ISSN 1835-9728

Environmental Economics Research Hub Research Reports

Taking Stock: Seventeen Years after the Murray-Darling Basin Agreement

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Research Report No. 4

November 2008

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Environmental Economics Research Hub Research Reports are published by the The Crawford School of Economics and Government, Australian National University, Canberra 0200 Australia.

These Reports present work in progress being undertaken by project teams within the Environmental Economics Research Hub (EERH). The EERH is funded by the Department of Environment and Water Heritage and the Arts under the Commonwealth Environment Research Facility.

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Lisa Yu-Ting Lee and Tihomir Ancev[1]

Abstract

After almost two decades of natural resource management by signatory states to the Murray-Darling Basin Agreement, there remains some ambiguity about the success of various initiatives aimed at improving the Basin's environmental conditions. This is despite significant public expenditure towards this end. One reason contributing to the confusion is that outcomes achieved through the investments have been poorly distinguished, blurring the transparency of public spending and the accountability of decision makers. In this research report, an account is made of the myriad of Murray-Darling Basin-related policies and its funding arrangements, as well as the achievements and impediments to program success. The aim is to demonstrate that significant environmental improvements could be achieved at substantially lower cost had early decisive action been taken.

1. Introduction

Vigorous debate surrounding the efficient use of water resources has been taking place in Australia in recent years, stimulated by the prolonged drought conditions and increasing environmental awareness. At the centre of the debate is the Murray-Darling Basin, regarded as Australia's food bowl producing much of the nation's agricultural output. The importance of the Basin is highlighted by the fact that the majority of all water use in Australia is consumed in the Murray-Darling, with almost 90% of the system's water diverted for extractive uses (CRCIF 2005). Numerous resource policies have been implemented since the signing of the 1992 Murray-Darling Basin Agreement and the 1994 Council of Australian Governments (COAG) water reform, largely in recognition of inefficient water allocation between extractive and non-extractive uses. This period saw substantial public funds injected into natural resource

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management, and the advent of market-based instruments (MBIs) including cap-and-trade schemes (e.g. water trade) and pricing schemes (e.g. cost-recovery). This policy direction was in line with the abundance of literature that advocates MBIs as the conduit to cost effectiveness.

Substantial progress, as measured by the media coverage of water management policies and the amount of public investment, has been made. However, documentation of tangible on-ground achievements is sparse and seems to suggest otherwise. There is limited empirical evidence of real improvements; in fact a 'report card' produced by CRCFE (2003) has shown a marked deterioration relative to 1994 conditions. Literature discussing advancements in water management are also somewhat myopic. Common themes include the extent of water market development, the Living Murray Initiative (Living Murray) and Landcare. Government buy-back of water entitlements has received similar attention, particularly the purchase of Toorale which some opponents (Ferguson 2008) have labelled a waste of money. The progress of other prominent, yet less publicised, natural resource management initiatives has not been as widely scrutinised. This includes, but is not limited to, the Environmental Works and Measures Program, Basin Salinity Management Strategy, and Australian Water Fund projects. Given the imprecise coverage, it is difficult to discern the state of affairs in the Murray-Darling.

The general impression is that progress in the Basin is somewhat disappointing despite almost two decades of concerted management. In this paper, an attempt is made to 'take stock' of the achievements and progress of natural resource policies in the Basin, or the reasons contributing to the lack thereof. An investigation is made into the range of government programs and initiatives, to clarify the relation between achievements and funding streams. The overall conclusion is that, for the substantial public investment, there is considerable underachievement. There remain several weaknesses in institutional arrangements as water reform evolved, underlying which is a significant information gap at the core of the frustrated progress. Better markets and policies could be designed where externalities are comprehensively and accurately captured, also allowing greater transparency in investment decisions. Nevertheless, environmental improvement could have been achieved at substantially

lower cost had there been earlier resolve to address water sharing arrangements, even if action was taken as recently as 2006.

2. Review of Water Management in the Murray-Darling Basin

The plight of the Murray-Darling is now a familiar story, accompanied by a long string of water management policies to stem its degradation. It also reflects the trend in favoured policy tools, from centralised regulatory directives towards reliance on market based approaches. Quantity instruments, often involving a cap, have been used as an alternative to direct regulation, commonly in the framework of a market with tradeable property rights (Rolfe and Mallawaarachchi 2007). There has been increased use of price instruments, although tending to shy away from direct water pricing. For example, full-cost recovery for water was only ever limited to operational costs, and does not capture environmental costs of extraction. One justification to this is the implication of higher usage charge on market prices if environmental costs are fully accounted for (Grafton and Hussey 2007). Rather, price instruments are commonly in the form of auction-style tenders, grants and rebates (Rolfe and Mallawaarachchi 2007). Subsidies have largely fallen out of favour, although it appears to have come full circle with the most recent policy, the National Plan for Water Security, embracing the use of direct subsidies to 'modernise irrigation'.

