A Cautionary Note on the Use of Socio-Economic Analyses in Water Planning

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Introduction

The Commonwealth Water Act is a relatively prescriptive legislative document and requires that the Murray-Darling Basin Authority (MDBA the Authority) develop a Bain Plan that articulates sustainable diversion limits (SDLs). In simple terms this is the maximum amount of water (including groundwater) that can be extracted from the basin whilst preserving (and in some cases restoring) the ecological integrity of the aquatic and riverine environments. If previous policy developments in this context are anything to go by[1], there is (and will continue to be) much debate about the science behind the establishment of these limits. Undoubtedly much of that discussion will centre on the trade-offs between supposedly uncertain environmental benefits and the purportedly certain impacts of having less water available for consumptive use, particularly in agriculture.

In many respects this debate is not assisted by the structure of the Act itself. More specifically, the Act mandates that the MDBA must "act on the basis of the best available scientific knowledge *and* socio-economic analysis" and "have regard to the *consumptive and other economic uses*[2] of the Basin water resources" (MDBA 2009, p. 14 – emphasis added).

The *Issues Paper* distributed by the MDBA in November 2009 is illustrative of the likely difficulties of dealing with these components of the Act at a practical level. On the one hand, formulation of the Plan is to be undertaken by focussing on key environmental assets and key ecosystem functions and the subsequent development of a set of environmental water requirements using hydrological modelling. On the other hand economic and social assessment is to be undertaken to establish potential implications, particularly for "those irrigation areas of the Basin which account for the largest proportion of current water diversions" (MDBA 2009, p. 14). Moreover, the *Issues Paper* posits that "the results of the two sets of analyses will then be considered together, in an iterative fashion if need be, with the social and economic analyses being used initially to inform how, where and when water can be delivered to meet environmental requirements at least social and economic cost".

Poignantly, the *Issues Paper* describes the next step thus: "*Following any adjustments, there may be a need to review the SDL options* and re-run the hydrological modelling and the analyses of potential economic and social impacts" (MDBA 2009, p. 14 emphasis added). This deceptively simple

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[1] The Living Murray (TLM) eventually settled on an agreement to return 500 GL of water to enhance the environmental status of the Murray River. The rather ad hoc political compromises that led to this outcome are described in detail in Crase and Dollery (2005)

[2] There is some confusion embodied in this statement. Economists would invariably argue that 'environmental use' is also an 'economic use' since: a) application of the resource to the environment has an opportunity cost and b) there is clearly a willingness to pay on the part of some to achieve environmental benefits.

statement downplays the complex political processes at play here and should concern those with an interest in the development of public policy generally.

This paper is used to briefly consider the implications of the development of SDLs by the MDBA. The papers is not used to make comment on the environmental dimensions of the task of establishing SDLs but instead deals solely with the development and use of socio-economic analyses. The paper should act as a cautionary note to the MDBA (and hopefully others) about the folly of endeavouring to integrate socio-economic objectives with environmental objectives when formulating water plans.

Measuring and Understanding Socio-Economic Impacts

There has been considerable development of water planning in this country in the last three decades. In large part this has come about because of the maturation of the water economy and recognition that relatively cheap water sources are no longer readily on offer. Water planning has also been expanded because of the widespread acknowledgement that previous government policies, aimed at using water as a vehicle for sponsoring regional development, had ultimately exposed many communities to serious risks. Some of those risks are tied to the likely impact of climate change and reduced water availability. Others are related to changing voter preferences and a desire for enhanced environmental amenity. A third and often underreported risk relates to the declining terms of trade of agriculture and the difficulty of justifying the existing claims of irrigated agriculture over resources, given its modest economic performance[3].

All of these risks imply substantial adjustment for those regional communities that have developed around irrigated agriculture. Perhaps ironically[4], water planning has become the standard approach for dealing with some of the transitional arrangements required to achieve change in these communities.

