salinity management vary between and within catchments, and over time. Where a policy intervention reduces the volume of water flows in the lower reaches of the catchment, landholders in these areas may incur costs as a result of reduced inflows to storages, less surface water runoff available for irrigation and higher salt concentrations. The spatial distribution of benefits from salinity management is highly dependent on the location of the intervention and the type of groundwater flow system. The benefits and costs also vary temporally as adjustment costs occur in the short term while benefits may accrue many years in the future. Further, public benefits such as improvements in water quality and the riverine environment may come at the expense of a loss in productive capacity, and this may have associated flow on effects for local services.

Rabbits

In addition to public good conservation measures being imposed on landholders, there are government activities with public good conservation objectives that also generate benefits for landholders. Government funded research into the control of noxious weeds and animals is one such example.

Control of rabbits on freehold land and adjoining travelling stock routes and roads is a responsibility of landholders. In NSW, the Rural Lands Protection Act 1989 Section 126 states that the occupier of land must "… fully and continuously suppress and destroy … all noxious animals.". As such the control of noxious animals is a private conservation activity that provides benefits to the broader community as well as private landholders.

Government is also involved in control measures, for example research into biological controls such as rabbit calicivirus disease (RCD). As a result, some public control measures can generate benefits for landholders, such as increased agricultural returns, public benefits, such as enhanced biodiversity conservation, while also reducing the opportunities for Australia's rabbit industry.

ACIL (1995) estimated that the potential benefits to agricultural production from rabbit control could be as high as 3 per cent of the value of Australian agricultural production, or $600 million a year. However, controls such as the rabbit calicivirus disease (RCD) will have cost implications for Australia's rabbit industry. Some of these costs are discussed in Foster and Telford (1996). Farmed rabbits derived from the European rabbit have to be vaccinated against RCD at a cost of around $2 per breeding doe. For the wild rabbit industry, reduced wild populations from the disease means higher search costs for rabbit harvesters. Increases in the costs of production could also arise through the requirement for more stringent inspection procedures reflecting any perceptions of disease risk associated with RCD. There may also be a decline in demand arising from any consumer perception of disease risk to humans from RCD (Foster and Telford, 1996).

Private expenditures in public good conservation, cost sharing principles and current government support

Private expenditures

As part of several surveys conducted through the 1990s, ABARE collected data from broadacre and dairy farmers on the level of selected land care expenditures. The land care expenditures considered were those activities which were eligible to be claimed under the then Sections 75B and 75D of the Income Tax Assessment Act (ITAA). These provisions have since been replaced and added to by Subsections 387-A, 387-B and 388-A of the ITAA 1997. Eligible expenditures included:

– pest and weed control;

– earthworks to address erosion, salinity or waterlogging;

– fencing to separate land classes or isolate areas affected by land degradation;

– tree and shrub establishment; and

– water storage and reticulation.

While these categories are referred to as land care expenditures, they exclude other expenditures, such as riparian fencing or the cost of managing remnant vegetation, which may also be described as land care activities.

Nonetheless, the estimated expenditures by broadacre and dairy farmers on these activities is substantial, exceeding $330 million in 1998-98.

5 Land care expenditure, broadacre and dairy farms

	Unit	1991-92	1992-93	1993-94	1998-99 *p*
Farms with expenditure	no.	40356	42531	33579	45257
Av expenditure *a*	$	3546	4499	3487	7338
Total expenditure	$m	143.1	191.3	117.1	332.1

Source: ABARE farm surveys.
a For farms with expenditure. *p* Preliminary.

Cost sharing

Identifying and valuing the private and public benefits from landholders' conservation efforts is an important step in identifying any underlying rationale for government intervention in the provision of such services. This can be a complex task especially when the effects and costs of changes in biophysical outcomes are poorly understood or non-market effects are involved as noted earlier in this submission (see Treadwell and Short 1997).

To elaborate, one reason why investment in conservation on private land may not be made is that these actions may generate significant external benefits which are not captured by the individual bearing the cost of the investment. In the presence of these external benefits, relying solely on market based incentives for individuals to invest in public good conservation is likely to lead to a less than socially optimal level of such actions. This provides an underlying rationale for government intervention (ABARE 1997).

Even when a rationale for government intervention has been established, the economic case for government intervention to foster investment in public good conservation necessarily depends on the intervention increasing public welfare. This requires the external benefits of the intervention to be greater than the costs of intervention. Similarly, the form of intervention to be used should be that which offers the highest positive net benefit.

These economic criteria are also relevant to the selection of the most appropriate form of cost sharing. According to Curran and Podbury (1994), the cost of raising additional tax revenue to, for example, finance government investment in public good conservation falls in the range of 20–50 per cent of the revenue raised. This cost needs to be recognised when selecting between alternative models, and level, of cost sharing.

This logic underpins one of the guiding principles for shared investment as endorsed by SCARM. In a paper recently prepared for ARMCANZ and SCARM by the Sustainable Land and Water Resources Management Committee (SLWRMC) Working Group on dryland salinity, the second of the principles directly relating to government investment was:

"Government should, in general, contribute to works only up to a level sufficient to trigger the necessary investment towards self-correcting, self-perpetuating, natural resource management systems that operate effectively." (SLWRMC Working Group on Dryland Salinity 2000, p. 47).

Government assistance to landholders: Land care tax provisions

In the evaluation of the land care tax provisions[1] completed in 1997, ABARE estimated the annual cost of the provisions, excluding administrative and compliance costs, over the 1991-92 to 1993-94 period to be between $5 million and $12 million a year (ABARE 1997). The evaluation concluded the provisions:

"…were able to provide modest incentives to a large proportion of individuals to invest in capital works for land care purposes." (ABARE 1997, p. 58).

The evaluation concluded the benefits provided to individual taxpayers were relatively small. Around 65 per cent of individuals with expenditure eligible to be claimed under Section 75B and around 85 per cent of those with expenditures eligible under Section 75D received a pre-tax subsidy equivalent of up to half the cost of their investment.

The evaluation noted that one shortcoming of provisions based solely on a system of tax deductions was that individuals who consistently fell below the tax-free threshold received little or no immediate benefit from the provisions. Up to 20 per cent of individuals with expenditure eligible to be claimed under Section 75B were estimated to have fallen into this category in 1991-92 and 1992-93.

However, this shortcoming has since been addressed by incorporating an option for taxpayers to claim a portion of the cost of land care works as a carry forward rebate (see Subsection 388-A of the ITAA 1997).

[1] The evaluation considered Sections 75B and 75D of the *Income Tax Assessment Act (ITAA) 1936*. These provisions have since been replaced and added to by Subsections 387-A, 387-B and 388-A of the ITAA 1997.

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