Initial inter-governmental arrangements have evolved from the early 1900s, beginning with the signing of the River Murray Waters Agreement in 1915 which focused on resource sharing between the states. Various amendments to the Agreement made over the 70 years of its operation were only minor changes relating to the construction of dams and weirs. The need for balance between environmental and extractive demands came into light as Australia's water economy moved into its mature phase, symbolised by the signing of the Murray-Darling Basin Agreement in 1992 (Quiggin 2001). The 1994 Water Reform marks the initial shift in natural resource management towards market-based solutions, and was integral to the Federal Government's National Competition Policy for competitive neutrality in key industries. To enable cap-and-trade markets in water, the Cap was introduced in 1995 and was tied in with National Competition Payments to motivate its implementation. However, the financial incentive had varying degrees of success in promoting the full water reform agenda. The Payments represented the first of a string of Federal funding towards

environmental management in the years to follow. It was also a precursor to the weak correlation between spending and outcome in natural resource policies.

Problems contributing to stagnating progress since the 1994 COAG Agreement related to institutional factors in water sharing arrangements. In 2004, the National Water Initiative was introduced to overcome sticking points pertaining to the specification of property rights for extractive and non-extractive uses (Freebairn 2005). Discussions of property rights over externalities associated with return flows also took place, in particular the impact of increased water use efficiency on downstream users; and the implications water trade between hydrological systems have for water quantity and quality. Following from this was the introduction of 'exchange rates', in part to try and capture transmission gains or losses for interregional trading. This was in spite of significant knowledge gaps in hydrological systems, which raises concern over the prudence of exchange rates. Another example of where a rush for action overshadowed the need for robust information is the Landcare program**.** Government failure in this instance led to excessive and poorly distributed public expenditure on small on-ground works (Pannell 2008).

Other prominent programs developed during this period include the Living Murray and Basin Salinity Management Strategy. The Living Murray began in 2002, aiming to deliver environmental improvements through its sub-components Water Recovery and Environmental Works and Measures Program. The 2001 Basin Salinity Management Strategy focused on salinity-related problems in the Basin, and is linked to the National Action Plan for Salinity and Water Quality. The contracting governments also agreed to build salt interception schemes under the Joint Works Program to achieve salinity reduction at Morgan. These initiatives represent substantial funding to deliver environmental improvements at target sites, with increasing reliance on market mechanisms (although avoiding direct buy-back). This shift away from 'command-and-control' policies reflects greater public acceptance of economic instruments in environmental management.

The most recent policy development was in January 2007, when the Federal Government announced the National Plan for Water Security – now Water for the Future. The strategies were in accordance with the objectives outlined in the National

Water Initiative, specifically to address over-allocation, modernise irrigation, and to create a transparent water management system. By this stage market-based instruments have become fairly mainstream, with one-third of the funds to be directed at buying back entitlements. Water information has also become a priority area, and for the first time irrigators are required to disclose water use information to public institutions. This was done in parallel to efforts to improve Basin wide hydrological modelling.

3. River of funding

A substantial number of programs and initiatives have been implemented to manage the Murray-Darling since 1992. These programs were accompanied by a constant stream of government funding, as well as top-ups and other funding avenues. In total, government spending on natural resource management is thought to be $830 million per year (DEWHA 2007). However, much like the Basin, a lot goes in but little comes out. In this section, details of high profile Basin-related programs and investments are provided, with the aim to show that overall achievements do not reflect the generous funding. All along, the redistribution of extractive water for ecological uses has remained a vexing point; the justification being, there is insufficient information to evaluate trade-offs between environmental benefits and economic losses (Grafton and Hussey 2007). For all the worry, expenditure on the agreements and initiatives has likely outstripped the cost of redistributing water towards environmental use. Earlier decisive action based on good science, removed from political motivations and workarounds, may have avoided the excesses.

A summary of relevant intergovernmental and Commonwealth programs, and its contributions, is provided in Table 1. Note State-based arrangements are not included.

Table 1: Summary of government initiatives and funding arrangements.