In economic terms the use of water in irrigation has historically been associated with economic rents – i.e. returns above the opportunity cost of the resource[5]. The development of water markets has exposed the magnitude of some of those rents which in turn explains why some interests are loath to see the resource move to alternative uses. However, as noted earlier, the declining terms of trade in agriculture has meant that many would also willingly exit production by selling their water rights on either a permanent or temporary basis. This background is important to any analysis of the socio-economic impacts of reallocating water.

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[3] The recent decline of the wine grape industry in some parts of the basin is a case in point. These events can be traced to the radical fall in grape prices, although some are keen to attribute all industry adjustments to policy aimed at delivering environmental water.

[4] The irony stems from the fact that a form of social planning led to the formation of these communities in the first instance. This begs the question as to whether the present generation of water planners will be better equipped to predict the future than the social planners who envisaged 'watering the desert'.

[5] It may also be possible argued that these rents derive from the fact that not all costs have been adequately captured in the past – say in the form of environmental degradation or subsidised irrigation infrastructure.

The standard approach to assessing such impacts is to model the economic rents generated by using water in a particular context and then extrapolate the changes in production that arises under scenarios of lower (or zero) water availability. In its crudest form this is usually done by examining standard gross margins related to production in an 'average' year, although more sophisticated measures can be developed that incorporate a degree of climatic variability. In order to take this information and then convert it into what is often presented as 'social analysis' the broader 'flow on effect' are tabulated. The most common approach is to develop (or simply reconfigure) some regional input-output model. In theory, this should then give some indication of the wider employment implications of change and/or some estimate of the potential change in regional output.

Whilst appearing relatively straight forward, it is not always clear that the limitations of this approach are understood. In that regard there are at least two important sets of technical caveats.

First, most models of changed production need to be treated cautiously. There are often major discrepancies between the average yield and the upper and lower bounds of actual production. In agriculture many of these variations can be attributed to differences in management expertise or other important nuances. Thus, for the planner to assume that all producers will be impacted in an equivalent manner runs the risk of grossly underestimates the variation in impacts, and by necessity the capability of many forward-thinking individuals to adjust.

A related factor attends the use of 'average' or 'historical' climatic data. There is widespread agreement that the water availability that has typified the basin over the last century is unlikely to be representative of the future. To use some 'average' water availability as the basis for estimating the production benefits (and rents) that might be foregone amounts to ignoring the reason for the analysis in the first place. As noted above, a more sophisticated approach involves interacting production models with models of climate. Ideally, adjustments to the climatic data need to be made to encapsulate the potential for lower water availability and yet this is not always done. The upshot is that 'average' or 'historical' water availability data will usually result in an overestimation of the current economic benefits of agricultural production.

A similar constraint relates to data on the prices received for agricultural outputs. For instance, a model developed around the price of wine grapes in 2000 is unlikely to accurately measure the economic implications of reduced wine grape production in 2009, especially as many wine grapes have recently been abandoned in response to record low prices.

The second genre of caveats relates to the extrapolation of production changes to deduce wider (social) ramifications. As noted earlier, this is most frequently undertaken using input-output models that endeavour to link the expenditures of sectors[6]. In simple terms, the aim of such an exercise is to

[6] There are more sophisticated approaches but, in the experience of the authors, most commissioned work relies on I-O models.

establish how a change in the production of one industry might ultimately impact on the production (and employment) of related industries.

For most of the consumers of the reports produced using input-output analysis, this is treated as the 'black box' component of the work. Moreover, consulting firms have a vested interest in maintaining the mystique of the technique, insomuch as their livelihoods rest on being commissioned to undertake studies of this form. The upshot is that the transparency of these models is sometimes questionable and it should not be assumed that input-output modelling is itself uncontested terrain. There is considerable conjecture about what constitutes the region of analysis, the extent to which production might be substitutable, just to name a few. It might surprise some to realise that an input-output model will almost always show a positive employment response to such events as an oil spill, since more labour is employed to rectify the problem. Similarly, were the unemployed paid to dig holes and then fill them in again, the input-output model would reveal a positive outcome. And yet regardless of these limitation policy makers appear to treat the findings from such models as an article of faith. The propensity of politicians to offer unequivocal pronouncements on the number of jobs that will be created (lost) as a result of a particular intervention is testament to this naivety. Put simply, models of this form give only a vague indication of the multiplier effects of shifting resources and this can serve to compound the inaccuracies of production estimates (descried above).