Programs for the Murray-Darling Basin	Funding (Mill)	Timeframe
National Competition Policy	$3,900	1997-2004
Joint Works Program	$60	2001-current
Natural Heritage Trust and National Action Plan	$400/yr (tot. ≈ $3,000)	2001-2008
The Living Murray First Step (TLM)		
– Water Recovery	$500	2004-2009
– Environmental Works and Measures Program	$150	2003-2011

National Water Initiative – Australian Water Fund	$2,000	2004-2010
Commonwealth Supplementary Contribution to TLM	$500	2006-2011
Water for the Future (formerly National Plan for Water Security)	$12,900	2007-2017
Caring for our Country (Natural Heritage Trust 3)	$2,250	2008-2011
Retiring properties in Queensland and NSW[2]	$50	2008
TOTAL	**$25,310**	
without National Competition Policy	***$21,410***	

3.1 Water Reform

The development of water markets has been highly publicised, having been regarded as the 'holy grail' to water allocation problems. While water markets have been established in most catchments, water trading has remained rather limited. In the past, trade has been confined to high security licences in middle and lower reaches of the River Murray (Connell 2007). Even with the rules relaxed, trade in permanent water entitlements has been less than 1% of diversions in 2001-02, with less than 1% of all trade occurring inter-regionally (Heaney et al. 2004). In 2005-06, permanent trade remains below 1% and temporary trade under 10%. Of the total temporary trade, 41GL (5%) were sold interstate (MDBC 2007b). This is partly explained by several barriers to trade, including a 4% limits on sales of entitlements outside of irrigation districts, and exit fees that will remain until 2016 (Connell and Grafton 2008).

There have also been several unexpected consequences, including the fallout in increased water use as 'sleeper' and 'dozer' licences are activated, stranded assets, and reduced return flows as irrigation efficiency increases. In addition, the push for greater water trading in the National Water Initiative has encountered problems of variability of supply and hydrology between catchments, due to gaps in biophysical and hydrological knowledge (Connell 2007). There has also been a general apprehension towards the water market, drawing from concerns pertaining to community decline, threat of foreign ownership, and a perceived loss of subsidies (Randall 1981). Another reason licence holders are reluctant to sell is the speculation that water prices and entitlements will appreciate. To circumvent the thin market problem, and in an effort to discover efficient prices, there has been a move towards tenders for buying back entitlements. However, there remains resistance from rural communities to recent government purchases. This is discussed further in section 3.9.

[2] This new money was sourced to purchase Toorale Station.

3.2 The Living Murray First Step

Part of the Living Murray Agreement was the First Step program, developed in 2003 and identifies six 'ecological assets' in the Basin to be protected. The implementation of the First Step was endorsed as part of the 2004 National Water Initiative under the *Intergovernmental Agreement*, in which contracting governments agreed to commit $500 million over five years for the recovery of (on average) 500GL of water per year for the environment – known as new environmental water or 'new e-water'. This sum was allocated solely to the Water Recovery program for a set of approved market-based variants of buy-backs and infrastructural projects.

Overall, water recovery has been lagging and it was not until February 2008 that there were enough projects approved to potentially recover the full 500 GL. April 2008 marked the momentous first 'water recovery' event, with 133 GL of environmental water entitlements secured in Victoria and South Australia. While the first water recovery is a significant milestone in the history of the Living Murray, most projects are still under development; 367 GL still need to be recovered at the rate of at least 1,500 ML per day to achieve the full 500 GL by mid 2009.[3] Also, no physical water will be released except in wet years, (MDBC 2008). This has obvious implications for the sustainability of water sharing under long-term climate changes.

There is also substantial effort towards environmental water recovery on state-levels that are not as widely publicised as Living Murray measures. For example, the NSW Government allocated $13.4 million towards its Wetland Recovery Plan in 2005, equally matched by the Commonwealth via Australia Water Fund. The objective is to permanently recover water for ecologically significant wetlands through infrastructure projects and buying back entitlements, which so far has acquired 6.5GL in the Gwydir and Macquarie.[4] There is also the NSW Riverbank Fund introduced in 2006, which allocated $105 million towards buying-back water for environmental purposes. The Australian Water Fund also supplemented $72 million towards Riverbank projects. In July 2007, 15 GL of environmental water was purchased for the Gwydir, Macquarie,

[3] From October 2008.
[4] The Wetland Recovery appears to be unrelated to the Living Murray, and could be considered 'other new e-water'.

Lachlan and Murrumbidgee rivers in NSW. Riverbank's role has since expanded to include the *Market Purchase Measure* as part of The Living Murray Water Recovery, to buy back 125 GL via a tendering process (NSWDECC 2008).

Complementary to Water Recovery, the Environmental Works and Measures Program was created in 2003, with $150 million over eight-years for capital works and improvements in infrastructure targeting the six ecological assets, such as upgrading weirs and fish ways. No evaluations of the effectiveness of the program are yet available; however a task force has been established for this purpose.

3.3 Supplementary Fund

In 2006, a one-off supplementary funding of $500 million was made to the Murray-Darling Basin Commission by the Commonwealth, as a top-up to the $500 million for the First Step Agreement. The supplementary contribution is to be spent over five years from 2006. Of this, $200 million was allocated for Water Recovery alone, bringing its total to $700 million over 5 years. Of the remaining supplementary fund, $100 million was flagged for infrastructure projects under the Environmental Works and Measures Program, totalling $250 million. The rest of the supplementary funding was to hasten other programs including the Basin Salinity Management Strategy, although it is uncertain how this was distributed (MDBMC 2006).

As mentioned, 133 GL of water entitlements have been 'recovered' as at mid 2008, meaning the average cost of the new e-water is $5,263/ML. If the full 500 GL is recovered, the average cost reduces to $1,400/ML. Based on 2006 market prices, this is more than three times greater than permanent water rights of $400/ML in the Murray Irrigation Limited (Quiggin 2006). Had the water recovery funding been put entirely towards entitlement buy-back, this would have resulted in a total of 1,750 GL of new e-water – three times greater than the *Intergovernmental Agreement* target of 500 GL, and sufficient for moderate improvements in the health of the Murray-Darling.

3.4 The Cap

Despite National Competition Payments, the implementation of the Cap has been delayed in three of the contracting states; although most valleys are within long term

targets (MDBC 2007a). Each state is required to have water sharing arrangements as part of its obligations to the National Water Initiative. For example, this takes the form of Water Sharing Plans in NSW, in which environmental flows beyond Cap provisos have been stipulated (NSWDNR 2008). The Basin Plan has requirements for a new sustainable Cap to be set, incorporating the interlinkages between surface and groundwater systems. However, how this new Cap will be reconciled with the existing commitments in current water sharing plans is yet to be resolved (Connell and Grafton 2008).

Environmental flows derived from the Cap and investments outside of the *Intergovernmental Agreement* are considered 'old e- water' or 'other new e-water'. Since 1999, combined old and other new e-water releases from NSW and Victoria total at least 770 GL, made up of one major release of 500GL in 2006, for the Barmah-Millewa site, and a series of smaller flow events (NSWDNR 2008). Considering that 95% of bulk water off-take occurs in NSW and Victoria (MDBC 2006), these releases account for almost all environmental flows to the Basin. This averages 86 GL/yr over the last nine years. Even in aggregate with the 133 GL of new e-water, average environmental water provisions remain well below the 500 GL/year target.

The impact of the Cap is more difficult to discern in unregulated systems.[5] The available means of monitoring extractions often involves just one gauge at the upstream and downstream end of unregulated rivers, and penalties for over-extraction are based on the three-year average flow at the downstream gauge. The lack of monitoring capacity limits the extent to which the Cap and water sharing arrangements can be enforced.

3.5 National Water Initiative – Australian Water Fund

The Australian Water Fund was set up by the Prime Minister in December 2004 for implementing actions towards National Water Initiative objectives. A commitment of $2 billion over five years was allocated amongst three programs under the umbrella of

[5] Unregulated catchments refer to river systems without an upstream head dam to 'regulate' downstream water releases.

Australian Water Fund: Water Smart Australia, Raising National Water Standards, and Australian Water Fund Communities.

Given the nature of Australian Water Fund projects, it is difficult to gauge physical outcomes against which to measure progress, e.g. Raising National Water Standards target knowledge based projects to improve management capacity on a national level. Projects under Water Smart Australia and Community Water Grants appear to have greater capacity for assessing the tangible water efficiency improvements. However, most projects seem to report expected water savings but do not undergo follow-up evaluation of progress or actual savings. Without a reliable means to monitor and evaluate projects' achievements, there is no clear indicator of project success. Community Water Grants projects are mostly based in very localised, residential settings, such as installing rainwater harvesting and water recycling systems, which leaves much scope for monitoring efficiency improvements.

3.6 Water for the Future (formerly National Plan for Water Security)

The National Plan for Water Security adds a further $10 billion to the mix, increased to $12.9 billion and rebranded as Water for the Future in early 2008. At the March 2008 COAG meeting, a Moratorium of Understanding for the Murray-Darling Basin Reform was agreed to by all States, including Victoria which initially opposed the reform. This took $1 billion in offering to the Victorian government, which leaves $1.9 billion as the net increase to Water for the Future.[6] The ensuing Basin Plan has an important feature whereby a final decision maker – a Commonwealth Minister – settles disputes between the states. The is envisaged to reduce the politicised nature of the Murray-Darling Basin Commission which has overshadowed decision-making processes, and depart from purely beneficial intents for the Basin (Blackmore 2002, Scanlon 2006).