Risky versus Uncertain Outcomes

In addition to the technical constraints that attend the socio-economic analyses of water reallocation, it is important to appreciate the level of uncertainty that circumscribes any prediction on this front. This produces an interesting contrast if an authority is asked to consider trade-offs between environmental and socio-economic consequences, as would appear to be the case in the formulation of the Basin Plan.

As an observer of policy processes for many years I have always been struck by the vociferous challenges presented to the science that underpins claims for increased environmental water. All manner of arguments are presented that attempt to refute the ecological evidence about the status of the environment. Whilst in no position to adjudge the veracity of these challenges, there appears to be a stark contrast to the treatment of the socio-economic models used to predict possible impacts. As an economist I have some basis for commenting on the flaws of the latter models, a few of which I have endeavoured to explain above.

What needs to be appreciated by policy makers (and/or water planners) is that the predictions of the socio-economic analyses are not definitive and arguably no more 'certain' than the models used to predict some environmental enhancements. Accordingly, arguments based on 'the risk to regional employment versus the uncertainty of environmental gain' need to be carefully scrutinised. In reality both environmental gains and socio-economic losses from water reallocation cannot be assured. To attribute risk to one form of modelling and uncertainty to the other implies some value judgement

about the science behind the different exercises, and water planners like the MDBA need to take care in this context.

Policy Intervention

The Basin Plan is to be informed by socio-economic analysis of the impacts of SDLs. Notwithstanding the limitations of the various analytical techniques, there is no indication that the plan will reflect on the policy interventions that will ultimately be invoked to deal with some of those impacts. Admittedly, this is a matter for policy makers and arguably beyond the scope of the Water Act. And yet the policy interventions to achieve any reallocation associated with SDLs cannot logically be isolated from the estimation of impacts, particularly as the Act requires that socio-economic impacts be incorporated.

Take the case of SDLs that are considerably less than the present Cap on extractions. In simple terms there are three broad policy tools for dealing with this phenomenon. First, extractive rights could be legislatively modified thereby reducing water take. Second, water rights could be purchased from willing sellers, an approach strongly advocated in the recent Productivity Commission (2009) draft report. Third, some form of investment in infrastructure might be undertaken to achieve 'water savings'[7] which might then allow consumptive extractions to fall in line with the SDLs.

Setting aside the relative merits of each of these policies for the time being, it is important to understand that the short, medium and long term socio-economic impacts of each of these interventions is likely to differ substantially. Thus, if the MDBA is required to consider socio-economic impacts without also modelling the ramifications of alternative interventions there is a serious risk that the Plan itself will radically misjudge the real impacts of any set of SDLs.

For instance, if buyback from willing sellers is used to achieve SDLs the ramifications for the regional economy will likely be very different compared to heavy investments in infrastructure. With the latter one might expect an initial boost to regional output as engineering firms cash in on government expenditures on purported 'water-saving' technologies. The longer term consequences of this approach might well be less optimistic, with the burden of upgrades and maintenance potentially exceeding the profitability of most agricultural activities. In contrast, the socio-economic impacts of a buyback intervention will largely be contingent on the response of water sellers. In some cases this has been shown to boost regional output whist a fall in regional output and employment is possible if irrigators completely retire land from production and fail to reinvest the proceeds of water sales.

This is not to advocate one policy intervention over another. Rather, what needs to be appreciated is that incorporating socio-economic impacts based on the assumption that water is simply 'taken' from irrigation communities is likely to radically overestimate (and simplify) the real consequences.