Of the $3 billion for the Addressing Over-Allocation component, $50 million was offered in a first round of buy-backs from February-May 2008. The first round acquired 35 GL of 'other new e-water', at an average cost of $1,400/ML; according to different sources only $37 million had been spent to acquire 22GL, in which case the

[6] The $1 billion 'sweetener' is part of the old-money offered under the $10 billion National Plan for Water Security (Milne 2008).

average cost is $1,700/ML (Wong 2008; Bardon 2008). It would appear the value of entitlements have been inflated in the course of government buy-backs; the price is likely to increase as more substantial purchases are made (Connell and Grafton 2008).

The $6 billion Modernising Irrigation component, partially offered in the form of subsidies for modern irrigation technologies, can further increase the cost of water recovery as it is in direct conflict with the objective to retire inefficient irrigation areas. The financial assistance for water efficient technologies allows less efficient irrigators to remain in the industry, and to use the water savings to expand irrigated production (Ancev and Vervoort 2007). In this sense, the value of such properties become inflated and unnecessarily increases the cost of buy-backs.

The smaller, but significant, element of the plan is Improving Water Information, towards which $480 million has been allocated. The Bureau of Meteorology has been given new powers to request water information from various parties to be used in a National Water Account. Under current arrangements, even where water metering is in place, water extraction data is considered confidential and is not publicly disclosed (Hudson 2005, pers. comm.). The new arrangement would mean this information is relayed to the Bureau of Meteorology, allowing for better water management through transparent monitoring of water use on a national basis. For this purpose, $620 million of the Modernising Irrigation component has also been allocated for water metering and telemetry rollout, administered by the Department of Environment, Water, Heritage and the Arts (Vertessy 2007).[7] This brings the total investment in water data to over $1 billion over the next 10 years, signalling the emphasis now given to accurate water information.

3.7 Joint Works Program

The Joint Works program began in 2001, and is a jointly funded program to build six major salt interception schemes as part of the Basin Salinity Management Strategy (the Strategy). The program is estimated to cost $60 million, with six jointly funded schemes towards keeping salinity below 800 EC at Morgan.[8] These new schemes are in addition to seven State-owned schemes predating 1988, and in aggregate are

[7] Telemetry refers to the remote measurement and reporting of information.
[8] Electrical conductivity (EC) is a measure of concentrated salts in the water.

expected to contribute 61EC of the salinity target (MDBMC 2006). In other words, the cost to reduce salinity is $1million/EC. Despite being a pragmatic solution, salt intervention technologies are expensive and treat only the symptom rather than the cause from non-point pollution that continues to introduce salt into the system.

3.8 Basin Salinity Management Strategy

The Strategy was developed in 2001, and aims to manage Basin wide salinity through end-of-valley targets and an overall downstream target at Morgan in South Australia. The States work to achieve these targets through in-valley actions, which are entered into a central Salinity Register managed by the Murray-Darling Basin Commission. The Register also captures legacy impact from previous activities and current salinity-reducing or increasing activities, which are calculated in dollar terms using modelled cost-functions. The objective is to ensure there is net credit for each state and the Basin as a whole. Through these measures, in-valley actions are expected to offset 10 EC points at Morgan, while salt intervention schemes are expected to offset 61 EC points. In 2005-06, these measures combined have successfully achieved the salinity targe at Morgan (MDBMC 2006), although its success can largely be attributed to salt intervention schemes. Targeted in-valley measures could potentially make a greater contribution; for example Heaney et al. (2000) have also shown that reforestation at sites with faster responding aquifers and porous soils, and increasing irrigation efficiency, can be effective. Such long-term strategies will become feasible as greater hydrological information becomes available.

The main stumbling block for the Strategy is the measurability of outcomes, with monitoring and evaluation identified as key areas for improvement. The reliability of entries in the Salinity Register is evaluated according to a standardised classification protocol, according to which most of the entries are of low confidence rating. This undermines the confidence in the progress of signatory states (MDBMC 2006). A contributing factor may be that each state uses its own hydrological models to estimate salinity impacts, each of which have strengths and weaknesses and is useful for different purposes. Following from this is a strong impetus for hydrological-economic models to be consolidated, so that salinity impacts are modelled consistently and may improve the reliability of the models. There also remain significant information gaps in groundwater hydrological functioning. For example,

IQQM models surface water and MODFLOW models groundwater, each with weak hydraulic interactions between surface and groundwater (Letcher and Jakeman 2002).

3.9 Other Related Programs: Retiring properties in Queensland and NSW, Natural Heritage Trust, National Action Plan for Salinity and Water Quality, and National Competition Policy

There has been considerable controversy over Federal government plans to retire properties which can provide flows to the Murray-Darling, largely attributed to unease over the socio-economic impact of such purchases. In a recent move by the Federal government, $50 million of new money has been flagged for the purpose of acquiring land with large storages (ACF 2008). The first purchase was Toorale, which cost $24 million split between the NSW and Federal government. The property held 14GL of entitlements; that is, bought at an average cost of $1,700/ML, equivalent to the cost in the first round of Addressing Over-allocation. Toorale seems to have attracted significant media attention because it was purchased in the midst of rural discontent over the buy-backs, and was particularly contentious due to Toorale's history and the potential for benefits to be offset by irrigation expansions in Queensland (Ferguson 2008). However, a similar purchase was made in August 2008 for the Pillicawarrina cotton property in the Macquarie Marshes, under a joint venture by the Commonwealth and NSW through Riverbank. The land was reportedly acquired for $10 million with 7GL of entitlements (The Land 2008); at an average cost of $1,400/ML, this is similar to the cost of Toorale. Pillicawarrina was fully operational as a cotton farm, yet its purchase had widespread support of landholders, and did not attract the same negative press as Toorale. The main issue at stake seems to be community disgruntlement over government decisions perceived as questionable, rather than the cost or social impact of purchases itself.

Other national programs include the Natural Heritage Trust and National Action Plan for Salinity and Water Quality, jointly delivered through Regional Natural Resource Management. Joint funding to these programs averaged $400 million/yr since its initiation seven years ago. In the third phase of Natural Heritage Trust from 2008, a further $2.25billion over 5 years is committed towards States' natural resource strategies under the guise of Caring for our Country (DAFF 2007). Another significant source of funding was the National Competition Policy. While not directly

related to natural resource management, tranche payments were tied into the water reform process and totalled $3.9 billion from 1997-2004 (NCC 2005).

The projects under Natural Heritage Trust and National Action Plan were largely small-scale, and unsuccessful in some circumstances. With some exception, most of the investments promoted practices that were not adoptable at the required scale, or invested in the wrong places (Pannell 2008). In an audit report, it was noted that there was an absence of consistently validated data and insufficient information to indicate whether or not the joint programs are meeting expectations. The audit also highlighted the need to address transparency and accountability of funds, and problems with the quality and measurability of targets directly linked to the scarcity of scientific data (ANAO 2008). The issue of transparency and measurability of outcomes is a common theme throughout most natural resources programs, compromising the cost effectiveness of on-ground actions.

3.10 Summary

Public investment into natural resource management totals at least $25 billion over the last seventeen years, or $21 billion excluding the National Competition Policy. This was without the envisaged restoration of over-allocated river systems. Investment decisions appear to be without strong justification; and the most cost-effective solution to buy-back rights from irrigators has, until recently, largely been avoided (Quiggin 2008). There remains resistance from the rural community, who are unconvinced of the merits of government buy-back. Furthermore, the numerous initiatives will likely benefit from better defined deliverables to rationalise the sums allocated and develop a way of quantifying results. Still, without prudent monitoring and accounting, it is near impossible to scrutinise successes and weaknesses.

4. Transparency, Consistency and Courage

Overall, there has been some progress and prudent, although somewhat ineffective, measures implemented. Government failure remains in the tradition of hypothecating funds without due evaluation, perhaps with ulterior motives or as temporary fixes. A fundamental issue is the availability of reliable scientific information against which to scrutinise decisions, blurring accountability and the cost-effectiveness of investments. Decisions backed by good science and well defined trade-offs will improve

transparency and help avoid politically-driven motivations (Connell and Grafton 2008). It will also justify difficult decisions regarding redistributions that need to be made to avoid environmental collapse in the Lower Murray.

Water information has been an area of neglect, but has gathered momentum in recent years as reflected by the investment of $1 billion towards improving water data quality and metering technology. The National Water Account will be based on a comprehensive 'geofabric' – in a collaboration between the Bureau of Meteorology, CSIRO and Geosciences Australia – which will tie together all water information (hydrological flows, water use, climate etc) (Vertessy 2007). The Bureau of Meteorology will also will build upon CSIRO work on the Murray-Darling Basin Sustainable Yields Assessment, commissioned in November 2006 and funded under the Australian Water Fund Raising National Water Standards Program (Vertessey 2008, pers. comm.). A 'supermodel' will be built to estimate the current and future water availability, and the level of over-allocation, in all catchments within the Basin. A novel component is that the model makes use of existing State agency models (CSIRO 2007). This is an important move towards standardising the quality of hydrological information used in assessing land use changes. It is logical that evaluations are based on a single, comprehensive basin-wide model which can capture whole-of-catchment effects and interdependencies consistently. A useful extension may be to incorporate on-ground data to reflect tangible outcomes and environmental impacts. This will be possible as improved information of the system comes to hand, which should feed into overall water planning to maximise public benefits (Connell and Grafton 2008). For example, the Integrated Monitoring of Environmental Flows program in NSW has been in place since 1997 to monitor the effect of environmental rules in regulated systems in the Barwon-Darling River. Integrating data from such empirical studies would help verify outcomes and provide an indicator of environmental improvement. Data from airborne electromagnetic surveying (AEM) could also be used to supplement understanding of surface and groundwater connectivity across landscapes at high salinity risk, and to inform strategic decisions such as reforestation.