[7] There is a growing literature that is heavily critical of this approach. In essence, in river systems with high allocations such an approach is both costly and usually yields very modest amounts of fungible water (see, for example, Crase and O'Keefe 2009).

Optimising versus Compromising the Plan

There is a clear intention throughout the *Issues Paper* that the Authority will seek to develop an 'optimal' plan that purports to balance economic, social and environmental impacts. Section 4.3 of the *Issues Paper* deliberately invokes the optimisation nomenclature. What is not at all clear is how this optimisation model is to be developed and then applied.

Bringing together a range of benefits and costs expressed in economic (dollar) terms, social impacts (likely to be expressed in employment terms) and environmental gains (described in ecological terms) is no simple task. Moreover, the techniques available to achieve this task, such as multicriteria analysis, have no shortage of critics. Like input-output analysis, much of this criticism stems from the lack of transparency that attends application of the technique (see, for instance, Bennett and others 2009). There are also serious questions about the political economy of an approach that leaves important tradeoffs in the hands of an unelected bureacracy.

The commentary available from the *Issues Paper* offers little comfort in this context, despite public assurances from members of the Board that the ambition is not to 'pick winners' (per com Freeman 2009). The commentary on the prospects for delivering water to environmental assets downstream from the confluence of several tributaries is illustrative of this problem and is repeated below for convenience:

> "…sharing water contributions in this way needs to consider the social and economic consequences. For example, the gross value of irrigated agriculture in various valleys could be a significant consideration in the distribution of contributions of water to downstream assets. This could be done at either a gross scale or on a 'per Megalitre' basis. A balance would need to be struck between minimising overall economic impacts and avoiding, where possible, substantial localised consequences in a particular valley. The differing economic impacts of water reductions to various irrigated agricultural industries could also be part of this consideration" (MDBA 2009, p. 33).

It is hard to see how these judgements will be made and how the Authority will not be expected to assume the mantle of omniscient planner. Moreover, given that the ills that face many irrigation communities might be directly traced to the actions of the former generation of planners, there is some room for scepticism. For instance, it might be helpful to reflect on how the Plan might differ if the principles described around inter-valley sharing (above) were applied when grape prices were more (or less) buoyant than is presently the case. There is little evidence that the Authority would be better equipped to predict such price changes than private agents. This raises important questions about the extent to which a purportedly 'optimal' Plan is superior to one based solely on environmental information. On the basis of the commentary in the *Issues Paper* it would appear that the socio-economic analyses involved in the formulation of the Plan will ultimately be employed by bureaucrats to pick winners and losers.

As an economist I am obliged to express some reservation about planning exercises of this form. As a taxpayer I also have serious reservations about the longer term implications for the public purse since the evidence on planning on this scale is hardly complementary.

Concluding Remarks

The MDBA has been set a difficult task made more challenging by the prescriptive nature of the Water Act. Arguably, naïve components of the Act serve to make the task even harder.

Setting SDLs will be a complex task, even if these were to be solely based on ecological and hydrological information. Regrettably, there are also major demands imposed by the necessity to consider socio-economic impacts in the formulation of SDLs.

Concerns about the integration of socio-economic analyses into the SDL debate arise from several sources. First, the techniques employed to adjudge socio-economic impacts are not without their limitations. Moreover, these limitations are often as severe as those embodied in ecological modelling, regardless of the penchant to present one as being more robust and certain than the other. Second, socio-economic analyses are by necessity backward looking, especially if the Authority is prevented (or chooses to) exclude adjustment policies as part of the modelled output. Third, the inclusion of socio-economic data in the formulation of an 'optimal Plan' constitutes a 'bridge too far', even for the most optimistic planner.

Ideally, the Plan would deal with the core environmental objectives. If it is obligatory to include socio-economic analyses then this should be limited to informing policy makers about the need for some form of structural adjustment and not be employed to compromise water allocations to the environment. As it stands, water markets and buyback have played a useful part in facilitating transition. It would be folly if the Authority was to think it could do a superior job, via water planning, than markets and conventional income redistribution mechanisms.