A particular challenge to current institutional arrangements is with regards to water sharing between the jurisdictions, which need to be modified to ensure ecological

assets in the lower Murray are sufficiently protected. This will likely inflict major costs for parties, and involve real political pain (Connell and Grafton 2008). However, the social cost of inaction will only increase with time. During the current drought, prices for permanent licences have reached as high as $2,000/ML, which is a far cry from 2006 prices of $400/ML. It appears the opportunity for acquiring low-value entitlements has been missed. However, even at the likely long-term prices for permanent entitlements around $1,000/ML, $500 million would suffice to recover 500GL – which could be achieved over five years at $100 million/yr (Quiggin 2008). Even at the observed premium of $1,400-1,700/ML in the current buy-back – indicating an endowment effect – $850 million is enough to meet Living Murray obligations. This is but a portion of the 'Addressing Over-Allocation' funding.

Suppose the total expenditure on natural resource management, of $21 billion, had been put towards buy-backs since 1992, price unadjusted. At $1,000/ML, at least 21,000 GL could have been acquired permanently. Even at $2,000/ML – a significant mark-up compared to prices even just two years ago – at least 10,500 GL could have been recovered. This is far beyond the recommended 4,000 GL/year required for good improvements in the health of the Murray-Darling (WGCS 2008). This also suggests that only one-third to one-fifth of the total expenditure was required to achieve a high level of environmental improvement. Given the delay, and urgency of the situation that has now evolved in the Coorong and Lower Lakes, it may take up to $8.9 billion recovering the 4,000GL needed to secure long term health of the rivers (WGCS 2008).

5. Conclusions

Since the Murray-Darling Basin Agreement in 1992, a string of government initiatives have been implemented along with substantial public investment. In spite of the numerous agreements and initiatives, corresponding achievements have been decidedly lacklustre due to poorly informed investment decisions and buck-passing. The upshot of this is continued deterioration in the health of the Murray-Darling system. Notwithstanding information barriers, the most straightforward solution, to buy-back entitlements, has also been resisted. Perhaps by having put off this difficult but seemingly necessary action, the social cost has become even greater than if the

problem was confronted sooner. Stronger action may have resolved water resources issues at a fraction of the expense.

Reference

Ancev, T and Vervoort, W 2007, 'The National Plan for Water Security: Taking over the Role of a Market?', *Connections: Farm, Food and Resource Issues*, The University of Melbourne, Melbourne.

ACF (Australian Conservation Foundation) 2008, 'Toorale buy-back shows Government is listening', Feature Article 16/9/08, ACF.

ANAO (Australian National Audit Office) 2008, *Regional Delivery Model for the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality*, Audit Report 21, Commonwealth of Australia, Canberra.

Bardon, J 2008, *Wong faces heat over water infrastructure plans*, ABC News, 21 October.

Blackmore, D 2002, 'Protecting the future', in D Connell (ed.), *Unchartered Waters*, Canberra: Murray Darling Basin Commission.

Connell, D 2007, *Water Politics in the Murray-Darling Basin*, The Federation Press, Sydney.

Connell, D and Grafton, Q 2008, 'Planning for water security in the Murray-Darling Basin', *Public Policy*, vol. 3, no. 1, pp. 67-86.

CRCFE (Cooperative Research Centre for Freshwater Ecology) 2003, *Ecological Assessment of Environmental Flow Reference Points for the River Murray system* (Interim Report), Prepared by the Scientific Reference Panel for the Living Murray Initiative, Canberra.

CRCIF (Cooperative Research Centre for Irrigation Futures) 2005, *Irrigation in Perspective: Irrigation in the Murray and Murrumbidgee Basins*, CSIRO Land and Water.

CSIRO (Commonwealth Scientific and Industrial Research Organisation) 2007, *Overview of project methods, a report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project*, CSIRO

DAFF (Department of Agriculture, Fisheries and Forestry) 2007, *Phase Three of the Natural Heritage Trust,* viewed April 2008, <www.nrm.gov.au/funding/pubs/nht-questions.pdf>.

DEWHA (Department of Environment, Water, Heritage and the Arts) 2007, *Integrated Water Resource Management in Australia*, viewed April 2008, <http://www.environment.gov.au/water/publications/action/case-studies/murray.html>.

Ferguson, S (2008), *Buying Back the River*, transcript 20 October 2008.

Freebairn, J 2005, 'Principles and issues for effective Australian water markets', in J Bennett (ed.), *The Evolution of Markets for Water, Theory and Practice in Australia*, Edward Elgar, Cheltenham, pp. 8-23.

Grafton, Q and Hussey, K 2007, 'Buying back the living Murray: at what price?', *Australian Journal of Environmental Management,* vol. 14, pp. 74-81.

Heaney, A, Beare, S and Bell, R 2000, 'Targeting reforestation for salinity management', *Australian Commodities,* vol. 7, pp. 511-518.

Heaney, A, Thorpe, S, Klijn, N, Beare, S and Want, S 2004, 'Water charges and interreginal trade in the southern Murray-Darling Basin', *ABARE Conference Paper* 04.14.

Letcher, RA and Jakeman, AJ 2002, *Experiences in an Integrated Assessment of Water Allocation Issues in the Namoi River Catchment*, Technical Report Working Paper, ICAM, Australian National University.

MDBC (Murray-Darling Basin Commission) 2006, *Improvement in Accuracy of Measurements of Diversions and Return Under the Cap,* Publication No. 43/06, MDBC, Canberra.

MDBC 2007a, *Review of Cap Implementation 2005/06, Publication No. 12/07,* Murray-Darling Basin Commission, Canberra.

_____ 2007b, *Water Audit Monitoring Report 2005/06,* MDBC, Canberra.

MDBC 2008, *The Living Murray Progress Report (Water Recovery)*, viewed April 2008, <http://thelivingmurray.mdbc.gov.au/programs/water_recovery/progress>.

MDBMC (Murray-Darling Basin Ministerial Council) 2006, *Basin Salinity Management Strategy 2005-06 Annual Implementation Report*, MDBC, Canberra.

NCC (National Competition Council) 2005, *Assessment of Governments' Progress in Implementing the National Competition Policy and Related Reforms*, NCC, Melbourne.

NSWDECC (New South Wales Department of Environment and Climate Change) 2008, *Water for the Environment*, viewed October 2008, <http://www.environment.nsw.gov.au/environmentalwater/index.htm>.

NSWDNR (New South Wales Department of Natural Resources) 2008, *Water for the Environment: Environmental Rules for Rivers*, viewed August 2008, <http://naturalresources.nsw.gov.au/water/rivers.shtml>.

Pannell, D 2008, 'New environmental policy "Caring for our Country"' *Pannell Discussions 17th March*, viewed April 2008, <http://cyllene.uwa.edu.au/~dpannell/pd/pd0121.htm>.

Quiggin, J 2001, 'Environmental economics and the Murray-Darling river system', *Australian Journal of Agricultural and Resource Economics,* vol. 45, no. 1, pp. 67-94.

Quiggin, J 2006, 'Repurchase of renewal rights: a policy option for the National Water Initiative', *The Australian Journal of Agricultural and Resource Economics*, vol. 50, pp. 425-435.

Quiggin, J 2008, 'Buying back water', *John Quiggin Commentary*, viewed July 2008, <http://johnquiggin.com/index.php/archives/2008/03/04/buying-back-water/>

Randall, A 1981, 'Property entitlements and pricing policies for a maturing water economy', *Australian Journal of Agricultural Economics,* vol. 25, no. 3, pp. 195-220.

Rolfe, J and Mallawaarachchi, T 2007, 'Market-based instruments to achieve sustainable land management goals relating to agricultural salinity issues in Australia', *Australasian Journal of Environmental Management*, vol. 14, pp. 27-34.

Scanlon, J 2006, *A hundred years of negotiations with no end in sight: Where is the Murray Darling Basin Initiative leading us?*, MDBC, Canberra.

The Land 2008, *Govts buy NSW cotton farm to help save Macquarie Marshes*, article 7/08/08.

Vertessy, R 2007, *Advancing Water Information*, presentation made at the Water Information Industry Seminar, Bureau of Meterology, 22nd Nov 2007, Sydney.

WGCS (Wentworth Group of Concerned Scientists) 2008, *Senate Submission: Senate Inquiry into the Urgent Provision of Water to the Coorong and Lower Lakes*, WGCS, Sydney.

Wong, P 2008, 'Government water purchase secures rights to 35 billion litres for the Murray Darling', *Media Release*, PW 69/08, Canberra.